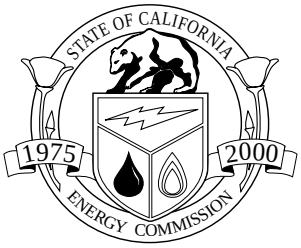
HANDBOOK

HOW TO HIRE AN

ENERGY AUDITOR To Identify Energy Efficiency Projects

Gray Davis, *Governor*



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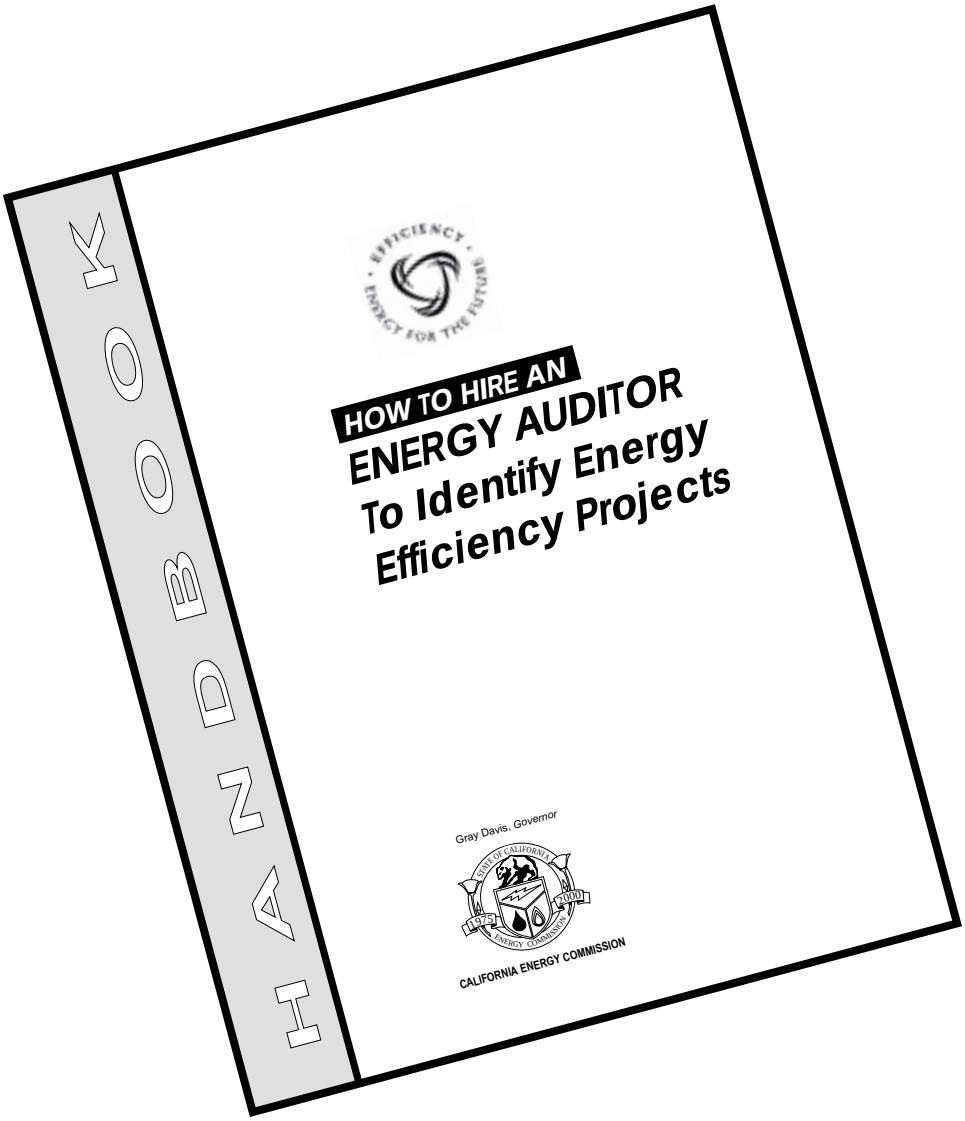

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This document is one of a series of publications contained in the Energy Commission's *Energy Efficiency Project Management Handbook*, that was designed to help local governments, schools and other public entities successfully implement energy efficiency projects in their facilities.

For information on how to obtain a copy of other documents, contact the Nonresidential Building Office at (916) 654-4008. All documents can downloaded from the Energy Commission's Web Site at:

www.energy.ca.gov/reports/efficiency_handbooks

How To Hire an Energy Auditor

To Identify Energy Efficiency Projects

Energy Efficiency Project Management Handbook

California Energy Commission
Energy Efficiency Division

An energy audit, also called a feasibility study or technical assistance report, is typically needed to identify technically viable and cost effective energy projects that will reduce energy use and operating costs in your facility.

Those preparing the audit will evaluate your energy-using equipment and identify ways to enhance its operating efficiency. In the process, they should also resolve occupant comfort problems and decrease your facility's maintenance costs.

If you need an energy audit, you must determine who will complete it. Will it be done by your in-house staff, an energy consultant or an Energy Services Company?

This document is primarily directed to those planning to hire an energy consultant or energy auditor. Even if you decide not to hire one, however, the information it provides can help you to insure a successful, cost-effective audit.

Contents

I. DO YOU NEED AN ENERGY CONSULTANT?

If your staff has the time and expertise, you can save money and do the energy audit yourself. The money saved can be spent on the projects. There will be no energy savings, however, if your staff is too busy to do the audit and the project installation is delayed.

If you decide to have your staff do the energy audit, we recommend that you use the Energy Commission's guide, *Guide to Preparing Feasibility Studies for Energy Efficiency Projects*. The Guide can provide a road map to completing a study. The Energy Commission staff uses it to evaluate consultant reports.

Even if you contract with a consultant, your organization is still responsible for monitoring the contractor's activities. This ensures that the audit meets your requirements and the dollars spent are consistent with the budget.

This section discusses various areas to consider in determining whether or not to hire an energy consultant.

A. Pros and Cons of Hiring a Consultant

There are advantages and disadvantages to using a consultant instead of your own staff.

Advantages

A consultant can:

- Confirm and verify that the projects are feasible.
- Obtain and use the latest technical and cost information.
- Use computerized building simulation models which can more accurately estimate project feasibility.
- Identify technological problems before installation.
- Free up your staff.

Disadvantages

- Contracting out does not mean less work for your staff. Your staff will still need to:
  - Prepare the RFP and the scope of work to select the consultant. Preparing an RFP is very time consuming.
  - Manage the consultant and review the energy audit.
  - Resolve protests and conflicts from losing bidders and consultants.

B. Types of Energy Consultants

If you decide to contract for an energy audit you will probably select from two types of companies: energy consultants and Energy Services Companies (ESCOs). The major differences between the two relate to their scope of services.

The information contained in this document can be applied to both ESCOs and energy consultants who prepare energy audits. In fact, you may receive proposals from both of them if you solicit for an energy audit. The following describes the differences between these two types of companies:

Energy consultants specialize in evaluating and recommending projects to improve the energy efficiency of buildings. Generally these consultants have electrical and mechanical engineers on their staff that can estimate energy use, energy savings and costs of the projects. They can provide additional services, such as preparation of project specifications or engineering and design, but they usually do not provide financial or management services. Some energy consultants also can assist you in hiring the vendors, managing the contractors and reviewing bid packages, ESCO and financial proposals.

ESCOs often perform energy audits to identify cost-effective energy efficient retrofits. The ESCOs main interest lies not with the audit but in installing and managing the recommended energy projects. Some ESCOs arrange financing and provide equipment maintenance. ESCOs have a vested interest in the completion, operation and resulting savings from your projects. Contracting with an ESCO is an important decision because it involves a long-term contract, typically called performance contracts. In performance contracts, the ESCO guarantees the energy savings associated with the installed projects. For more information on ESCOs, refer to the Energy Commission publication, *How to Hire an Energy Services Company* (P400-00-001D).

II. WHAT ARE THE DIFFERENT TYPES OF ENERGY AUDITS?

Three main types of audits are: *Preliminary, Single Purpose, and Comprehensive*. Selecting the appropriate type of audit for your facility saves you time and money. Each type is distinguished by the level of detail and analysis required to complete the audit. The less detailed the audit, the less accurate the estimates of project costs and energy savings.

Some audits produce an energy balance which compares actual energy use from past utility bills with the estimated energy use of the existing equipment based on assumptions of current operating conditions.

The balance verifies that assumptions used in estimating the energy consumed by equipment are consistent with the total energy use identified in the utility bill.

An accurate energy balance insures that the consultant will not over- or under- estimate the energy savings. The added time and cost of doing the balance, however, may not be warranted for studies which focus only on lighting retrofits.

This section describes each type of audit and how to select the proper type for your facility.

A. Preliminary Audits

These are quick evaluations to determine a project's potential and to decide if a more detailed energy audit is warranted. Often these audits are used as a screening or marketing tool by ESCOs and equipment vendors. Depending on the size of facility, it usually takes less than one day to complete.

Preliminary audits could also be conducted by your facility staff to help determine whether to hire a consultant. In any case, the auditor uses the collected data to grossly estimate energy savings and project costs for broad groups of projects, such as the installation of energy efficient lights. Those projects with favorable paybacks could be further analyzed in a future targeted or comprehensive audit (see the next sections).

Preliminary audits usually cost about one - three cents per square foot, depending on the size of the facility. This cost includes a letter report containing a preliminary list of feasible projects. The report usually provides minimal calculations and supporting analysis, and very rough estimates of energy savings and project costs. There is no consideration for the interactions between projects -- the effect of installing energy efficient lighting on the HVAC system, for example. As a result, the energy savings are not accurate and should not be used as the basis for project financing decisions. The following summarizes the advantages and disadvantages of preliminary audits:

Advantages

- Provides an idea of an energy project's potential prior to spending money on a detailed study.
- Is least expensive type of audit.

Disadvantage

- Provides only minimal information; its accuracy is limited on project costs and savings.

B. Single Purpose or Targeted Energy Audit

This type of audit provides a detailed analysis on one or more types of projects. The projects analyzed could result from a preliminary audit or a vendor, or could be selected by the facility staff as a needed repair or upgrade project.

Often vendors that specialize in a particular type of energy efficient equipment will perform these types of audits. Examples include those that focus only on lighting, energy management systems, variable speed drives, boiler/chiller replacements, thermal energy storage systems, energy generation, or a combination of these projects.

Single purpose audits that target lighting projects may cost about three to seven cents per square foot, assuming a mixture of lighting types and multiple buildings. For smaller facilities or buildings with the same type of fixture, the cost could be less.

All targeted lighting audits should contain, at a minimum, a count of the number and types of fixtures in each room, and spot checks of light levels. The hours that lights are on are typically verified by facility staff.

For air conditioned facilities, the energy used for lighting should be between 30 and 50 percent of your facility's total electrical use.

An energy management system project or a HVAC replacement project will generally require more analysis than a lighting project and may cost five to nine cents per square foot. These types of analyses require collection of HVAC equipment operating data, and computerized simulations to extrapolate annual operating energy use. The Energy Commission's feasibility study guide contains a discussion on the information to be collected and analyzed in single purpose or targeted audits.

Sometimes single purpose audits, such as those focusing only on lights, do not require a detailed energy balance of all energy using equipment. Other projects, however, like energy management systems or central plant replacements, will require, at a minimum, a simplified energy balance to ensure that engineering assumptions on operating hours, loads, and equipment efficiencies are valid.

A simplified energy balance uses energy density factors for systems that are not being considered for energy projects, and collects detailed information on equipment that is considered for a retrofit. All the assumptions used to develop the energy balance and the operating information for both the existing and proposed equipment are contained in the energy audit.

The following summarizes the benefits and drawbacks of a single purpose audit:

Advantages

- Provides a detailed analysis of specific energy technologies.

- Analyzes only the projects that you want.

Disadvantages

- Provides no energy management plan, which could result in random project development.

- Offers potentially biased analysis -- especially if the project is recommended by someone with a future vested interest.

- Focuses on specific technologies that may adversely impact future energy project recommendations.

- May miss non-targeted opportunities.

C. Comprehensive Audit

A comprehensive audit provides a detailed energy project implementation plan for a facility, since it evaluates all major energy using systems. The systems to be evaluated include the building envelope, lighting, domestic hot water, HVAC and controls. In some cases, the audit will evaluate the potential for thermal energy storage (TES) and energy cogeneration projects.

This type of audit offers the most accurate estimate of energy savings and cost. It considers the interactive effects of all projects, accounts for the energy use of all major equipment, and includes detailed energy cost saving calculations and project cost.

Comprehensive audits typically use computer models to simulate building and equipment operations based on weather, equipment set points, hours of operation and other parameters. Comprehensive audits are generally the most expensive of the three types. A comprehensive audit generally ranges from 18 to 50 cents per square foot for facilities with less than 50,000 square feet of conditioned area, about 12 cents per square foot for larger facilities (e.g., greater than 250,000 square feet) and 10 cents per square foot for very large facilities (e.g., greater than one million square feet).

In a comprehensive audit, one of the key elements is the energy balance. This is based on an inventory of energy-using systems, assumptions of current operating conditions and calculations of energy use. This estimated use is then compared to utility bill charges. An accurate energy balance insures that the consultant will not over- or under- estimate the energy savings.

The Energy Commission's feasibility study guide details information to be collected and analyzed in a comprehensive audit. The following summarizes the advantages and disadvantages of comprehensive audits:

Advantages

- Provides a detailed analysis of project cost and savings for all energy technologies appropriate for the facility.

- Includes the interactive effects of all projects.

- Provides a logical, non-biased plan for project implementation.

Disadvantages

- Is the most expensive audit of the three types.

- May analyze more projects than can be immediately implemented by your organization. If the audit is used later, it may contain outdated information. If this happens, the audit was a waste of time and money.

III. WHAT TYPE OF AUDIT DO I NEED?

The audit you select will be based on your energy project goals. If your needs are well defined and aimed at specific projects, a single purpose or targeted audit may be the best choice. If you do not know your needs, or want information to help you promote the project's benefits, a comprehensive audit may be your best choice. There are many factors to consider; however, the decision will be more obvious once you have defined your needs and resources.

The following table lists questions you should ask yourself to determine the type of audit that best suits your needs:

Questions to help you determine your audit needs	***If your answer is"Yes" then we recommend . . .***	***If your answer is "No," then we recommend . . .***
Do you want a cursory analysis of the potential for energy projects in your facility?	Preliminary energy audit	Single purpose or comprehensive study
Do you already have an energy audit completed?	Existing studies may only need to be updated to get project financing	Preliminary audit, single purpose or comprehensive study
Have some energy efficiency projects been installed?	Single purpose study focusing on specific projects not previously analyzed	Preliminary audit, single purpose or comprehensive study
Do you have limited funds to spend on an audit?	Preliminary or single purpose study	Comprehensive audit
Do you know what projects you want to implement?	Single purpose study	Preliminary audit or comprehensive audit
Do you want a document that serves as an energy plan for your facility?	Comprehensive study	Preliminary audit or single purpose study
Are you concerned about accuracy of energy project savings and cost?	Comprehensive study	Single purpose study

IV. CAN I UPDATE AN EARLIER AUDIT?

An existing energy audit may still be valid if you update its recommendations. As a general rule, if your facility has undergone major changes and much of the original equipment has changed, or if new buildings have been added, it may be more appropriate to do a new study. If your facility has not significantly changed since the original study was done, however, the existing study can be updated in the following areas:

Areas to be Updated	Comments
Equipment operating schedules	Update equipment and operating schedules that have changed since the audit was done
Energy technology	Update recommendations to reflect current energy efficiency technologies, such as T8 lamps and electronic ballasts
Energy costs	Refer to current utility rate schedule
Energy cost savings	Recalculate using new energy costs and baseline changes
Project cost	Update prices for materials, labor, installation, regulatory permits, engineering, design and construction management
Payback or project economics	Recalculate using new cost savings and project cost

V. HOW SHOULD I SELECT THE ENERGY CONSULTANT?

Depending on your organization's contracting requirements, the consultant who will conduct the energy audit and prepare the technical report can be selected either by sole source or competitive bid. This section will describe both processes and the benefits and drawbacks of each.

A. Sole Source

A public facility can elect to negotiate exclusively with a single consultant. In some cases, the audit cost could be less than the maximum threshold amount which triggers the need for competitive bidding. Public facilities which select this option often have a long-standing working relationship with a particular consultant. As a result, the consultant may be knowledgeable about the energy equipment, the needs and problems of the facility and may charge less for preparing an energy audit. This may not always be true, however.

In general, sole source contracts should be considered for emergencies, and special and unique projects, as they could be more costly than competitive bid.

Even if your organization chooses to sole source, you may want to use elements of the competitive process, such as getting cost quotes from other firms, to assure the best price. The following will help you decide whether or not sole source contracting is your best option:

Advantages

- Reduces transaction costs for both you and the consultant.
- Puts contract into place quickly, expediting the production of the audit and implementation of the projects.
- Results in the selection of a consultant desired by your facility.

Disadvantages

- Lacking competition, your organization may not get the best price for the job.
- Allows no evaluation of other proposals which could be better for your facility.
- Could result in protests.

B. Competitive Bid

When compared to sole sourcing, competitive bidding often results in the lowest audit cost -- offering best value from both a technical and cost perspective.

A detailed and clearly written work statement creates a level playing field for all bidders, reduces the incidence of low-balling by consultants, insures that you get the best value for your money, and enables the facility manager to review each proposal objectively.

Competitive bidding can either occur formally -- through public notices -- or informally, depending on the legal requirements of your organization. The processes work this way:

Formal Competitive Bidding: Request for Proposal (RFP)

Some organizations use the RFP process to select engineering consultants. The RFP is sent to interested consultants who are asked to submit proposals. Each proposal is reviewed and the consultant who meets the minimum technical requirements specified in the RFP and represents the best value from a technical and cost standpoint is selected. The process usually weighs heavily the cost of doing the work. A sample RFP that contains the work statement and selection criteria is in Appendix A.

Formal Competitive Bidding: Request for Qualifications (RFQ)

Many organizations choose to select engineering or architectural consultants by using an RFQ. In this process, bidders compete and are ranked based on qualifications. The bidder that is the most technically qualified is ranked #1, the next most qualified is ranked #2 and so forth. The cost for the work scope is negotiated with the most qualified bidder (rank #1). If an acceptable price cannot be reached with the first bidder, then negotiations are started with the next qualified bidder (e.g., rank #2). In some cases, you may get the most qualified, but not the least cost, bidder. With the RFQ, some of the lower cost benefits of the RFP process are lost. You still have the option of rejecting the most qualified, however, if you believe the price is too high.

Informal Bidding

Without resorting to a public notice, a facility manager prepares a detailed work statement which identifies the scope of the study, the buildings to be audited, the required deliverables and due dates. A select group of consultants are asked to submit a written bid for the specified work. Generally, the consultant who can do the work for the lowest cost or is determined to be the best value from both a technical and cost perspective is selected.

C. Which Is Best?

To help you determine which process may be best, here is a summary of pros and cons of competitive bidding. Compare it with the previous one on sole source selection.

Advantages of Competitive Bid

- Assures the audit is provided at "real market" cost or at the best value from a technical and cost perspective.
- RFQ - All proposals are evaluated on the same criteria, the one best meeting the technical criteria and cost requirements is selected.
- RFP - All proposals are evaluated on the same criteria; the one that meets technical requirements at lowest cost is selected.

Disadvantages of Competitive Bid

- Has a high transaction cost for both the facility staff and consultant.
- Requires substantial time to prepare all bid documents and review proposals -- could delay the start of the audit.

VI. WHAT FACTORS AFFECT ENERGY AUDIT COSTS?

How much should an audit cost? An energy audit may seem expensive, but it is well worth its price since it provides documentation on projects that can save you money.

If you have never contracted for an energy audit, you may be shocked when you receive proposals. To guard against such surprises and to help you determine reasonableness of an estimate, this section discusses factors affecting an audit's price. They will help you accurately estimate what a study should cost. The cost may be fine-tuned in price negotiations or through competitive bidding as discussed later in this section.

A. Type of Audit

Generally, the more detailed the energy analysis and calculations, the more costly the audit. The following table summarizes typical costs:

Type of Audit	Typical Cost ($/sq. ft.) 1997 dollars
Preliminary audits	$0.013 to $0.03/sq. ft.
Single purpose audit	$0.03 to $0.07/sq. ft. (lighting) $0.05 to $0.09/sq. ft. (HVAC and controls)
Comprehensive audit	$0.18 to $0.50 sq. ft. (less than 50,000 sq. ft.) less than $0.12/sq. ft. (more than 250,000 sq. ft.)

B. Type of Facility

The type of facility may also affect the cost of an energy audit. For instance, health care facilities are usually more complicated than other buildings because of complex mechanical systems and controls, a multitude of miscellaneous equipment, and the need to meet strict health and safety standards. Elementary schools, on the other hand, have less complex energy equipment and are less costly to analyze.

Complex facilities can **add as much as three to four cents per square foot** to the audit cost when compared to a similar-sized facility. The order of facility complexity from most to least is as follows:

Most Complex

- Health care facilities
- Universities, colleges, and other higher education institutions
- Water and wastewater treatment plants and detention facilities

Least Complex

- City halls, administration buildings, libraries, courthouses, police and fire departments, and other local government facilities
- K-12 schools

C. Size of Facility

Most often, the unit cost of the audit (as measured in cents per square foot) will decrease as the size of the facility increases. This is largely because certain costs such as travel and per diem expenses, or word processing and quality control charges, are fixed or do not change proportionally with facility size. The result is a much higher cost per square foot for small facilities (less than 10,000 square feet) than large facilities (more than 250,000 square feet).

The following shows how square footage can affect the cost of a comprehensive audit for two different types of facilities:

Examples

Facility	Typical Cost (1997 dollars)
School 10,000 sq. ft.	< $0.50/sq. ft.
Courthouse 250,000 sq. ft.	< $0.12/sq. ft.

D. Availability of Electrical and Mechanical Drawings

The age of a facility may impact the cost of its audit. If detailed, "as built" mechanical and electrical drawings are unavailable, the consultant will need to reconstruct a schematic for equipment operations. This could be complex and time consuming, especially if there are many air handlers and different types of mechanical systems. If "as built" drawings are unavailable and the mechanical systems are complex, it **may add up to two cents per square foot** to the cost of the audit.

E. Experience and Reputation of the Consulting Firm

Often, consultants with experience preparing energy audits can perform the work less expensively. These consultants have light meters, flue gas analyzers, computerized building models, technological references and other analytical tools available to help them conduct the audit and evaluate the data. Experienced consultants can analyze and evaluate energy projects in a short period and determine whether the projects are technically and economically feasible. The engineer you select should also have a successful track record designing and installing energy projects recommended in the audit.

The charges for an energy audit vary based on differences in the consultant's overhead and operating costs, profit margins, and experience of personnel. **The cost can vary by up to six cents per square foot for identical work.**

F. Including Performance Specifications or Project Design

Performance specifications inform equipment contractors and installers about the project to be implemented and the quantity and type of equipment to be installed. These specifications delineate the project's objectives. They establish the minimum equipment requirements, installation parameters and construction documents needed to ensure that a project will successfully meet the audit's predictions.

Performance specifications also explain how a project is to be implemented. All information necessary to ensure that the resulting project costs and bids are in line with the consultant's estimates should be included.

Performance specifications are not a substitute for engineering design. But if engineering design is not required, performance specifications generally provide sufficient information for an organization to go directly out to bid. Preparation of specifications that are clear will create a "level playing field" for equipment bidders and make it easier for you to evaluate different proposals.

Having the consultant who prepared the energy audit also prepare the performance specifications is important for the following reasons:

- The consultant is knowledgeable about the projects to be installed. He understands the requirements and conditions which could affect the project's outcome.

- The consultant could respond to project proposals with higher than expected project costs.

- The consultant can ensure that the specified projects will meet the quality standards of the facility and the requirements specified in the energy audit.

Performance specifications **may add up to four cents per square foot** to the cost of a single purpose or comprehensive energy audit. In some cases, the consultant who prepared the energy audit may be willing to include the preparation of the specifications as part of the total energy audit. A generic specification for various energy projects is contained in Appendix B.

VII. HOW CAN I DETERMINE AUDIT COSTS?

The cost of an audit can be determined through price negotiations or competitive bidding. In either case, you must inform the bidders of the scope of the audit and its minimum reporting and analytical requirements, such as those contained in the Energy Commission's feasibility study guide. This is to ensure that you are getting audit costs for comparable work. A description of each option for determining audit costs follows.

A. Price Negotiations

Your staff can negotiate a reasonable audit cost with the selected consultant. The basis for negotiations could be past experience with the consultant or the cost information in this document.

Your facility manager can negotiate with the consultant until a mutually agreeable cost is reached. If a reasonable cost cannot be agreed upon, you may want to speak with another consultant. The key to successful price negotiations is your knowledge of the energy audit's cost. This "intuitive cost" is usually determined arbitrarily and may not represent the lowest cost energy audit.

B. Competitive Bidding

As already discussed, competitive bidding often results in the lowest audit costs. To ensure a level playing field for all bidders, you must prepare a detailed "work statement" which discusses the scope of the audit, the expectations, the deliverables and schedule. Section IX, page 18, lists the typical information contained in the work statement.

Although this method requires more up-front work by the facility manager, this is offset by the overall lower costs which result from bidding.

VIII. WHAT CRITERIA SHOULD I USE TO SELECT THE ENERGY AUDITOR?

Though cost is an important consideration in selecting a consultant, it should not be the only criteria.

The success of energy efficiency projects depends on the consultant selected to prepare the audit. Energy savings calculations and project analysis using computerized building simulation models are complex and the detection of unreasonable assumptions is very difficult. Therefore, it is important to select a reputable consultant to perform the energy audit while meeting your cost requirements. This section will discuss the important factors to consider when selecting one.

A. Consultant Staff Experience

For **comprehensive energy audits**, the consultant should have broad experience on all types of energy efficiency projects, such as lighting, HVAC, building envelope, domestic hot water and energy equipment controls. Individuals responsible for preparing the audit should have extensive experience performing audits in facilities similar to yours. The Energy Commission's staff recommends at least three years of experience.

For single purpose audits consultants should have specialized expertise in the specified project area, such as lighting or energy management systems. Again, the Energy Commission's staff recommends at least three years of relevant experience in this specific area on related facilities.

Consultants with comprehensive energy audit experience can better analyze a facility and consider the interactive effects of various energy projects than consultants specialized in only one area. Those performing the audit should have the appropriate educational and technical background, such as college degrees, professional licenses, and professional affiliations.

B. Responsiveness

The consultant selected must be accessible and responsive to questions, concerns, and problems. Even after the audit has been completed, difficulties can arise during the project bid stage or after the projects have been installed. That's why the consultant must remain available, be accountable for the audit and demonstrate a track record of past responsiveness.

C. Conflict of Interest

Your consultant should be objective and dedicated to ensuring that the recommended projects are beneficial and cost-effective. If he represents a vendor or has a vested financial interest in your projects, his objectivity may be compromised. This could result in recommending inappropriate equipment or overstating the value of the project. That's why each proposed consultant should identify any financial relationships with equipment vendors or service companies.

D. References

Preparing energy audits and installing projects are challenging tasks. It is therefore

important to check a consultant's references carefully. Consider only references pertaining to projects similar to yours. Ask consultants to provide information about projects that they designed, managed and commissioned. Have them include the name of the organization, contacts, project description, project cost and savings, and consultant staff involved. References should be contacted to determine:

- A record of implementing similar projects. Discuss their projects to get ideas for your energy projects.
- The feasibility of the recommended projects.
- The accuracy of energy savings calculations and project cost estimates.
- Responsiveness to client's needs.
- Incidence of any conflicts of interest.

In addition, ask consultants for sample audits.

E. Availability of Qualified Consultant Staff

The availability of qualified staff is an important consideration when selecting a consulting firm. A company may have experience doing energy project work, but if they assign inexperienced staff to do the audit, the quality of the data collection and analysis may be compromised. When evaluating consultant proposals, ask for a listing of staff who will be working on your project and determine the:

- Percentage of time each will dedicate to the project.
- Nature and relevance of past work and years of experience doing work similar to that requested in your proposal.
- Status of existing work assignments.

IX. WHAT SHOULD I INCLUDE IN THE CONTRACT?

A. Work Statement

A work statement can be developed as a result of a preliminary energy audit or a walk-through of the facility by your staff or others. The walk-through identifies specific energy efficiency projects or energy equipment concerns to be evaluated by the consultant. Depending on the type of audit desired, these special concerns can be addressed by a targeted audit or a comprehensive audit.

The work statement identifies the scope of the study, the buildings to be audited, special audit requirements, the deliverables and schedule. By understanding your scope, prospective consultants know your expectations and can provide an accurate cost estimate for performing the energy audit.

Once the draft work statement is written, it is advisable to have other staff involved in the audit review it for accuracy and completeness. Typical information contained in the work statement includes:

- Project background.
- Facility location.
- Buildings to be audited and square footage.
- Detailed tasks, including any special analysis and the audit format (e.g. Energy Commission feasibility study guide).
- List of deliverables (e.g., preliminary list of projects, draft and final energy audit, preparation of performance specifications).
- Energy audit schedule (to include start date for audit, due dates for deliverables).

After the consultant has been selected and a final price for the audit negotiated, the next step is to formalize the contract.

In addition to the standard legal information, the contract will also include a detailed work statement. This work statement should be similar to that developed earlier during the price negotiation or competitive bid stage (see Section VII, page 15).

B. Schedule

The table on page 19 contains a typical contract schedule. Actual time could be more or less, depending on the project type and project implementation method used.

C. Compensation

There are two main ways to pay a consultant:

- **Fixed fee amount**: Payment is based on an agreed upon amount for the energy audit regardless of how much time the consultant actually spent on the audit.
- **Actual time and material with a cap on the total audit cost**: Compensation is based on actual hours spent on various tasks, multiplied by the hourly rates of the consultant, plus direct expenses, with a cap on the total agreed price. The cap

may be the result of a negotiated price or competitive bid and should be based on the lowest cost. Since monitoring and verifying "actual hours spent" is difficult, it is imperative to have a cap on the audit cost to protect your facility from excessive consultant charges.

D. Payment

Here are several payment elements to consider:

- **Retention**: Some contracts provide for retaining a percentage of the energy audit cost until all tasks have been satisfactorily performed. This is to safeguard the organization from unsatisfactory performance by the contractor. It is possible that even consultants who were satisfactory in the past may perform poorly on your audit. The contract should be written to provide flexibility to have the consultant redo unsatisfactory work without further cost, or to allow you to cancel the contract with minimal cost incurred.

- **Payment upon delivery of the final product deemed acceptable by your organization**: This is the best situation, since no payment is made until the energy audit has been reviewed and deemed satisfactory by your organization or by the entity providing the project financing.

- **Payment based on satisfactory performance of tasks or milestones**: Progress payment amounts are determined by negotiations with your consultant. Conditions for payment are stated in the contract. If you choose to pay in progress payments, it is important to set milestones to insure that you have an acceptable product, or reason to believe that the consultant will provide an acceptable product at a later date. You may otherwise end up without an audit if you decide to stop the contractor's work before completion. If you plan to pay progress payments, we recommend using the following table for determining the payment amounts:

Work Task Deliverables	Typical Compensation Percentages
Task 1: Site Visit	Direct expenses: travel + per diem
Task 2: Preliminary list f projects	10 percent of energy audit cost
Task 3: Satisfactory draft audit	60 percent of energy audit cost
Task 4: Satisfactory final audit	10 percent of energy audit cost
Task 5: Performance specifications	10 percent of energy audit cost
Release retention (if applicable)	10 percent of energy audit cost

TYPICAL CONTRACT SCHEDULE

Task or Purpose	Typical Completion Time	Elapsed Time
Site audit: Consultant collects site information	1-5 days	1 wk
Preliminary project list is provided to facility, identifying potential energy projects	3 wks after site audit	4 wks
Draft energy audit identifies the specific projects, cost and savings	8-12 wks after the site audit	12-16 wks
Final energy audit incorporates comments from the draft	2 wks after comments received on draft	16-20 wks*
Project financing is secured	2-12 wks after the final	18-32 wks
Construction manager (CM) is selected (if applicable); the CM will oversee project	4-10 wks after final audit	22-42 wks
Engineer is selected to prepare performance specifications and project design	2-10 wks after CM selected	24-52 wks
Request for Bid (RFB) goes out soliciting bids to purchase and install the projects	4 wks after spec or design	28-56 wks
Equipment installer is selected	4-6 wks after RFB due	32-62 wks
Equipment is installed and commissioned	4-26 wks after installer selected	36-88 wks

* Assumes a two week review of the draft audit.

E. Other Contract Considerations

When contracting with a consultant to prepare the energy audit, we recommend the following provisions be included:

- State that all contract decisions will be made by your organization -- no work statement or deliverable changes can be made without your written approval.

- Provide an "escape route" in the event that you want to cancel the contract because the contractor did not prepare an acceptable study that meets your needs and requirements (e.g., one that follows the Energy Commission's feasibility study guide).

X. HOW SHOULD I REVIEW THE ENERGY AUDIT?

The consultant makes many assumptions when calculating energy savings and project costs. These could have an impact on the cost effectiveness and feasibility of the proposed projects. Unreasonable assumptions can make an unsound project look cost-effective. This can mean scarce public funds are spent on marginal projects. Some projects such as energy generation and thermal energy storage systems can increase operating cost and result in no savings if improperly evaluated and installed. Conversely, a poor study can result in rejecting sound projects.

Someone involved in the implementation of the projects should review the audit. Your review team could include your technical and operations staff, utility representatives and financing representatives.

By having input from those knowledgeable about the use of your facility, project assumptions can be verified and the feasibility of all recommended projects examined before the audit is finalized and the projects installed. Early involvement by all affected parties, particularly the decision makers, results in streamlining project installation and greater acceptance of the projects.

Consultants preparing the energy audit make numerous assumptions which affect the technical and cost effectiveness of the recommended projects. It is necessary to verify all assumptions and models before proceeding with installation. This section explains the main areas in an energy audit that should be reviewed and discusses whether the review can be completed by your staff.

A. Energy Audit Review Checklist

If your organization has experienced and knowledgeable staff, no outside assistance may be needed to review the study. Conversely, if your staff only knows its facility, it may be worthwhile to get an independent review of the recommended projects.

Possible independent reviewers include utility staff; public organization staff, such as those found in schools, cities and counties; Energy Commission staff; and independent consultants.

Though the task of reviewing an energy audit may seem daunting, it is well worth your time to review it thoroughly. Detecting errors in the report will save you time and money when you finance and install your projects.

The table on page 23 lists the main areas to be reviewed in an energy audit. It assumes a moderate level of knowledge about your facility and about energy efficiency projects. A discussion of each of the elements follows the table.

Energy Audit Review Checklist		
Areas to be checked in the energy audit	**Can be done with in-house staff?**	**Recommend outside review assistance?**
Facility operating hours	Yes	No
Equipment operating hours	Yes	No
Accuracy of energy and demand rates used in the energy audit	Maybe	Maybe-good idea to get independent review
Appropriateness of project recommendations for the facility	Maybe-depends on level of knowledge	Maybe-good idea to get independent review
Accuracy of existing equipment identification in the energy audit	Yes	No
Energy saving estimates	No	Yes
Use of appropriate simulation models and assumptions	No	Yes
Project cost estimates	Maybe-depends on level of knowledge	Maybe

- **Facility Operating Hours**

  It is critical that the consultant uses the correct operating hours for your equipment. Since these hours establish the energy baseline, incorrect information can skew the energy and cost savings and result in unrealistic expectations on project paybacks.

  Different systems may have different operating hours. For instance, there is a difference between occupancy hours (when the building is occupied) versus equipment hours (when the equipment is on). The HVAC system may come on in the morning, several hours before building occupancy begins. When reviewing the energy audit, ensure that the assumed operating hours in the energy audit match the actual operating conditions.

- **Equipment Operating Hours**

  The hours of operation used to calculate energy savings vary depending on the project. There could be different schedules for different equipment. HVAC operating hours, for example, are usually different than building and lighting operating hours.

  Energy savings are calculated on the actual hours when the equipment is on. This is true for projects such as lighting retrofits and motor replacements. For other projects such as occupancy sensors and energy management systems, the hours used to calculate energy savings are the hours which are "reduced" as a result of the project. For example, if the lights are on ten hours a day and an occupancy sensor reduces the operation to eight hours a day, the hours used to calculate the energy savings are two and **not** the operating hours of the lights.

  To ensure reliable energy savings, be sure to confirm that the proper hours are used in the calculations.

- **Accuracy of Energy and Demand Rates Used in the Energy Audit**

  The energy and demand rates used to calculate energy cost savings are different for various projects. Some facilities are on rate schedules that charge more for energy during certain times of the day and/or periods of the year. Projects that reduce energy use during such peak periods will result in more cost savings than those that only reduce energy use during the lower cost, offpeak periods. Use of the wrong rates will skew the savings and make an unfavorable project appear cost effective and vice versa. For instance, interior lights generally operate during the peak periods and the electricity cost will be higher than exterior lights, which operate during the offpeak periods.

  For a discussion of how the weighted energy rates should be determined for various projects, please refer to the Energy Commission guide on feasibility studies.

  Due to the deregulation of the electric industry, future electricity prices are highly uncertain. The changes in future prices could impact the cost effectiveness of your

projects. Therefore, consider having your consultant evaluate projects based on your current prices and also based on an estimated percent reduction in your current price.

- **Accuracy of Existing Equipment Identification in the Energy Audit**

  Errors can be made in the counting and identification of equipment. These mistakes result in inaccurate estimates of total energy savings and project costs. Ultimately, they can result in inappropriate project recommendations.

- **Appropriateness of Project Recommendations For the Facility**

  Reviewers of recommended projects must determine if they are appropriate for the facility. Areas to consider include:

  - Equipment complexity - can the new equipment be operated by your existing staff, or is training needed?

  - Equipment compatibility - is the new equipment compatible with existing systems?

  - Equipment reliability - has the equipment had a proven track record?

  - Operational cost - will the new equipment increase workload of your existing staff or require the hiring of outside maintenance specialists?

  It is important that recommended equipment be warranted for at least five years. Only time tested technologies should be recommended in the studies. Projects such as energy management systems (EMS), and energy generation and thermal energy storage (TES) projects may be inappropriate for some facilities. If equipment is turned on and off at the same time each day, a seven day programmable time clock may be more appropriate than an expensive and more complex EMS. If a facility lacks qualified and trained maintenance staff to operate a particular project, the estimated savings may not be realized. Incorrectly operated energy generation or TES systems may actually increase operating costs.

- **Checking for Overestimating the Energy Savings -- interactive effects**

  When analyzing multiple projects in comprehensive or single purpose audits, verify that the consultant has not double-counted the energy savings. The consultant must take into consideration the interaction of similar projects. If the implementation of one project impacts another, this interaction must be taken into account. A detailed discussion on hierarchy of project analysis is contained in the Energy Commission's feasibility study guide.

  Example: The energy audit recommends two lighting projects which affect the same fixtures: installation of more efficient fluorescent lamps (T-8 lamps and electronic ballasts) and occupancy sensors. The installation of the energy efficient fluorescent lamps should be considered first before the installation of the occupancy sensors.

Therefore, the baseline energy use for the occupancy sensors assumes that the energy efficient fluorescent lamps have been installed. In this example, the implementation of T-8 lamps and electronic ballasts will reduce the energy savings potential of the occupancy sensor project.

Example: Installing energy efficient lighting will impact the building's air conditioning and heating load. If air conditioning savings are considered as part of the lighting project, the additional energy used by the heating system will also need to be considered. If credit is taken for air conditioning savings, hourly simulation models are generally used to justify the savings.

- **Use of Appropriate Simulation**

  As previously discussed, all assumptions and calculations used in the energy audit must be justified. The consultant may use actual measurements, such as flue gas analyzers and actual temperature readings to justify the calculations, as well as simulation models.

  Simulation models help determine a building's baseline and the proposed, new heating and cooling loads after installation of energy efficiency projects. Models can take into account the interactive effects of projects and simulate the building's energy use based on past weather conditions and equipment operations. If correct assumptions are used, models can provide an accurate estimate of equipment energy use.

  If simulation models are used, the consultant must provide appropriate input, verification, and summary reports to enable the reviewers to check and verify the model's results. For a list of appropriate input, verification, and summary reports for various simulation models, please refer to the Energy Commission's feasibility study guide.

  A list of standard simulation models follows. The use of one of these models should be considered mandatory when evaluating chiller replacements, energy generation or thermal energy storage systems, and energy management systems:

  - *DOE 2.1E* based model (Visual, Power), United States Department of Energy
  - *Hourly Assessment Program (HAP)*, Carrier Corporation
  - *Trace 600*, The Trane Company
  - *Modified Temperature Bin Models,* ASHRAE
  - *Reduce Swimming Pool Energy Cost (RSPEC)* for swimming pools only, United States Department Of Energy

  Information on how to obtain copies of these models is contained in Appendix C.

- **Checking Project Costs**

  Inaccurate project costs can result in questionable project economics, project

cost budgeting problems, cancellation of projects and disillusionment on the benefits of energy efficiency. This is particularly problematic if budgetary considerations are based on the original project cost estimates. You must ensure that the consultant has included all items when estimating the project cost. The following summarizes the minimum cost information to be provided by the consultant. A more detailed discussion is contained in the Energy Commission's feasibility study guide.

- **Substantiation of equipment cost.** All equipment cost estimates should be actual price quotes no more than six months old. Quotes as well as standard cost estimating factors are contained in the most recent edition of *Means Cost Data Series* or comparable cost estimating guides.

- **Detailed equipment cost.** The cost estimates must include a detailed description of all equipment, including ancillary equipment, the number of pieces to be purchased and the cost per unit. The amount of contractor mark-up and sales tax must be indicated for each type of equipment.

- **Labor cost.** The total cost for labor must identify the particular job classification (for example, electrician), the hours required and the cost per hour for installation. It should also specify any cost adjustment factor for your city.

- **Other installation cost items.** Unless there is justification as to why they are unnecessary, include demolition and disposal costs in your calculations.

- **Engineering design cost**. The cost for engineering and design is based on a percentage (typically 15 percent) of the total cost for equipment, labor and other installation cost items. Engineering design drawings maybe needed for projects involving equipment replacement such as the installation of new HVAC equipment or lighting fixtures. Design drawings provide information to prospective bidders on the required equipment and building specifications.

- **Construction management.** Unless there is justification for not including construction management, projects costs should include the cost of hiring someone to oversee the installation, final inspection and system commissioning of the project. Typically 10 percent of total project cost is used as an estimate for construction management cost.

  If your organization lacks the staff to oversee a project, hiring a construction manager may be a good option. In some cases, the consultant who completed the energy audit may have the experience to be a construction manager. For a detailed discussion of Construction Management duties, refer to the Energy Commission's publication entitled *How to Hire a Construction Manager for your Energy Efficiency Project.*

- **Training**. If new HVAC equipment or control systems such as energy management systems, thermal energy storage or cogeneration are proposed, the cost of training should be included in the project cost. This ensures your staff will operate the equipment in the most effective and efficient manner.

- **Commissioning.** To ensure that newly installed equipment operates according to design specifications, a consultant can be hired to inspect and commission the projects. The cost of commissioning can be added to the project cost. Estimated commissioning costs vary considerably from project to project. The following are estimated cost ranges.*

  – Whole building: 0.5 to 1.5 percent of total construction cost (controls, electrical, mechanical)

  – HVAC and automated controls: 1.5 to 2.5 percent of mechanical contract

  – Various energy efficiency measures:
  avg. 53,000 ft.^{2} \$0.08 to \$0.64/ft^2/yr
  avg. 102,000 ft.^{2} \$0.13 to \$0.43/ft^2/yr

- **Permits and plan check fees**. These costs must be included when a project requires permits and plan checks. The consultant should contact the appropriate regulatory agency to determine the fee amount.
- **Contingency costs**. To account for unforeseen problems, contingency costs should be included in project cost estimates. Typically, contingency costs are between 10 percent to 20 percent of the total project costs.

* *Commissioning for Better Buildings in Oregon* prepared for the Oregon Office of Energy, by the Portland Energy Conservation, Incorporated. This document can downloaded at the following Web Site:

<www.energy.state.or.us/bus/comm/bldgcx.html >

XI. WHAT CAN I DO TO ENSURE A SUCCESSFUL AUDIT?

Throughout the audit process, it is important to cultivate and develop a partnership with your consultant. This will ensure that your goals are in concert. Consider these areas to ensure a successful audit:

Pre-Site Visit Data Collection

- Collect information about your energy-using equipment to give to your consultant.
- Request utility billing information from your local utility.
- Contact your local utility representative and inform them about the audit. Your utility can advise you about project financing options and financial incentive programs.
- Keep your management informed about the audit. An informed management team can expedite the implementation of the projects.

Site Visit by Consultant

- Arrange for key decision makers to be at the meeting with the consultant. This includes people such as the city manager; directors of public works, facilities and general services; or county administrative officers and maintenance staff.
- Make sure that the concerns about the facility are understood by the consultant to eliminate any misunderstandings about project expectations.
- Consider how your project will be financed. Will you use your own money, a loan with a private financial institution or the Energy Commission?

Post Audit Project List

- Review proposed project lists to ensure that the consultant has included all applicable measures, addressed your concerns, and has not included unrealistic projects.

Draft Energy Audit

- Review the draft energy audit with your staff and others such as your utility company to ensure that the consultant has included your concerns and has complied with the work statement. By doing a quality, technical review of the draft, you can avoid installing inappropriate or infeasible projects in your facility.
- Set a tentative date for the comments to be sent or discussed with the consultant.

Final Energy Audit

- Review the final energy audit to ensure that the consultant has considered your comments.

Performance Specifications

- Review the performance specifications to ensure that the technical requirements specified are consistent with the needs of your facility.

Follow-through

- Be involved with all phases of the audit -- do not walk away from the project. Get outside assistance if needed.

- Keep your management informed about the energy audit, the project recommendations, estimated project costs and financing considerations.

- Stay in contact with everyone involved with the energy audit. Any meetings should include your consultant, utility representatives, and local government management team.

- Ensure that assignments, deliverables and schedules are clear and understood by the consultant.

Additional information on energy audit references are contained in Appendix C.

APPENDIX A

SAMPLE REQUEST FOR QUALIFICATIONS

City of _____
REQUEST FOR QUALIFICATIONS
Energy Audit to Identify Energy Efficiency Projects

The City of _____ requests proposals to be submitted for the following purpose and in accordance with each of the terms and conditions that are attached and incorporated in this Request for Qualifications (RFQ).

Important information is contained in the various sections of this proposal. These include:

Section I	Introduction and Administrative Requirements
Section II	Background
Section III	Work Statement and Deliverables
Section IV	Proposal Format
Section V	Minimum Administrative Requirements*
Section VI	Instructions for small business, minority, women and/or disabled veteran business enterprise (if applicable)*
Section VIII	Evaluation and Selection Process
Section IX	Sample Contract Terms*

* Sample sections not included in this appendix. These sections are common to all RFQs released by your organization.

Section I
Introduction and Administrative Requirements

I. Introduction

A. Background

The City wants to identify ways to reduce energy use and costs in its facilities through a wide range of energy projects. We want to use any utility incentives that might be available for the recommended projects. The contractor will coordinate with (name of utility) to ensure that the recommendations meet all utility program requirements.

The contractor will supply all assistance needed from initial identification to actual installation of the energy projects.

B. RFQ Purpose

This Request for Qualifications (RFQ) will result in the selection of a contractor who will:

- Assist the City in development of an implementation strategy
- Prepare an energy audit that will identify cost-effective energy efficiency opportunities in the buildings described in Section II
- Develop performance specifications or other design documents needed to bid and install the measures
- Review vendor bids and select qualified equipment contractors
- Manage and commission the projects

C. Budgeted Funds

There is a maximum of $_____ available. This is an hourly rate plus cost reimbursement contract with a ceiling on the total contract amount.

D. Responses to RFQ

Responses to this solicitation will be according to the format described in Section IV. The bidder's response shall document its qualifications to perform the tasks described in the Work Statement, Section III.

E. Contact Person

Questions or clarifications about this RFQ should be directed to: _____

F. Tentative Schedule

_____RFQ released
_____Pre-bid meeting or site walk-through
_____Proposals due no later than _____ pm
_____Notification of short list firms
_____Interviews (if needed)
_____Contractor selected
_____Contract start date
_____Required project completion date

II. Administrative Information

A. Small Business, Minority, Women, Disabled Veteran Business Enterprises State any requirements

B. City Can Cancel The City reserves to right to do any of the following:
- cancel this RFQ,
- modify this RFQ as needed, or
- reject any or all proposals received

C. Contract Term The successful bidder must begin work within one week after the City awards the contract from this RFQ. The contract will be effective for up to ___ years, from the commencement of the contract term.

D. Final Contract At the City's discretion, the content of this RFQ may be incorporated into the final contract.

E. Cancellation The City reserves the right to cancel any contract awarded through this RFQ by providing 30 days notice to the successful bidder.

F. Verbal Any verbal communication from City employees concerning this RFQ is not binding and shall not alter a specification, term or condition of this RFQ.

G. Bidders' Cost The cost of developing a proposal is each bidder's responsibility and cannot be charged to the City.

H. Conference A Pre-bid Conference and site walk-through will be held on _____, at _____ at _____. All prospective bidders are invited to attend this conference or to send representatives to the same.

I. Due Date Deliver ____ typed copies to the City of _____, Contracts Office, _____, no later than _____, at _____ pm. All bids must be complete when submitted. Facsimile (FAX) transmissions may not be accepted in whole or in part under any circumstances.

J. Withdrawal A bidder may, by letter to the Contact Person, withdraw or modify a submitted proposal prior to the due date.

K. Documents The successful bidder will be required to submit and/or prepare a few standard documents and statements prior to the contract award. The following standard documents are included in this RFQ for informational purposes:

_____

L. City Property All proposals and related material submitted in response to this RFQ become the property of the City and are a public record.

M. Immaterial Defect The City may waive any immaterial defect or deviation contained in a bidder's proposal. The City's waiver shall in no way modify the RFQ or excuse the successful bidder from full compliance.

N. Subcontractors If a bidder intends to use subcontractors to conduct any of the work described in the proposal, the bidder must identify the subcontractor, provide a summary of each subcontractor's qualifications, experience and duties that would be performed.

O. Negotiations The City will begin negotiations with the top ranked bidder(s) for an acceptable fee and contract. The bidder(s) will be required to submit a list of contractor rates after written notification of selection. If negotiations with the top ranked bidder(s) fail, the City will enter into negotiations with the next highest ranked bidder, and so on.

P. Contract Award The contract shall be awarded to the proposer who satisfies the technical criteria, format and all administrative requirements, and whose cost are acceptable to the City. Bidders must achieve a minimum technical score of ___ points in order to be considered in the cost negotiation phase. Details of the selection process are contained in Section VIII.

Section II
Background

A. About This Section

This section provides prospective bidders with information about the City facilities to be analyzed and the reasons for the audit.

B. Organizational Information

The City operates _____ buildings totaling about _____ square feet. The _____ Department is responsible for maintaining and operating these buildings. Some energy projects have been installed by city staff in the past. These include: _____.

C. Organization Goals

Our City is interested in an energy audit because of the following reasons (List your goals, objectives, expectations and needs and how information will be used): _____.

D. Building Information

Describe each building by including the following:

- Name of building, year built and number of stories
- Daily and annual operating schedules
- Annual energy cost
- Square footage of heated and/or cooled spaces
- Overall types and sizes of HVAC units
- Special uses, such as, kitchen, laundry, pool
- Special equipment, such as, cogeneration
- Special concerns, such as, asbestos

Example Building Information

The building to be audited consists of the City Hall and Police Station. Floor plans are available for all of these buildings and can be reviewed by contacting _____.

The City Hall and Police Station are approximately 130,000 square feet. It has 11 stories and is constructed of concrete. The building's operating daily and annual operating hours are _____. The annual electric and gas use is summarized on Table ___. Mechanical equipment include: a) two Carrier centrifugal chillers, run in parallel, and rated at 150 tons each; and b) two natural gas fired boilers rated at 1.5 million BTUs per hour each. The chillers use R-11 and reject condenser heat to a cooling tower, rated at 185 tons, located on the roof. Most of the building is supplied by a chill water loop that supplies the coils on 4 constant volume air handling units. The HVAC system utilizes a hot water reheat system.

Section III
Work Statement and Deliverables

A. Introduction

When directed by the City's project manager, the contractor will:

- Prepare an energy audit for the buildings identified Section II
- Prepare performance specifications and other design documents for selected projects identified in the energy audit, as determined by the City's project manager
- Assist the City with implementation of the projects such as bid review and selection, project management and commissioning

The scoring criteria in this RFQ is designed to favor contractors who demonstrate the highest level of experience and expertise in each of the technical areas outlined in the work statement.

B. Tasks

1. Site Visit/ Initial Meeting

The contractor will conduct a site visit for the purpose of completing a detailed energy audit of the City's lighting and HVAC systems at the buildings described in Section II. The site visit will include: gathering historical data of existing energy use, meeting with the facilities' staff, touring the facilities, identifying all major lighting and HVAC equipment and systems, determining occupancy schedules and energy use patterns, and identifying facility or occupancy changes that could affect energy use.

At the site visit the contractor will learn how the City intends to implement its energy projects and to assess the best form to present the information. After the initial site visit meeting, the contractor will develop a preliminary list of projects and fax (or send) it to the City's Project Manager. Once the list is transmitted, the contractor will call the City's Project Manager to discuss the list and any details that could potentially affect the outcome of any tasks in this work statement. The contractor will not proceed with subsequent tasks under this work statement until the City's project manager has approved of the preliminary project list.

2. Perform Analysis

The contractor will perform an analysis of the lighting and HVAC equipment at the City facilities described in Section II. The analysis will follow the California Energy Commission's *Guide to Preparing Feasibility Studies for Energy Efficiency Projects*, May 1996 (Guide). An energy use

balance will be prepared for each building for electricity and natural gas. Analyses will be performed to determine which, if any, energy efficiency project options are cost effective. Each project will be discussed on a building-by-building basis with separate savings and cost.

The analysis will also address the following specific concerns: _____.

All project cost analysis shall include cost of material, labor, engineering design, project management and commissioning of the measures.

3. Energy Audit Preparation

Following the Guide, the contractor will prepare an energy audit that describes the facility and its energy use patterns, identifies all cost effective lighting and HVAC options, presents recommendations regarding all options analyzed, and includes all calculations conducted in support of the analyses. The audit will be formatted to allow the City to use it as a basis for bidding the projects. As most of the identified projects will be implemented using outside contractors, the work should be divided into logical and biddable tasks.

4. Draft Energy Audit and Comments

The contractor will provide _____ draft copies of the energy audit to the City's project manager. At the request of the City's project manager, the contractor will meet with the City to discuss the audit and identify projects needing performance specifications.

5. Final Energy Audit and Specifications

The contractor will incorporate changes and recommendations from the City staff and finalize the audit, delivering three copies to the City's project manager. After receiving approval from the City's project manager, the contractor will work with the City to develop performance specifications for the recommended projects. The performance specifications should contain, at a minimum, the information specified in Appendix B of the California Energy Commission publication *How to Hire an Energy Auditor*. The specifications should be in a form that can be included in the City's bid documents to hire an equipment contractor to design or install the projects. The contractor will provide the specifications on a 3.5 inch diskette in a software program specified by the City's project manager. The contractor will work with the engineering design firm as needed and be available by telephone for questions that may arise at the bidder's conference.

6. Select Equipment Installer

The contractor will assist the City's project manager in evaluating all equipment bids and identifying proposals that meet the City's technical and administrative requirements.

7. Project Management & Commissioning

The contractor will manage all phases of the energy project. Typical tasks will include, but not be limited to:

- Maintain project schedules
- Plan and track project budgets
- Perform construction review, cost and value analysis
- Coordinate and monitor the work of all equipment installers for compliance with federal, state and local regulations
- Conduct final testing and commissioning
- Recommend final project acceptance

C. DELIVERABLES AND DUE DATES

Tentative Due Dates

Task 1: Visit the Site, Prepare Preliminary Project List ..... _____

Task 2: Perform Energy Audit Analysis ..... _____

Task 3: Prepare Audit ..... _____

Task 4: Write Draft Energy Audit ..... _____

Task 5: Final Energy Audit and Performance Specifications ..... _____

Task 6: Evaluate and Select Equipment Installers ..... _____

Task 7: Provide Project Management and Commissioning ..... _____

Meetings

At the request of the City's project manager, the contractor shall be available for meetings or briefings to City staff or others.

Amendments

Any contract amendments shall require prior review and approval by the City's project manager.

Payment Conditions

The City's project manager will specify the invoice format, such as:

- No payment will be made in advance of receiving a satisfactory final energy audit as determined by the City's project manager.

- Progress payments will be made upon receipt of draft and final energy audits submitted to and approved by the City's project manager, based on time and materials. A request for payment must include an itemized invoice with cost backup and travel receipts attached. Ten percent of the amount invoiced will be withheld until the end of the contract term.

Section IV
PROPOSAL FORMAT

Introduction

This section provides information on how to prepare a bid in response to this RFQ. These instructions prescribe the **mandatory** proposal format. Instructions must be adhered to, all questions must be answered, and all requested data must be supplied. Proposals that fail to meet these requirements and do not answer all questions will be eliminated from the evaluation process.

Mandatory Format

The proposal shall be organized as follows:

1. Cover Letter
2. Table of Contents
3. Summary of Approach and Technical Staff
4. Contractor Experience
5. Company Organization
6. Personnel Qualifications and Resumes
7. Approach to Tasks in Work Statement
8. Conflicts of Interest
9. List of References
10. Sample Audits
11. Completed City Documents and Statements

1. Cover Letter

The cover letter must be signed by a person having the authority to commit the bidder to a contract and include:

- A summary of the bidder's ability to perform the services described in the Work Statement, Section III.
- A statement that the bidder is willing to perform those services and enter into a contract with the City.

2. Table of Contents

Each proposal must include a Table of Contents organized in the order cited in this "Mandatory Format" section and with page numbers.

3. Summary

Summarize your company's overall approach to the Work Statement, highlighting any outstanding features, qualifications and experience relevant to performing the technical work, including the project management. Discuss your current job commitments and how your company can complete the work discussed in this RFQ according to the schedule in Section III.

Provide a short description of each staff member who will be doing work on this contract. Highlight any specialized energy expertise that is applicable to the tasks outlined in the Work Statement.

4. Contractor Experience

- Describe your company's experience in preparing energy audits for city governments. Include your project implementation experience in engineering and design, project and construction management and commissioning.

- Give examples of work performed within the past 36 months that is similar to that indicated in the Work Statement (Section III). Explain its relevance to the Work Statement and the proposed contract.

- Provide a minimum of three references for whom you have provided services similar to that requested in this RFQ. If possible, include references for which you have prepared the energy audit and designed, managed and commissioned the resulting projects.

  For each reference, indicate the company, contact person, telephone, nature of the service or work provided, date of service, and project status.

- Highlight any additional experience that you believe is relevant to the work under this contract.

5. Company Organization

- Describe your company structure.

- Describe reliability, continuity, professional awards, location of your company and subcontractors, if any. Include type of company, composition, functions to be performed by members of your company and subcontractors and how they pertain to this contract.

- Describe any electronic reporting, Internet capabilities or other tools that would facilitate communicating information to the City.

- Provide an organizational chart for your company. Briefly explain the relationship of each technical staff member and subcontractors, if any, to your company.

6. Personnel Qualifications

- Complete Form 2A by listing all individuals in your company who will provide technical services through this contract. Indicate the specific tasks that they will be assigned. Include each individual's job classification, academic degrees, professional registration, areas of contract responsibility, and percentage of time on a monthly basis that the individual will work on the contract tasks.

  A proposal that shows a balance of staff time between both senior and more junior levels will rank higher than one that does not.

- Describe the relevant experience each technical staff member had in performing pertinent tasks identified in the Work Statement.

- Provide a current resume or biographical sketch for all personnel who will be assigned to this contract.

7. Approach

- Describe approach to providing services in the Work Statement.

- Based on the facility description in Section II, discuss the information to be collected and the process to be followed to complete the Work Statement. Explain the general type of recommendations you believe are appropriate for the facilities listed in Section II.

- Describe data collection equipment (i.e. flue gas analyzer, amp/watt meter, light meter, anemometer, etc.) to be used to accomplish the tasks listed in the Work Statement.

- Indicate the building simulation program to be used to accomplish the tasks in the Work Statement.

8. Conflicts of Interest

Indicate any relationships with equipment manufacturers or vendors, Energy Services Companies or equipment maintenance firms. The City reserves the right to reject any or all proposals that present a true or apparent conflict of interest.

9. Sample Audits

Attach one relevant example of prior work. This example should be similar in scope to the work requested in this RFQ

10. Required Documents

Complete and submit the following City documents:

_____

Form 2A: Contractor Staff Qualifications
Contractor Name:

Bidder's Staff Name and Title	Degrees	Professional Affiliations and Licenses	Specialties	Assigned Work Statement Areas	Total Years of Relevant Experience	Percentage of Time Available for this Contract*

* Percentage of time contractor's staff will be available each month to work on this contract.

SECTION VIII
EVALUATION AND SELECTION PROCESS

Introduction

Each proposal shall be evaluated on how well it meets the City's needs as described in this RFQ. The City reserves the right at any time to reject any or all proposals.

Evaluation Stages

To analyze all proposals, the City will organize a committee with expertise in evaluating consulting services. The committee will analyze proposals in the following stages:

A. Administrative

After the submittal period closes, each proposal received before the deadline is opened and examined to see if it complies with the RFQ administrative and format requirements in Sections IV to VI.

B. Technical

Technical proposals meeting the administrative requirements are evaluated and score based on the criteria on page A-17. The committee identifies those proposals that meet or exceed the required minimum technical points. Point calculations reflect the averages of the combined scores of all evaluators.

C. Interviews

The committee may use patterned questions to conduct bidder interviews; bidder responses will be scored. Upon completion of the interviews, the City may make adjustments to the scores and re-rank the top competitors.

The committee may reject all bidders and proposals if none are considered in the best interest of the City.

Scoring

The criteria stated on page A-17, Weighting Factors and Criteria, are used in the evaluation of the technical proposal. The technical proposal must attain the minimum score of _____ to pass. Those not attaining the minimum are eliminated from further competition.

The Committee will award points based on:

- Exceptional: 90 to 100 percent of maximum points for the criterion. The proposal satisfies the requirements and describes specifically how and what will be accomplished in a superior manner, both quantitatively and qualitatively, using sample products and illustrative materials such as diagrams, charts and graphs.

- Above Average: 51 to 90 percent of maximum points for the criterion. The proposal satisfies the requirement and describes specifically how and what will be accomplished in an exemplary manner, using sample products and illustrative materials such as diagrams, charts and graphs.

- Average: 50 percent of maximum points for the criterion. The proposal satisfies the requirements and describes generally how and/or what will be accomplished.

- Below Average: 25 to 49 percent of maximum points for the criterion. The responses are minimally acceptable.

- Fail: less than 25 percent of maximum points for the criterion. The proposal is not in substantial accord with the RFQ requirements; will have significant effect on the amount paid, or the quality or quantity of products or services; or provides an advantage to one competitor over the other competitors.

Weighting Factors and Criteria

Criterion	Key Elements	Points
Approach to Work Statement	- Demonstrated understanding of tasks outlined in work statement - Demonstrated experience with similar tasks - Audit approach, analysis and recommendations - Ability to satisfy time lines for deliverables	40
Company Technical Experience	- Quality and relevance of experience in conducting energy audits for local governments - Depth, relevance and quality of work examples - References - Depth of relevant project implementation experience	60
Company Organization	- Organizational strengths of proposed company - Appropriate level and type of staff to complete work in a competent and timely manner.	25
Personnel Qualifications and Experience	- Qualifications of assigned personnel - Experience of assigned personnel - Availability of assigned personnel	25
Interview	- Response to questions - Quality of presentation - Explanation of approach to work statement tasks	50
TOTAL		**200**

APPENDIX B

SUGGESTED INFORMATION FOR PERFORMANCE SPECIFICATIONS

Once the energy audit is complete, your energy auditor can prepare performance specifications and other technical documents for use in bidding the projects. Performance specifications describe project objectives, equipment to be installed, minimum equipment performance standards and installation parameters. Sometimes information on quantities, capacities, locations and specific material or equipment types are also included when performance specifications are used to solicit competitive bids.

For complex projects like new central plant equipment or energy management systems, performance specifications will not be specific enough for you to directly bid the project. You will need to hire an engineer to prepare detailed technical analysis and drawings. These design documents are needed to bid complex projects.

The three main parts of performance specifications include:

1) **General Project Information**: The project's background, objectives, a summary of the retrofit work required and a description of any attachments.

2) **Material Specifications**: Identification of the **minimum** equipment performance standards.

3) **Contract Considerations**: Your organization's bid submittal and standard contract requirements. These might include instructions, bid forms, general conditions, supplemental conditions, labor wage requirements and sample contracts.

This appendix discusses the information needed in each of these parts for common lighting and HVAC projects.

The Construction Specifications Institute (CSI) and the American Institute of Architects (AIA) can provide examples of other performance specification formats. Their addresses are contained in Appendix C.

The following projects are discussed in this document:

- **Lighting**

  - T8 lamps and electronic ballasts
  - Compact fluorescent retrofit
  - Fluorescent fixture replacements
  - High pressure sodium retrofit
  - Fluorescent fixture modifications (delamp/reflectors/lens)
  - Occupancy sensors
  - LED exit signs

- **HVAC**

  - Boiler
  - Chiller
  - Heat pump
  - Cooling tower
  - Energy management system (EMS)
  - High efficiency motors
  - Variable speed drives

LIGHTING

Performance specifications should include the following information, at a minimum:

I. General Project Information

A. ***Project Background*** - Describe the project's history and status

B. ***Summary of the Work*** - Explain the specific projects and buildings involved

C. ***Attachments*** - Identify the project locations and equipment to be retrofitted. Include a list with a description and count of existing fixtures and proposed changes by building in a summary table format.

II. Material Specifications

This section lists the minimum technical information for each of the following:

A. ***Fluorescent lamps*** - Indicate lamp type, temperature and color rendering index, minimum warranty requirements and acceptable manufacturers.

B. ***Electronic ballasts*** - Specify ballast types including input wattage and requirements for ballast factor, power factor, total harmonic distortion, sound rating, wiring arrangement (e.g., parallel lamp operation), warranty and acceptable manufacturers. Address any concerns with existing organization electronics.

C. ***High pressure sodium/metal halide fixtures*** - Specify fixture requirements, service voltage, lens requirements, lamps and ballasts, mounting hardware, kit contents, warranty and acceptable manufacturers.

D. ***Fluorescent fixture replacement including compact fluorescent fixtures*** - Indicate fixture requirements, service voltage, lens requirements, lamp and ballast requirements (see A and B of this section), mounting hardware, warranty and acceptable manufacturers.

E. ***Lenses*** - Identify materials and pattern, dimensions and minimum thickness.

F. ***Optical reflectors*** - Specify reflector requirements such as reflective finish, percent reflectance, angular tolerances, required contents of reflector kits, ballast accommodations, UL certification, visibility, ease of maintenance, lamp life effects, warranty and suggested manufacturers.

G. ***Occupancy sensors*** - Indicate sensor type and requirements for room coverage and volume, detection, switching, bypass, time delay, status indicators and fail-safe function, compatibility with lighting ballasts and compact fluorescent loads, minimizing false starts, warranty and acceptable manufacturers.

1. Ultrasonic: Specify requirements for operating frequencies, motion sensitivity and for minimizing the impact on the hearing impaired.

2. Infrared: Specify sensor and lens type and daylight filtering requirements.

3. Wall Mounted Sensors: Specify requirements for wiring and toggle switching, power supply, sensor switch mechanism and override.

4. Power and Switching Modules: Specify acceptable manufacturers and power and switching module requirements.

5. Low Voltage Wiring: Specify wiring type for plenum and non-plenum use.

H. ***LED exit signs*** - Delineate type, maximum wattage per sign, and requirements for battery backup, color, wiring, UL listing, warranty and acceptable manufacturers.

III. Bid Document and Contract Considerations Between Your Organization and the Equipment Contractor

These items should be considered for your bid documents and contracts. You may need to modify some items to meet your organization's needs.

A. ***Site Inspection***

1. Require that the contractor bidding on the project is responsible for site inspection and field verification prior to submitting the proposal.

2. Indicate how inconsistencies with the performance specifications will be handled, both prior to and after bid submittal.

B. ***Submittals, Approvals and Contractor Requirements***

1. Specify what information must be submitted by the contractor.

   - Have the contractor give you a cost per fixture or piece of equipment and state that this cost will remain the same when additional fixtures or equipment of the same type are needed.

   - Require the contractor, as part of its bid, install a complete system, including all peripheral accessories.

2. Indicate that the winning contractor will be the one with the lowest **responsible** bid.

3. Require that the contractor identify any discrepancies with the performance specification in its bid. State that failure to do so will result in no compensation if change orders are needed later.

4. Explain how equipment substitutions and project alternates will be handled and whether demonstration of equipment is needed before construction begins.

5. Require the contractor install a system that works.

6. Require the contractor install equipment that meets all utility rebate requirements.

7. Require the contractor assume the responsibility for ensuring that the installation meets all state and local regulatory requirements.

8. Require the contractor be licensed, bonded and insured.

9. Specify the labor classes to be used on the project, such as work to be done by an electrician or the Light Fixture Maintenance class. Include letters from the California Department of Industrial Relations approving the use of any special labor classes.

C. ***Installation and Project Requirements***

Indicate the contractor's responsibilities in each of the following areas:

1. Compliance with state and local regulations, codes and permits, including wiring and seismic requirements

2. Inspections and payment of fees

3. Workmanship and supervision requirements of installers

4. Coordination with organizational staff and utilities

5. Removal of property including disposing of lamps and ballast per local, State and federal laws codes and regulations

6. Cutting, patching, repairing to ensure a proper appearance after retrofit

7. Protection of equipment and furniture as well as contractor's responsibilities for damage and cleaning costs

8. Cleanliness and condition of site at all times

9. Cleaning fixture housings and lenses

10. Labeling or identifying fixtures which have been retrofitted

11. Tests, adjustments, acceptance requirements, final approval

12. Painting of retrofitted or modified equipment

13. Responsibility to repair non-functioning equipment

14. Requirement to provide "as built" drawings for specific types of projects, such as new fixture layouts and installations.

15. Guarantee and warranty of equipment, materials and workmanship

16. Requirements for record-keeping C contractor must keep records of discrepancies between the number of fixtures on the performance specifications and the actual quantities.

HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS

Engineering design will be required for most HVAC projects, including when equipment is replaced or modified or when new controls are added to the system.

Performance specifications will provide general information about the equipment and the minimum operating standards for the equipment. This information will be used by your project designer or engineer to complete the detailed drawings and technical specifications for the project.

Performance specifications should include the following, at a minimum:

I. General Project Information

A. ***Project Background*** - Describe the project's history and status

B. ***Summary of the Work*** - Explain the specific projects, buildings involved and the contractor's responsibilities.

C. ***Attachments*** - Identify the project locations and equipment to be retrofitted. Include a summary table which describes the existing and proposed energy efficiency projects by building.

II. Material Specifications

This section describes the minimum technical information for several HVAC projects.

A. ***Boiler*** - Specify size and boiler type, requirements for modulating or high and low fire, intermittent ignition, insulation, hot water reset, mixing valves, acceptable full load and part load operating efficiencies, acceptable air emissions and acceptable manufacturers.

B. ***Chiller*** - Specify size and chiller type, refrigerant type, operating strategy, minimum full load and part load efficiency requirements, requirements for UL or ETL certification, pipe insulation, control panel features, demand limiting controls

and other control capability, minimum operating temperatures, evaporator, warranty and acceptable manufacturers.

C. ***Energy Management System (EMS)*** - Specify EMS performance requirements, digital and analog type and description of control points, CPU and terminal controls, power line carrier or hardwire requirements, number of cells, acceptable manufacturers, equipment and software requirements, computer requirements, remote monitoring and programming, training, service and support requirements and battery backup needs.

D. ***Cooling Tower -*** Specify minimum performance requirements, approach and range temperatures (^{O}F), fan motor type (two speed, variable speed), operating strategy, water treatment requirements, control valve and associated controls for condenser water temperature and flow requirements and acceptable manufacturers.

E. ***Premium Efficiency Motor*** - Specify requirements for NEMA B, AC induction, horsepower, rpm rating and frequency, frame and class, ambient temperature, service factor, ball bearing type, minimum nominal efficiency according to IEEE Test Method 112B and compatibility with VFDs.

F. ***Variable Frequency Drives*** - Specify requirements for motor starter, range of response (e.g., 4-20 ma DC signal), enclosure type, ambient temperature range, adjustable minimum and maximum speeds, minimum power factor, compatibility with existing motors, equipment performance, controllers (e.g., how the VFDs will be controlled, what controllers are needed, controller size range), remote start capability, sequence of operations, minimum efficiency at various loads, noise/harmonics isolation and acceptable manufacturers.

G. ***Package Units*** - Specify heating and cooling capacity requirements, minimum energy efficiency requirements (e.g., minimum SEER for air conditioning and COP for heating) for split, gas pack or heat pump, as appropriate, and controls, such as economizer, thermostat and time clock.

H. ***Other Equipment*** - Specify equipment requirements for ancillary equipment such as heat exchangers, liquid pressure amplifiers. The equipment requirements should be at a level of detail similar to items A through G.

III. Contract Considerations between Your Organization and the Equipment Contractor

These items should be included in your bid documents and contracts. You may need to modify this section to meet the needs of your organization.

A. ***Site Inspection***

1. Indicate that the contractor bidding on the project is responsible for site inspection and field verification prior to submitting a proposal.

2. Discuss how inconsistencies with the performance specifications will be handled, both prior to and after bid submittal.

B. ***Submittals, Approvals, Substitutions***

1. Specify what information must be submitted by the contractor:

   - Have the contractor give you a cost per piece of equipment and state that this cost will remain the same when additional equipment of the same type is needed.

   - Require that the contractor, as part of its bid, install a complete system, including all peripheral accessories.

2. Indicate that the winning contractor will be the one with the lowest **responsible** bid.

3. Require that the contractor identify in its bids any discrepancies with the performance specification. State that failure to do so will result in no compensation if change orders are needed later.

4. Explain how equipment substitutions and project alternates will be handled and if a demonstration of the proposed equipment is needed before construction begins.

5. Require the contractor install a system that works.

6. Require the contractor install equipment that meets all utility rebate requirements.

7. Require the contractor assume the responsibility for ensuring that the installation meets all state and local regulatory requirements.

8. Require the contractor be licensed, bonded and insured.

C. *Equipment Contractor Services*

Discuss any unique concerns, applications or installation requirements.

1. *Boiler*: Indicate any boiler installation requirements, structural or space limitations, local regulatory requirements and contract deliverables.

2. *Chiller*: Delineate any chiller installation requirements and contract deliverables.

3. *EMS*: Specify any unique installation requirements and contract deliverables. Examples include requirements for interfacing with existing HVAC equipment and systems, design drawings, control sequence, list of control points, as-built drawings and training.

4. *Cooling Tower*: Identify any unique installation requirements, structural or space limitations and contract deliverables.

5. *Premium Efficiency Motors*: Indicate unique installation requirements and contract deliverables.

6. *Variable Frequency Drives*: Specify unique installation requirements and contract deliverables. Examples include requirements for compatibility with existing equipment, integration with controlled equipment, testing and balancing the system and design drawings.

7. *Package Units*: Delineate any unique installation requirements and contract deliverables.

D. *Installation*

Specify the contractor's responsibilities in each of the following:

1. Structural, seismic, electrical, wiring, conduit and other requirements

2. Equipment integration with existing systems

3. Equipment abandonment, disposal and re-use

5. Testing and acceptance

E. ***Project Requirements***

Specify your requirements for contractor performance for the following:

1. Compliance with regulations, codes and permits

2. Inspections and payment of fees

3. Workmanship, supervision requirements of installers

3. Coordination with organizational staff and utilities

4. Removal of property

5. Cutting, patching, repairing to ensure a proper appearance after retrofit

6. Protection of equipment, furniture and property and contractor responsibilities for damage and cleaning costs

7. Cleanliness and condition of site at all times

8. Tests, adjustments, acceptance requirements, final approval

9. Responsibility to paint the retrofitted or modified equipment

10. Responsibility to repair non-functioning equipment

11. Requirement to provide "as built" drawings and number of sets

12. Requirements for pipe flushing

13. Requirements for staff training and equipment programming

14. Guarantee and warranty of equipment, materials and workmanship

15. Requirements for record-keeping — contractor must keep records of discrepancies between the information in this specification and the actual installation (e.g., additional points on an EMS).

16. Requirements to provide at least three bound (such as in a three ring binder) copies of operation and maintenance data for the installed equipment.

APPENDIX C

REFERENCES FOR MORE INFORMATION

I. Some Organizations Who Have Hired Consultants to Identify Energy Projects

The following have hired energy consultants and are willing to share their experiences:

California Department of General Services
Energy Assessments
717 "K" Street, Suite 409
Sacramento, CA 95814
John Baca
(916) 323-8777

City of San Francisco
Bureau of Electricity
1155 Market Street, 4th floor
San Francisco, CA 94103
John Deakin
(415) 554-3175

Contra Costa Community College District
500 Court Street
Martinez, CA 94553
Tom Beckett, Director of Facilities
(925) 229-1000, ext 1270

California Energy Commission
Nonresidential Buildings Office
1516 Ninth Street, MS-26
Sacramento, CA 95814
Daryl Mills
(916) 654-4008

CSU, Stanislaus
801 West Monte Vista
Turlock, CA 95832
Victor K. Takahashi
(209) 667-3211

Pacific Gas and Electric Company
Mail Code H28H
P. O. Box 770000
San Francisco, CA 94177
Jon Livingston
(415) 972-5970

II. Additional Information on Energy Audits and Energy Auditing Tools

- *Guide to Preparing Feasibility Studies for Energy Efficiency Projects*, February 2000, Publication Number 400-00-002
  California Energy Commission, Publications Unit
  1516 Ninth Street
  Sacramento, CA 95814
  (916) 654-5200
  An updated version of this guide will be available in early 2000.

- *Building Energy Software Tools*
  <www.eren.doe.gov/buildings/tools_directory/>
  The U. S. Department of Energy, Office of Building Technology, State and Community Programs Web Site provides information on 184 energy-related software tools for buildings. The software categories include whole building analysis, materials, components equipment and systems, codes and standards, and other applications.

- *Energy Design Resources Software Tools*
  <www.energydesignresources.com/tools.html>
  This site contains tools for evaluating skylights, analyzing building energy use, and calculating life-cycle benefits of investments in improved building design.

- *Energy Smart Pools Software*
  <www.eren.doe.gov/rspec/>
  This U. S. Department of Energy site provides information on how to reduce swimming pool energy costs. Energy analysis software for pools can be downloaded from this site.

- *Equipment Purchasing Guides*
  <www.pge.com/customer_servic…y/smart/html/equipment_guides.html>
  This Pacific Gas and Electric site contains information on energy efficient lighting, heating, ventilating and air conditioning equipment, motors, refrigeration, glazing, and industrial processes.

- *Commissioning for Better Buildings in Oregon*
  <www.energy.state.or.us/bus/comm/bldgcx.htm>
  This document discusses the benefits of commissioning, how to select a commissioning agent, the role of operation and maintenance staff, and how to develop a maintenance plan for the building.

III. Additional Information on Performance Specifications

American Institute of Architects (AIA)
1735 New York Avenue, N.W.
Washington, D.C. 20006-5292
Telephone: (202) 626-7300
Fax: (202) 626-7424
www.aiaonline.com

Veterans Administration
Master Specifications
This site contains over 300 master specifications for construction projects such as medical, office, and utility buildings.
www.va.gov/facmgt/standard/spec_idx.htm

ASDMaster Software
The Electric Power Research Institute and Bonneville Power Administration have performance specifications for adjustable speed drives.
www.motor.doe.gov/mcsnew.shtml

The Construction Specifications Institute (CSI)
99 Canal Center Plaza, Suite 300
Alexandria, VA 22314
(800) 689-2900, (703) 684-0300,
Fax (703) 684-0465
www.csinet.org

Federal Energy Management System
Master Specification for Lighting
www.erendoe.gov/fem/resources/masterspec.html

Building Specification Guidelines for Energy Efficiency—The Energy Commission and Eley Associates are developing reference specifications for energy efficient technologies. Draft specifications available late 2000.
Contact Erik Kolderup (415) 957-1977
www.eley.com