EDAPT Example Project  
1123 W 3rd Ave, Denver, CO 80223

Xcel Energy’s Energy Design Assistance Program

Measurement and Verification Report

June 29, 2013

**Prepared for:**

Mr. Customer

XYZ Inc.

1234 Sesame St, Denver, CO 80223

(303) 275-4568

mrcustomer@xyz.com

**Prepared by:**



Xcel Energy

1800 Larimer St. Ste. 1500

Denver, CO 80202

**Energy Consultant:**

testec

(252) 626-8842

testec@gmail.com

Energy Design Assistance Program Process & Timeline

Xcel Energy’s Energy Design Assistance (EDA) process is designed to assist the Owner and Design Team in making decisions concerning energy-efficiency measures for the project. The main steps of the process are as follows.

|  |  |  |
| --- | --- | --- |
| **Construction stage** | ENERGY DESIGN ASSISTANCE STATE | **DATE** |
| **aPPLICaTIon**  **Design phase** | Step 1: APPLICATION  Complete application  Xcel Energy accept/reject of application | **June 29, 2013** |
| **PRE/EARLY SCHEMATIC DESIGN PHASE** | Step 2: INTRODUCTION  Introductory meeting  EDA Program overview  Energy efficiency measure discussion  Begin collection of building and incremental cost data  Submit introductory report | **July 15, 2013** |
| **Schematic Design phase** | Step 3: PRELIMINARY ENERGY ANALYSIS (PEA)  Early massing, HVAC, daylighting (Enhanced Track only)  Preliminary energy analysis meeting  Review of analysis results in PEA report  Selection of measures to be included in final energy analysis  Submit PEA report | **June 29, 2013** |
| SD completion | |  |
| **Design Development phase** | Step 4: FINAL ENERGY ANALYSIS (FEA)  Final energy analysis meeting  Review of updated whole building analysis in FEA report  Review of program incentives  Introduction to verification process  Customer selects a energy design alternative, showing an intent to move forward with selected measures | **June 29, 2013** |
| DD completion | |  |
| **Construction Document phase** | Step 5: CONSTRUCTION DOCUMENT (CD)  Customer sends final design CDs to EDA Verification Consultant  **EDA Verification Consultant:**  Confirms measures included in final design documents. Sends to EDA  Modeling Consultant to update model  Submits CD report with updated model results and incentive  EDA consultant complete green certification docs (Enhanced Track only)  Design team completes documentation for fee reimbursement | **June 29, 2013** |
| **CD Completion** | |  |
| **Construction** | **Construction Occurs. Estimated construction completion date** |  |
| **Construction ends** | |  |
| **Post-Occupancy** | EDA Verification Consultant conducts:  On-site measurement and verification. Sends M&V results to EDA Modeling Consultant to update model  Submits M&V report with updated model results and incentive |  |
| **Incentive payment to customer is received approximately two months post-verification** | | |

Xcel Energy, through the Energy Design Assistance program, has qualified energy consultants to provide our customers with a service that includes an integrated design process. This integration includes using an energy model to predict energy savings. The energy model itself is an instrument to project results and review different energy efficiency opportunities. The results of these models belong to Xcel Energy and their customers as participants through the Energy Design Assistance program.

Xcel Energy customers participating in the Energy Design Assistance program may distribute the results of their model to anyone they choose. Xcel Energy will not release this information unless written permission from the customer has been obtained.  As a result of this permission, two reports will be provided: the Preliminary Energy Analysis Report and the Final Energy Analysis Report. Xcel Energy also cautions the use of these reports; data is based on an analysis done for a specific time frame.  Buildings naturally adjust as occupancy reaches its full potential, causing variations from pre-construction data.

Project Summary

|  |  |
| --- | --- |
| Project Name | EDAPT Example Project |
| Xcel Energy Project # |  |
| Location | 1123 W 3rd Ave, Denver, CO 80223 |
| Building Type | Hotel |
| Conditioned Floor Area | 52,000 |
| Unconditioned Floor Area | 0 |
| Above-Grade Stories | 3 |
| Below-Grade Stories | 0 |
| Electricity Provided by Xcel | Yes |
| Natural Gas Provided by Xcel | Yes |
| District Heating **Gas Provided by Xcel** | Yes |
| District Cooling **Electricity Provided by Xcel** | Yes |
| EDA Baseline | ASHRAE 90.1-2007 |
| Track (Basic or Enhanced) | Basic |
| Certification (Enhanced Only) | USGBC LEED Silver |
| Early Analysis (Enhanced Only) |  |
| Estimated Savings (vs. baseline) |  |
| Demand (kW) | 20 |
| Energy (kWh) | 100,000 |
| Gas (Dth) | 200 |
| Estimated Construction Completion Date | June 29, 2313 |
| Estimated 80% Occupancy Date |  |
| Estimated Verification Date |  |

|  |  |
| --- | --- |
| Customer incentive calculations are based on the following dollar amounts | |
| Demand ($/kW) | $ 400 |
| Energy ($/kWh) | $ 0.04 |
| Gas ($/Dth) | $ 4 |

Project Participants

Project participants at the meeting included:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Company | Role | E-Mail | Phone | In Attendance |
| John Doe | The Best Architects | Architectural Firm | john.doe@arch.com | (252) 626-8842 |  |
| Jim Smith | The Best Mechanical Engineers | Mechanical Engineer | jim.smith@contractor.com | (252) 626-8842 |  |

Measurement and Verification Summary

Measurement and verification (M&V) activities are performed as part of Xcel Energy’s Energy Design Assistance (EDA) program to verify installation/operation of the project energy efficiency measures (measures) included in the final design as represented in the Construction Documents. The inclusion of the measures reduces peak summer demand and energy consumption compared to a baseline design. Through the EDA program, financial incentives are provided to the customer based on peak demand savings, energy savings and natural gas savings. Thus, M&V determines if the incentives anticipated for the project based on the as-designed building are valid for the as-built building. If a significant discrepancy exists, the energy model is updated to reflect as-built conditions and the incentives are recalculated based on the new savings results.

This report presents a summary of the measurement and verification (M&V) findings for the project. Through M&V activities, the presence of the measures is verified and their potential to save is determined. The M&V findings are based on drawing reviews, construction submittals, visual inspections, site survey data, spot measurements and/or short term monitoring. The specific M&V approach followed for the measures integrated into this project are detailed in this report. The schedule of activities is shown in the following table.

Table : Schedule of M&V Activities

|  |  |
| --- | --- |
| M&V Activity | Date |
| CD review | June 29, 2013 |
| On-site verification | June 30, 2013 |
| Installation date of monitoring equipment | N/A |
| Removal date of monitoring equipment | N/A |

## As-Built Measures Economic Summary

The new construction/renovation work has been completed. John Doe, M&V Consultant, on behalf of Xcel Energy, has verified the as-built condition of all efficiency measures that were pursued. The following table details annual energy cost savings for the verified efficiency measures relative to the ASHRAE 90.1-2007 (modified) baseline model, along with the related incremental construction cost. A simple payback period was calculated taking into consideration reduced incremental cost due to incentives from Xcel Energy.

Table : Final Predicted Energy Efficiency Measure Simple Payback Analysis

|  |  |
| --- | --- |
| Incremental construction cost | $70,299 |
| Xcel Energy incentive\* | $21,459 |
| Adjusted incremental construction cost | $48,840 |
| Annual energy cost savings | $23,429 |
| Payback with incentive (in years) | 2 years |

\*This incentive is calculated using un-rounded energy modeling results.

# Measures Included in the Final Design

The Selected Design Alternative included the following measures:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | CD Review Results | | Verification Plan | | | Field Verification Results | |
| Measure | Description | CD Review | Verification Approach | Short-Term Data Logging | Long-Term Data Logging | Verification Status | Notes |
| 20% EPD Reduction in Guest Rooms Only | Reduce EPD in guest rooms with EnergyStar rated TVs and mini-fridges. | Only a 15% EPD reduction was found in guest rooms. Mini-fridges were EnergyStar rated but not TVs | Determine EPD in guest rooms by sampling rooms and counting equipment power | None | None | Verified | EnergyStar TVs were installed; model 20% EPD reduction |
| 20% LPD Reduction in Guest Rooms Only | Reduce LPD in guest rooms with CFLs and vacancy sensors | Found as modeled | Count fixtures and inspect lamp and ballast ratings. | Put data logger in guest rooms to verify vacancy sensor operation | None | Verified |  |
| R-15 Exterior Wall Insulation Only | R-15 exterior walls | Found as modeled | Review installation | None | None | Verified |  |
| R-50 Roof Insulation Only | R-50 roof insulation | Only R-45 insulation was found in the roof construction. | Review installation | None | None | Verified | R-40 Roof insulation installed; model R-40 Roof insulation |
| Rotate Building 90 Degrees Only | Building sited with long axis E-W | Found as modeled | Visit building site ☺ | None | None | Verified |  |

# As-Verified Results

Table 2‑ EDA Baseline Annual Information

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Energy  Cost  ($) | EUI  (kBtu/ft2-yr) | Peak  Demand  (kW) | Electric  Consumption  (kWh) | Natural Gas  (Dth) |
| $146,465 | 102.21 | 136.340 | 645,181 | 1,567.366 |

Table 2‑ As-Verified - Annual Savings vs. EDA Baseline

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Design Alternative | Energy Cost Savings  ($) | EUI Reduction  (kBtu/ft2-yr) | Peak  Demand Savings  (kW) | Electric  Consumption Savings  (kWh) | Natural Gas Savings  (Dth) | Incremental Capital Cost  ($) | Estimated Incentive\*\*  ($) | Simple Payback\*  (years) |
| Design-Team and Customer Agreed-Upon Alternative | $23,429 | 14.25 (16%) | 25.409 (19%) | 104,147 (16%) | 191.231 (12%) | $70,299 | $21,459 | 2 |

\*Simple payback includes reduction of incremental capital cost by estimated Xcel incentive

\*\*This incentive is calculated using un-rounded energy modeling results.  Because of rounding error, hand-calculation may be off by up to $1.

# Results by Individual Measure

Table 3‑4 EDA Baseline Annual Energy Information

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Energy  Cost  ($) | EUI  (kBtu/ft2-yr) | Peak  Demand  (kW) | Electric  Consumption  (kWh) | Natural Gas  (Dth) |
| $146,465 | 102.21 | 136.340 | 645,181 | 1,567.366 |

Table 3‑5 Measures - Annual Savings vs. EDA Baseline

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Measure | Energy  Cost  Savings  ($) | EUI  Reduction  (kBtu/ft2-yr) | Peak  Demand Savings  (kW) | Electric  Consumption Savings  (kWh) | Natural Gas Savings  (Dth) | Incremental Capital Cost  ($) | Simple Payback  (years) |
| 20% EPD Reduction in Guest Rooms Only | $9,068 | 2.47 (2%) | 10.809 (8%) | 42,861 (7%) | -24.041 (-2%) | $19,899 | 2 |
| 20% LPD Reduction in Guest Rooms Only | $7,366 | 2.06 (2%) | 11.649 (9%) | 33,925 (5%) | -13.936 (-1%) | $39,798 | 5 |
| R-15 Exterior Wall Insulation Only | $607 | 1.12 (1%) | 2.664 (2%) | 1,531 (0%) | 51.931 (3%) | $1,851 | 3 |
| R- 40 Roof Insulation Only | $4,191 | 3.04 (3%) | 0.351 (0%) | 17,208 (3%) | 99.436 (6%) | $8,750 | 2 |
| Rotate Building 90 Degrees Only | $2,703 | 5.52 (6%) | 1.043 (1%) | 11,108 (2%) | 74.901 (5%) | $0 | 0 |

# Documentation of Verification Process by Measure

## 20% EPD Reduction in Guest Rooms

Found EnergyStar mini-fridges using 100W and EnergyStar TVs using 100W when on.

## 20% LPD Reduction in Guest Rooms

5 random rooms were inspected. All rooms had CFLs in main sleeping area and high-efficiency T-8s with electronic ballasts in the bathrooms. Verified operation of occupancy sensors in guest rooms by recording with HOBO data logger for 30 min. during the inspection.

## R-15 Exterior Wall Insulation

Examined contractor submittals and could see edge of construction uncovered inside of one of the mechanical rooms.

## R- 40 Roof Insulation

Examined contractor submittals and looked at insulation thickness at edge of roof hatch.

## Rotate Building 90 Degrees

Building’s long axis faces East-West.

# Verification of Hours Used Within the Model

All hotel hours were verified with the hotel operator.