Technical analysis study

# BUILDING **NAME** BUILDING STREET BUILDING ADDRESS

# PROJECT: ETECPSXXXXXXXXXXX

# 

# SPONSORED BY:

# ENERGY TRUST OF OREGON EXISTING BUILDINGS ELECTRIC UTILITY: GAS UTILITY:

# SUBMITTED BY: ATAC NAME

# REPORT DATE VERSION # X

## contacts

## SITE CONTACT

The following facility personnel assisted with this report:

Name, Title

Building Name

Building Street

Building Address  
Contact Phone Number  
Contact Email Address

## ENERGY TRUST CONTACT

Account Manager Name

ICF

615 SW Alder Street  
Suite 200

Portland, OR 97205  
503.525.6140

## atac contact information

The Allied Technical Assistance Contractor (ATAC) that prepared this report is:

ATAC Engineer’s Name(s)  
 Company Name  
 ATAC Address

ATAC Phone Number

ATAC Email Address

## disclaimer

<Please include this page in your report exactly as written here>

*In no event will Energy Trust of Oregon, Inc. or ATAC be liable for (i) the failure of the customer to achieve the estimated energy savings or any other estimated benefits included herein, or (ii) for any damages to customer’s site, including but not limited to any incidental or consequential damages of any kind, in connection with this report or the installation of any identified energy efficiency measures. The intent of this energy analysis study is to estimate energy savings associated with recommended energy efficiency upgrades. This report is not intended to serve as a detailed engineering design document, any description of proposed improvements that may be diagrammatic in nature are for the purpose of documenting the basis of cost and savings estimates for potential energy efficiency measures only. Detailed design efforts may be required by participant in order to implement potential measures reviewed as part of this energy analysis. While the recommendations in this report have been reviewed for technical accuracy and are believed to be reasonably accurate, all findings listed are estimates only, as actual savings and incentives may vary based on final installed measures and costs, actual operating hours, energy rates and usage.*

## next steps for the participant

### APPLY FOR ENERGY TRUST INCENTIVES

***Make an implementation decision:*** *Please evaluate the information contained in this report and any potential measures and incentives listed in the Form 110C – Project Detail and Incentive Estimates (produced by ICF). Have your contractors bid for the measures(s) you wish to implement and send ICF a copy of the final bid. ICF will review your contractor’s proposed scope to determine compliance with Existing Building’s requirements and the energy efficiency measures as described in this report. After it is determined by ICF that the project bid specification match the studied measures, Form 120C-Incentive Application will be provided for you to review. If you apply for Energy Trust incentives for you project, your signed Form 120C – Incentive Application must be provided to ICF BEFORE you issue purchase orders or make other financial commitments to begin the project work.*

***Upon Completion of the Project:*** *ICF must be notified once the project is completed in order to arrange a post-installation verification for projects that receive incentives greater than $5,000. The program must receive all required documentation and perform any required post installation verifications before incentives can be issued.*

### APply for energy trust solar incentives

***Make a solar implementation decision:*** *Please evaluate the solar site evaluation (SSE), if included in this report. Your PMC will arrange a meeting to discuss the results of the evaluation. Or, if you wish to move forward, your PMC will provide you with a list of qualified Trade Ally contractors. Obtain bids on the solar measures you want to implement. When you’ve selected a solar Trade Ally contractor for the installation, the Trade Ally will provide and submit the necessary incentive application paperwork to Energy Trust on your behalf. The PMC and Energy Trust’s solar staff are available to answer all your solar questions.*

***Upon Completion of the Solar Project:*** *The solar Trade Ally will arrange for the final Energy Trust verifications, and within 30 days of a successful verification you’ll receive your solar incentive check from Energy Trust.*

## executive summary

<The following information must be contained in this section in paragraph form>

**1. YEAR BUILT, 2. NUMBER OF STORIES, 3. FLOOR AREA, 4. AREA OR SPACE AFFECTED BY MEASURES**

**5. ANNUAL AVERAGE GAS & ELECTRICITY USAGE, 6. CURRENT EUI, 7. TOTAL % SAVINGS FOR ELECTRICITY & GAS**

Example: This report documents energy efficiency improvements for the HVAC systems at the ABC Buildings at 1234 State Street in Portland. The facility was built in 1985, is three stories above ground and one below, and contains a total floor area of 44,000 square feet. The energy efficiency measures (EEM) affect the upper three floor area of 33,000 square feet. Using data from the last three years, the average annual energy use for the building was 34,000 therms and 498,000 million kWh. This translates to an Energy Use Index of 117. Table 1 below lists the energy efficiency recommendations for the facility. Combined, these recommendations are expected to reduce the building’s gas usage by 15% and reduce the electricity consumption by 10%.

## Energy efficiency measure summary

1. **EEM 1: [Brief Title:** Brief on or two lines of description].
2. **EEM 2: [Brief Title:** Brief on or two lines of description].
3. **EEM 3: [Brief Title:** Brief on or two lines of description].

table 1: eem summary table (annual)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| MEASURE | ELECTRIC SAVINGS  (kWh) | GAS  SAVINGS  (THERMS) | ENERGY COST SAVINGS \* | NON-ENERGY BENEFITS \*\* | INSTALLATION COST | SIMPLE PAYBACK  \*\*\* | RETURN ON INVESTMENT (ROI)  \*\*\*\* |
| EEM #1 |  |  |  |  |  |  |  |
| EEM #2 |  |  |  |  |  |  |  |
| EEM #3 |  |  |  |  |  |  |  |
| PRESCRIPTIVE | (Savings From incentive booklet) | (Savings From incentive booklet) |  |  | | | |

NOTES:

\* Cost savings are based on Energy Trust average utility rates of $0.078/kWh and $0.750/therm for Oregon and $0.792/therm for Washington in payback calculations. Actual participant rates may be different.

\*\* Non-energy cost benefits are from items such as avoided maintenance, reduced water costs, or other cost savings.

\*\*\* Simple Payback is a measure of how quickly your investment in the measure will pay for itself.

\*\*\*\* Simple ROI is another measure of measure’s benefits. This is simply the inverse of the Simple Payback and can be used as a rough comparison to other investment opportunities.

## HISTORICAL ENERGY USE

TABLE 2: HISTORICAL BUILDING ENERGY USE

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Electric Use (kWh) | | | | Natural Gas Use (therms) | | | |
|  | 20xx | 20xx | 20xx | 3 Year Average | 20xx | 20xx | 20xx | 3 Year Average |
| Jan |  |  |  |  |  |  |  |  |
| Feb |  |  |  |  |  |  |  |  |
| Mar |  |  |  |  |  |  |  |  |
| Apr |  |  |  |  |  |  |  |  |
| May |  |  |  |  |  |  |  |  |
| Jun |  |  |  |  |  |  |  |  |
| Jul |  |  |  |  |  |  |  |  |
| Aug |  |  |  |  |  |  |  |  |
| Sep |  |  |  |  |  |  |  |  |
| Oct |  |  |  |  |  |  |  |  |
| Nov |  |  |  |  |  |  |  |  |
| Dec |  |  |  |  |  |  |  |  |
|  | | | | | | | | |
| TOTAL |  |  |  |  |  |  |  |  |
| TOTAL ENERGY USE IN KBTU | | |  | | | | | |
| ENERGY USE INDEX (KBTU/SQ.FT./YR) | | |  | | | | | |

NOTE: The EUI for this building is [xx% more/less] than the average energy use per square foot for a building of this type.

## facility overview

#### facility description

<Address the following bulleted points in this section in paragraph form>

* Type of buildings (Office, Gym, Lab, Manufacturing, etc.)
* Occupancy
* Facility Operating Hours
* Number of stories
* Square footage and height of each story of each building
* Total volume of the building
* Tightness of the building
* Previous energy efficiency upgrades

#### internal loads

<Address the following bulleted points in this section in paragraph form>

* Lighting
* Equipment
* Other (Pool, Laundry, Data Center, etc.)

#### Water side hvac system

<Address the following bulleted points in this section in paragraph form>

* Chilled Water Loop System (age of existing equipment)
  + Chiller(s) – Type, IPLV, COP
  + Pumps
    - Condenser Pumps – type, power, schedule
    - Evaporator Pumps – type, power, schedule
  + Cooling Tower (age of existing equipment)
    - Fan – type, power, schedule
  + Details of operation
* Hot Water Loop System (age of existing equipment)
  + Boiler(s) – type efficiency, capacity
  + Pumps – type, power, schedule
  + Details of operation
* Domestic Hot Water Loop System (age of existing equipment)
  + Boiler(s) – type, efficiency, turndown ratio, maximum capacity
  + Heat Exchanger (if the boiler is shared between hot water loop and domestic hot water loop) – type, efficiency, etc.
  + Details of operation

#### air side hvac system

<Address the following bulleted points in this section in paragraph form>

* Type – (Single zone system, terminal reheat system, multi-zone system, dual duct system, variable air volume, induction system, etc.)
* Fans/RTUs – type, power, schedule
  + VFD, IGV, constant, etc.
  + Cooling type
  + Heating type
  + Age
  + Size (CFM, tonnage, etc)

#### controls

<Address the following bulleted points in this section in paragraph form>

* Include room set points (winter/summer), supply air temps (winter/summer), economizer settings, supply air temp reset based on load, supply air static pressure reset based on load, demand controlled ventilation, start/stop of HVAC equipment, schedules, and age of existing controls system.

#### other building energy equipment

<Address the following bulleted points in this section in paragraph form>

* Name of energy user and operational details

#### prescriptve measures

List the prescriptive measures available/applicable to this project.

#### lighting & solar pv opportunities

<NOTE FOR ATAC>. Please work with your Account Manger to bring Lighting recommendations to our lighting partners and solar recommendations to our solar partners.

## model calibration

<If building simulation software was used, complete the table below to show the model’s energy use and the billed energy use.>

table 3: billed/baseline versus modeled energy use

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Electric Use (kWh) | | | Natural Gas Use (therms) | | |
|  | Baseline | Model | % Deviation | Baseline | Model | % Deviation |
| Jan |  |  |  |  |  |  |
| Feb |  |  |  |  |  |  |
| Mar |  |  |  |  |  |  |
| Apr |  |  |  |  |  |  |
| May |  |  |  |  |  |  |
| Jun |  |  |  |  |  |  |
| Jul |  |  |  |  |  |  |
| Aug |  |  |  |  |  |  |
| Sep |  |  |  |  |  |  |
| Oct |  |  |  |  |  |  |
| Nov |  |  |  |  |  |  |
| Dec |  |  |  |  |  |  |
| TOTAL |  |  |  |  |  |  |

NOTE: Use average of 3 years or most representative year for sites with missing or inconsistent data for the baseline energy usage.

## Explanation:

<Use best engineering judgment to determine the baseline conditions, taking into consideration recent energy efficiency upgrades, building occupancy changes, etc. Describe baseline if different than actual building usage. (ie. Modified baseline was used to show energy usage with code efficient system.)

If modified baseline is necessary, notify Energy Trust for prior approval.

If the modeled energy usage deviates substantially from the actual energy use, provide an explanation. Explain the assumptions used in the model and the rationale behind each.>

## detailed description of proposed measures

#### eem 1 – [title]

#### baseline condition

<Write a paragraph about the existing condition pertaining to this measure only. Rolling baselines are not encouraged, but are most appropriate in some situations. If you used a rolling baseline, state what the baseline is for this measure and explain why it was chosen. It is recommended to use qualitative information as well as quantitative information about the existing condition so that the reviewing engineer appreciates the purpose of the change.>

#### proposed condition

<Write a paragraph about the proposed condition pertaining to this measure only. Consider including a scope of work for the customer to use when requesting bids>

#### non-energy savings description

<Address this section only if there are non-energy benefits related to this measure. Must include customer documentation in appendix.>

table 4: summary of eem1

|  |  |  |
| --- | --- | --- |
|  | kWh Savings | Therm Savings |
| Estimated Energy Savings |  |  |
| Age of Equipment Being Replaced |  | |
| Is Existing Equipment Currently Working or Not Working? |  | |
| Cost  [Specify if Incremental was used] |  | |
| Notes  [Include Assumptions Here] |  | |

table 5: eem 1 conditions

|  |  |  |
| --- | --- | --- |
| Item | Baseline Condition | Proposed Condition |
|  |  |  |
|  |  |  |

<Example: If a centrifugal chiller of 0.94 kW/ton is replaced with a rotary screw chiller of 0.52 kW/ton, the table would be like the example below. Also include parameters changed in calculations/model. Can be added in appendix if complex.>

example 1 (chiller):

|  |  |  |
| --- | --- | --- |
| Item | Baseline Condition | Proposed Condition |
| Type | Centrifugal | Rotary Screw |
| kW/ton | 0.94 | 0.52 |

Example 2 (ddc upgrade):

|  |  |  |
| --- | --- | --- |
| Item | Baseline Condition | Proposed Condition |
| Schedule | 24/7 | Generally 8AM – 5PM M-F (see appendix for specific zone schedule) |
| AHU/RTU-1 | The unit is not economizing properly. No Supply air temperature reset. Operating 24/7. | Unit operates from 5:30 AM to 3 PM Monday through Friday. Does not operate on the weekend. |
| AHU/RTU-2 | The unit is not economizing properly. No Supply air temperature reset. Operating 24/7. | Unit operates from 6:30 AM to 5 PM Monday through Friday. Does not operate on the weekend. |
| VFDs | Exhaust fan VFD is not properly controlled. | Add a space pressure sensor to reduce the exhaust fan energy (5 HP). |
| Demand Control Ventilation | None | Install (2) CO2 sensors to manage OSA damper positioning. |
| Unoccupied Temperature Setback | No temperature setback | Implement setback (55-58 °F in winter and 85-86°F in summer) |
| Fan Operation | Supply fan operates 24/7 | SF speed control optimized. Operates at 65% speed when OSA temperature is below 55°F). |
| Supply Air Temperature Reset | No SAT reset | SAT reset based on RAT |
| Optimal Start/Stop | None | Enabled |
| Economizer | Not functioning | OSA damper position modulates when OAT < 65°F |

#### eem 2 – [title]

#### eem 3 – [title]

## appendix a – EEM 1:

<Please provide all the supporting documents for EEM 1. The documents may include cut sheets, specification sheets, performance curves, schematic diagrams, eQuest results, spreadsheet calculation sheets, cost estimate sheets, customer provided backup of non-energy benefits, etc. It is advised to have an appendix for each EEM.>

<Note: Regardless of project complexity, clear documentation of assumptions used for baseline and anticipated project operations must be included within the study. Where practical, ATACs may use spreadsheet calculations or energy analysis software such as eQuest, HAP, Trace, EZ Sim, RetScreen, etc. All back-up calculation files must be included with each TAS submission. If an ATAC uses spreadsheet calculation or eQuest model for the study, submission of the soft copies of the Excel files or .pd2 & .inp files is mandatory. PDF files or locked Excel spreadsheets are not acceptable. Other specialized software tools may be used depending on the facility and the complexity of the recommendations. If the files are large and submitted to the PMC by email, the files should be in zip format or utilize a document share site like Dropbox.

For eQuest files: provide files for baseline, and files for each EEM in separate folders. Preferably not in a parametric run.

For Trace and HAP: provide input and output of baseline and EEM in both original analysis and pdf.>

## appendix b – eem 2

## appendix c – eem 3