

Appendix A

Audit and Audit Report Requirements

This appendix provides the details required for all audits performed under Work Assignment Contracts pursuant to this RFP. Contractors are required to follow the audit procedures and audit report instructions in this Appendix. Failure to follow these instructions may be grounds for termination of the applicable Work Assignment Contract and/or Contractor's Agreement to Agree with the Department of Energy.

Audit

The audit must include:

1. A visual on-site survey of the entire building. The survey should observe all energy using systems in operation. An on-site survey should not occur if the heating system is not operational. Exceptions may be granted with prior written approval from the Oregon Department of Energy.
2. A boiler combustion analysis for each boiler used for space heating and pool heater(s) within the building. The only exceptions are domestic hot water boilers and a back-up boiler used for emergencies (e.g., when the main boiler[s] fail).

A review of the audit report requirements is *critical* before the auditor goes on site. The audit report requirements will dictate how the auditor (Contractor) will view the facility and what data must be collected.

Audit Report Requirements

The audit report requirements are organized in three categories: general requirements, specific instructions, and format.

I. General Requirements

General requirements are items that the contractor must consider as the report is put together based on the information from the audit, scope of services, school district needs, and Department of Energy expectations. General requirements include:

- A. All energy efficiency measures (EEMs) with a potential simple payback of less than 50 years must be analyzed, included in the report and entered into the Web-based database (referred to as SID – Schools Interactive Database). All EEMs greater than 50 years should be mentioned but do not need to be analyzed.
- B. The report format will follow the structure described below (in Format section). Alternate formats that include all sections of this report may be accepted if all required information is presented in a complete and concise manner with all supporting data and documentation. Contractor must obtain prior written approval from the Department of Energy to use an alternate format.
- C. Details of calculations must be provided.
- D. Calculations must provide sufficient details to enable the school district to complete Oregon Business Energy Tax Credit (BETC) applications. Include age of equipment.
- E. The report must be complete, well written and with sufficient clarity to be easily readable.
- F. The report must be consistent – e.g., values for a specific item or usage do not change from page to page.

- G. The Contractor must use industry accepted calculation methods to predict achievable energy savings. Calculations methods by audit level are:
1. Level I Audits may use percent savings calculation methods or better. Calculation methods and assumptions must be clearly stated and supported. The Department of Energy accepts assumptions from these types of sources - white papers, energy clearing houses, nomographs, text books. Lighting calculations must use spreadsheets and provide room-by-room fixture type of existing and proposed lighting fixtures (see BETC lighting application).
 2. Level II Audits may use BIN calculation methods or better for heating and cooling EEMs. Calculation methods and assumptions must be clearly stated and supported. The Department of Energy accepts assumptions from these types of sources - white papers, energy clearing houses, nomographs, text books. Lighting calculations must use spreadsheets and provide room-by-room fixture type of existing and proposed lighting fixtures (see BETC lighting application).
 3. Level III Audits must use hourly simulations for both load analysis and the proposed EEMs. Calculation methods and assumptions must be clearly stated and supported. The Department of Energy accepts assumptions from these types of sources - white papers, energy clearing houses, nomographs, text books. Lighting calculations must use spreadsheets and provide room-by-room fixture type of existing and proposed lighting fixtures (see BETC lighting application).

II. Specific Instructions

Specific instructions describe the level of detail required in an audit report. These instructions are presented by section corresponding to the sections in the report.

All information is required.

?? This paragraph does not describe the "REport Identification" page - should be moved

B. ENERGY AUDITOR CERTIFICATION

Must be completed and signed.

C. REPORT SUMMARY

Within the tables, the simple payback without incentives must be clearly shown. The effects of any incentives (e.g., Energy Trust of Oregon , utility, or BETC incentive) must be included in this table or in a separate table.

A note should be included that SB1149 funded projects use the non-incentive calculated simple payback value to determine if the EEM meets the cost effectiveness criteria and whether the measure is required to be implemented in accordance with SB1149 Guidelines. The Guidelines state that EEMs with a simple payback or less than 15 years must be implemented first and then EEMs with a simple payback greater than 15 and less than 50 years can be implemented at a later date.

D. BUILDING OPERATING CHARACTERISTICS

“Percentage of building used “ is based on the building square footage used (at one or more spaces/areas) divided by total building square footage.

E. FACILITY DESCRIPTION

The building description must contain sufficient detail for the school district and the Department of Energy to understand the school building (e.g., year built, number of remodels, type of construction, etc.). For Level I Audits, parts of the description can be in bullet format. For Level II Audits, the description must provide more detail (e.g., which sections of building were remodeled in a specific year, envelope u-values, etc.). For Level III Audits, the description must provide sufficient detail that the hourly model can be developed.

F. ENERGY USING SYSTEMS DESCRIPTION

The system descriptions shall contain sufficient detail for the school district and the Department of Energy to understand a building's energy using systems (e.g., size/capacity, type of system [CAV, VAV, etc], types of sequence of operation, operating schedules, etc.). For Level I Audits, parts of the description may be in bullet format. For Level II Audits, descriptions must provide more detail (e.g., nameplate data). For Level III Audits, the description must provide sufficient detail that the hourly model can be developed.

G. ENERGY CONSUMPTION PROFILE

1. The Energy Consumption Profile shall be based on monthly averages using utility data from at least the 24 months immediately preceding the audit.
2. The Energy End Use Split Estimates for Level I Audits shall be based on industry-standard publications such as ELCAP. Estimates for Level II Audits shall be based on datalogging, real-time amp readings, and supplemented with industry-standard publications.

H. ENERGY EFFICIENCY MEASURES (EEM)

The following data for each EEM at each audit level by school is required:

1. EEM Number: Number each EEM. The EEM number assigned must be consistent throughout the report and included in the measure summary table.
2. Individual EEM Description: Provide a complete "existing and recommended condition" description of each EEM proposed. Include sketches for clarity where applicable. Expand length of narrative as required. Provide a description that is adequate to ensure school staff understands proposed EEM and can either implement with the provided information or can hire an engineer. The description must provide sufficient information so the engineer can begin engineering design and specifications work. Any information (HP, capacity, wattage, etc) must be provided. A caveat indicating that more engineering work is required prior to implementation is acceptable, but cannot be used in place of required information.

Descriptions must also include: hazardous material disposal issues, SB1149 commissioning requirements, effects on indoor air quality, effects on classroom acoustics, building code compliance issues (e.g., seismic upgrades to lighting fixtures or boiler stacks), or if cost savings will not be realized because adjusting energy savings baseline (e.g., the existing system has no outside air while the new system will result in increase in energy use due to new outside air intake).

3. Energy Calculation Methods: Provide detailed information for each energy conservation measure. Auditors should use the calculation methodology to predict energy savings that are "accurate enough." In judging methodologies, the auditor should balance the potential value of the energy

savings against the cost of the analysis. Note: BIN analysis is required for Level II Audits and hourly simulations are required for Level III Audits. The details can be located in an appendix (with a note in this section of the report) or in this section and must include:

- a. List the assumptions being made for each EEM.
- b. Saving calculations, at a minimum, should be done using bin or modified bin methods for Level II Audits. Detailed hourly computer simulations to be used for Level III Audits. Use of other recognized engineering methods for calculation of building loads and savings is acceptable for Level I Audits. A more complex modeling method can be used for audit Levels I and II if needed and if within the audit budget.
- c. Provide combustion efficiency test results for the existing equipment.
- d. Using recognized engineering techniques, determine the building's existing and recommended loads. For each EEM, include a brief description of the system design and present condition. Note all assumptions made and sources of data used. Include copies of back-up calculations. No energy baseline adjustment are allowed without prior written approval by the Department of Energy.
- e. Heating and Cooling Loads. Use an energy use spreadsheet model or hourly simulation is required for all building spaces that are either heated or cooled. At a minimum:
 - i. Use recognized engineering methods for calculation of building loads. Allocation of master metered consumption data to individual buildings by a square footage method is NOT acceptable.
 - ii. Provide an explanation of the methodology used and a listing of all input variables, output data and assumptions for all energy use model values determined by computer simulations.
 - iii. Compare energy use model results for the base case (existing conditions) with metered data. Explain any difference between simulated and metered totals that exceed plus or minus 10 percent.
 - iv. Provide a zone map for any building(s) analyzed by a Zoning methodology. Show zone boundaries and locations with respect to the building(s) outline along with the calculations.
- f. Special EEM Analysis Requirements:
 - i. Lighting. Adhere to the following lighting requirements:

Survey the building to determine existing connected interior and exterior lighting power and energy usage.
Provide a detailed schedule showing specific locations by area, space, room number, name or other individual space identification with the actual number and type of existing and proposed number and type of new lamps, ballasts and fixtures involved and the foot-candle levels.
Calculate the reductions in lighting energy, and increases in other forms of energy use, such as heating, associated with installing the EEM.
Include documentation and results of the above survey and calculation.
Lighting survey documenting existing lighting levels.
Lighting survey documenting the existence of PCBs.
Lighting calculations using IES procedures to verify adequate lighting levels with modified lighting system. Explain calculations and document room and fixture input variables. Show sketch of new fixture layouts.
 - ii. Energy Management Systems (EMS) or Direct Digital Controls (DDC) Systems

Describe existing control configuration and operating sequence. When available, provide control schematic or control prints. List time settings including any manual changes made to account for weather, holidays, etc.

Describe proposed control configuration and operating sequence. List new operating schedules. List new points and control devices.

Include training costs for building operators. Does agency intend to enter into a control service contract.

List other functions beyond energy management included in the EMS design, i.e., security and fire detection.

g. **EEM Dependency on Other EEMs**

Clearly state if and how various EEMs interact with one another. Explain if and why one ECM may need to be completed before another particular EEM. Explain if and why savings from this ECM may be more or less effective depending on other EEMs. If this EEM is independent from all other EEMs in terms of savings or in terms of its practical application, so state. If certain measures are mutually exclusive then indicate the negative impact on other EEMs.

4. **Cost/Benefit**

a. **Energy Savings.** Calculate estimated energy savings and energy cost savings associated with recommended EEMs. When estimating energy cost savings, use and display current energy prices and include demand charges.

b. **Cost Estimates.** Sources must be documented for all cost estimates. Approved methods of cost estimating include: most recent edition of RLMeans Cost Estimating Data, Bureau of Labor and Industries, equipment vendor quotes, previous recent (within a year) projects of similar size and scope.

i. **Labor Estimates.** Identify number of man hours, labor rates, etc.. Use current prevailing wage rates for estimating contracted labor costs.. Include dates and sources of published estimating data.

ii. **Material Estimates.** Identify vendor and contact person who provided material estimates. Include dates and sources of published estimating data.

iii. **Locate detailed EEM cost estimates in an appendix to the audit report.** Itemize design, engineering, equipment, installation (labor, material, and contractor overhead and profit), and disposal costs. Indicate any salvage value in old equipment or materials. Document source of salvage value estimate.

Include the estimated commissioning cost for EEMs that require commissioning under the SB 1149 Guidelines. The commissioning costs are not to be included in the simple payback calculation.

c. **Simple Payback Analysis:** Compute the simple payback of the measure and enter into the report form.

5. EEM Useful Life: Develop EEM useful life using established values wherever possible. To establish lives of HVAC equipment use the ASHRAE HVAC Applications Handbook. Document the references used to determine each measure life.
6. EEM Impact on Annual Costs of Maintenance and Operation: Only the impact of terminating a service contract or the resulting loss of a school district staff will decrease maintenance and operation costs as a result of installing the proposed EEM

Provide one complete section for each EEM proposed. It should provide pertinent background information; observations that influenced the recommendation and calculations; measured and recorded data; and sources of methods and formulas used.

Regardless of the analysis method selected, all cost effective measures (simple payback less than 50 years) must be included in the analysis.

NOTE: For complexes, provide all information required in this section for the complex and for each occupied building being analyzed.

I. OPERATION AND MAINTENANCE (O&M) MEASURES

Use instructions for EEMs in Section H. above.

III. Format

The following tables and text must be included for each school (if a school is composed of more than one building, then the set of buildings is considered a “school”) within each report.

A. REPORT IDENTIFICATION

1. Building and Owner Information		
Building Name:		
Complex Name (if applicable) and/or School District:		
Address:		
City:	County:	Zip:
Building Construction Completion Date (mo/day/yr.) / /		

2. Institutional Contacts		
Administrator:	Title:	Telephone:
Building Operator:		Telephone:
Others:		Telephone:

3. Report Preparer(s)			
Name(s):			
Company:			
Address:			
City:	State:	Zip:	Telephone:

4. Utility/Energy Provider(s)	
Electric Utility:	
Other Energy Suppliers:	

B. ENERGY ANALYST CERTIFICATION

As an independent, consulting energy analyst, I am not directly responsible for the day-to-day operation of the building or operation being studied. I have no conflict of interest relating to this study and any energy conservation measures considered in this study.

I have calculated the total energy cost savings, by fuel type, expected to result from the acquisition and installation of each recommended energy efficiency measure. The energy prices used in this report are the current prices the institution is expected to pay based on the most recent billing history of the building(s).

As a professional energy analyst, I hereby certify that I have discussed any operation and maintenance procedures needing to be addressed and implemented with the building operator and facility manager.

I hereby certify that this study has been prepared by me or under my direct supervision and all information contained herein is correct to the best of my knowledge. I am listed as a qualified energy auditor for schools with the Oregon Department of Energy and am qualified to perform energy studies on commercial buildings.

Energy Analyst's Printed Name

Energy Analyst's Signature

Date

C. REPORT SUMMARY

1. General Information	
a.	Nature and Scope of Report.
b.	Facility Description Overview (Refer to Section E)

2. Building Energy Summary		Gross Square Footage:		
	Annual MMBtu	Btu Sq.Ft./Yr.	Annual Energy Cost	Cost Sq.Ft./Yr.
Annual Energy Consumption				
Estimated EEM Savings				
Estimated Consumption After EEMs				

3. Energy Efficiency Measure (EEM) Summary (In increasing payback period.)							
EEM #	EEM Description	Measure Cost (\$)	Total (\$ Savings)	Estimated Energy Savings	Fuel Type	Payback Years	Measure Life
Total EEMs							

4. Operation and Maintenance Summary (O&M)					
O&M #	O&M Description	Measure Cost	Estimated Energy Savings	Total (\$ Savings)	Simple Payback
Total O&Ms					

D. BUILDING OPERATING CHARACTERISTICS

1. Typical Daily Occupancy					
Indicate Building/Area	Hours/Day	Days/Week	Weeks/Year	Annual	% of Bldg Used
2. Number of persons in building during normal occupancy		Actual: Design:			
3. Is building ever partially occupied?			Yes	No	
Indicate Use	Hours/Day	Days/Week	Weeks/Year	Annual	% of Bldg. Used

E. FACILITY DESCRIPTION

1. General
2. Envelope
3. Attach Floor Plan/Schematic

F. ENERGY USING SYSTEMS DESCRIPTION

1. Describe systems, operating practices, equipment and conditions
a. Boiler/Chiller Plant
b. HVAC Fans and Associated Controls
c. Lighting (interior and exterior)
d. Domestic Hot Water
e. Others

G. ENERGY CONSUMPTION PROFILE

1. Utility Consumption Profile										
Electricity				Fossil Fuels						
Month	Demand (kw)	Consumption (kwh)	Electric (MMBtu)	Elect. Cost (\$)	Consumption 1 (therms)	Fossil 1 (MMBtu)	Fossil 1 Cost	Consumption 2 (gal, other)	Fossil 2 (MMBtu)	Fossil 2 Cost
Jul										
Aug										
Sep										
Oct										
Nov										
Dec										
Jan										
Feb										
Mar										
Apr										
May										
Jun										
Total:	xxx,xxx	x,xxx		\$	xx,xxx	x,xxx	\$	xx,xxx	x,xxx	\$
% of Total:		%		%		%			%	%
2. Energy Indexes										
Total Energy Use (MMBtu), Cost(\$):								xx,xxx		\$xx,xxx
Building Area (sf):								xx,xxx		xx,xxx
Energy Use Index(Btu/sf), Energy Cost Index(\$/sf):								xx,xxx		\$x.xx
3. Energy End Use Split Estimates										
End Use Category	Electric (kwh)	Electric (MMBtu)	Fossil (therm,gal)	Fossil (MMBtu)	Percent of Total					
Space Cooling										
HVAC Auxiliary										
HVAC Fans										
Interior Lighting										
Exterior Lighting										
Misc. Equipment										
Other Electric (incl. Refrigeration)										
Space Heating										
Hot Water										
Other Fossil Fuel End Use										
Total:		xx,xxx		xx,xxx	%					
Source of End Use Estimate (Datalogging, Real-time amps, ELCAP, etc):										

H. ENERGY EFFICIENCY MEASURES (EEM)

Prepare one sheet (chart) for each EEM identified for each building.		
1. EEM Number		
2. EEM Description		
a. Existing Conditions		
b. Recommended Changes		
3. Discuss EEM Calculation Methods (Brief)		
4. Cost/Benefit		
a. Electric and non-electric fuel unit savings		
Fuel Type	Unit (therms, gallons, tons)	Unit Savings/year
Total	b. MMBtu savings/year	c. Dollar savings/year: \$ (cost \$/unit)
d. Cost: (include detailed cost estimates as an appendix)		
Equipment: \$		
Materials: \$		
Labor: \$		
Total \$		
e. Simple Payback: years		
5. EEM Useful Life	years	
6. Other EEM Considerations		
a. EEM impact on maintenance	\$	/year
b. EEM salvage/disposal value	\$	/year

I. OPERATION AND MAINTENANCE (O&M) MEASURES

Prepare one sheet (chart) for each O&M identified for each building.		
1. O&M Number		
2. O&M Description		
a. Existing Conditions		
b. Recommended Changes		
3. Discuss O&M Calculation Methods (Brief)		
4. Cost/Benefit		
a. Electric and non-electric fuel unit savings		
Fuel Type	Unit (therms, gallons, tons)	Unit Savings/year
Total	b. MMBtu savings/year	c. Dollar savings/year: \$ (cost \$/unit)
d. Cost: (include detailed cost estimates as an appendix)		
Equipment: \$		
Materials: \$		
Labor: \$		
Total \$		
e. Simple Payback: years		
5. O&M Useful Life years		
6. Other O&M Considerations		
a. O&M impact on maintenance \$ /year		
b. O&M salvage/disposal value \$ /year		