Fort Collins Utilities
Integrated Design Assistance Program
Consultant Manual

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Contents

SECTION 1 INTRODUCTION 1-1
1.1 PROGRAM OVERVIEW 1-1
1.2 CONTACT INFORMATION 1-2
1.3 MANUAL USE AND ORGANIZATION 1-2

SECTION 2 ENERGY MODELING CONSULTANT SELECTION 2-3
2.1 ENERGY CONSULTANT PRE-APPROVAL 2-3
2.2 ENERGY MODELING CONSULTANT REQUIRED TRAINING 2-4

SECTION 3 CONSULTANT SCOPE OF WORK 3-1
3.1 CONSULTANT SCOPE OF WORK 3-1
3.2 EC ROLES AND RESPONSIBILITIES 3-2

SECTION 4 IDAP BUILDING PERFORMANCE GOAL 4-4
4.1 DEFINING BUILDING PERFORMANCE GOAL 4-4
4.2 PERFORMANCE GOAL CODE EQUIVALENTS 4-4
4.3 PROPERTY TYPES NOT LISTED IN EPA'S ENERGY STAR TARGET FINDER 4-4
4.4 BUILDINGS WITH MULTIPLE END USES 4-4
4.5 ESTABLISHING EUI TARGET USING EPA'S ENERGY STAR TARGET FINDER 4-5

SECTION 5 ENERGY MODELING GUIDELINES 5-9
5.1 ENERGY SIMULATION PROGRAM SELECTION 5-9
5.2 ENERGY SIMULATION INPUTS & SETPOINTS 5-9
5.3 QUALITY CONTROL PROCESS 5-11

SECTION 6 CALCULATION METHODOLOGIES 6-1
6.1 SCHEMATIC DESIGN ENERGY REPORT (SDER): 6-1
6.2 DESIGN DEVELOPMENT ENERGY REPORT (DDER): 6-1
6.3 FINAL ENERGY REPORT (FER) AND CD REVIEW 6-1
6.4 ENERGY SIMULATION MODELING FOR THE FER 6-2
6.5 POST FER ENERGY SIMULATION MODELING 6-2
6.6 ESTIMATING DESIGN PACKAGE COSTS 6-2

APPENDIX A SCHEMATIC DESIGN ENERGY REPORT TEMPLATE ..... A

APPENDIX B DESIGN DEVELOPMENT ENERGY REPORT TEMPLATE ..... B

APPENDIX C FINAL ENERGY REPORT TEMPLATE C

Section 1 Introduction

1.1 PROGRAM OVERVIEW

Fort Collins Utilities' (Utilities) Integrated Design Assistance Program (IDAP) provides technical assistance and financial incentives to help architects, engineering professionals, and building owners optimize energy and demand savings and reduce operating costs in eligible new construction and existing building major renovation projects.

IDAP employs a whole building performance-based strategy that fosters an integrated design approach with the project's design team starting during the conceptual phase. Through this process, the design team (typically the owner, architect, mechanical and electrical engineers, and general contractor) are presented with multiple high efficiency design strategies and their associated economic impacts at key milestones throughout the design process. Early involvement combined with the comprehensive interaction of key project stakeholders affords the opportunity to cost-effectively evaluate and incorporate efficiency strategies while design components are still fluid. The program is designed to be scalable for projects of varying size and flexible to grow with customer needs.

IDAP energy reduction targets are modeled after the 2030 Challenge®[1] initiative. IDAP has adopted the following Challenge 2030 elements into the program:

- All new buildings and existing building major renovation projects shall be designed and built to meet an energy consumption performance standard of 60% below the regional average EUI (Energy Use Intensity, defined as kBtu/SF/year) for that building type. The regional average EUI is based on 2003 building survey data, (i.e. data is based on older, less efficient buildings as compared to present day buildings) contributing to the achievability of Architectural 2030 targets. This standard for all new buildings and major renovations will be increased to:
    - 70% in 2015
    - 80% in 2020
    - 90% in 2025
    - Carbon-neutral in 2030 (using no fossil fuel GHG emitting energy to operate)
- Savings targets may be accomplished by implementing innovative sustainable design strategies and generating on-site renewable power (20% maximum contribution towards goal).
- Performance and design incentives are available for qualifying projects that meet or exceed IDAP energy consumption performance standards for both electricity and natural gas. Final performance incentives are based on actual building performance resulting from energy efficient design and control strategies, human behavior, etc.
- Includes existing building and major renovation projects. See 2.2-5 in the IDAP Participant Manual.
- IDAP has specific deliverables aligned with traditional architectural milestones allowing for a highly integrated, user-friendly and timely design assistance process.
- IDAP is intended for projects with intentional stretch goals and committed design teams using an integrated design process early in the project.

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[1] *Challenge 2030® is a federally registered trademark solely owned by Architecture 2030 / 2030, Inc. For additional information, visit architecture2030.org*

- For buildings achieving the target goal, Utilities will provide the owner with a plaque signifying they have met a special City of Fort Collins designation for building energy performance.

For new construction and existing building major renovation projects that do not lend themselves to a comprehensive whole building approach, Fort Collins Utilities and Platte River Power Authority offer the Efficiency Works program, providing prescriptive and custom incentives for qualified customers. Prescriptive incentives are available for high efficiency HVAC equipment, lighting, motors, refrigeration and compressed air measures that meet or exceed minimum eligibility requirements. Custom incentives are available for systems that exceed code requirements or standard industry practice. Once a project has been selected for IDAP, incentives cannot be obtained from or combined with other programs offered by City of Fort Collins Utilities or Platte River Power Authority for the same measures.

1.2 CONTACT INFORMATION

Questions about the program can be directed to the IDAP Program Manager via:

- Web:
  - http://www.fcgov.com/IDAP
- Customer informational hotline
  - (970) 221 6700
- Fax
  - (970) 221 6619
- Email
  - utilities@fcgov.com
- Mail
  - Integrated Design Assistance Program
    Fort Collins Utilities
    P.O. Box 580
    Fort Collins, Colorado 80522

1.3 MANUAL USE AND ORGANIZATION

This Consultant Manual outlines the rules and requirements of IDAP and is intended for use by building owners, contractors, architecture and engineering firms, energy services companies, and equipment manufacturers. There are two manuals for IDAP, the Participant Manual and Consultant Manual. Both should be reviewed by all parties. This Consultant Manual is organized as follows:

- Section 2–Energy Modeling Consultant Selection
- Section 4–IDAP Building Performance Goal
- Section 5–Energy Modeling Guidelines
- Section 6– Calculation Methodologies

Section 2 Energy Modeling Consultant Selection

2.1 ENERGY CONSULTANT PRE-APPROVAL

Energy consultants (ECs) providing modeling services under the IDAP program must be pre-approved by Utilities. If building owners/design teams wish to use a modeling consultant that has not previously been approved, the consultant can submit an energy modeling application to Utilities. Approved ECs will contract directly with the building owner or design team, not with Utilities.

2.1.1 ENERGY CONSULTANT APPLICATION

IDAP ECs provide valuable marketing resources and technical education to energy design, engineering, and consulting firms. By applying to become an EC, participants can enhance their business offerings for commercial and industrial customers. Approved ECs will become a part of the pool of qualified individuals/firms eligible to provide services under Utilities IDAP program. Other potential benefits may include:

1. ECs may receive marketing materials to aid in the promotion and marketing of the Utilities IDAP program at no charge.

2. Company information may be included on the Utilities web site, www.fcgov.com/IDAP, where consumers will be directed to locate a firm that can help them identify and evaluate potential whole building, energy efficient design strategies.

To apply, please complete an Energy Consultant application and allow 3 weeks for processing and notification. Please contact the IDAP Program Manager for application materials and further details regarding the application process at (970) 221-6700 or utilities@fcgov.com.

2.1.2 ENERGY CONSULTANT QUALIFICATIONS

Utilities will evaluate EC applicants based on the firms' qualifications, experience and ability to meet the requirements of the program. Selection as an EC does not guarantee any minimum level of work. The selection criteria for ECs may include, but not necessarily limited to:

- Demonstrated level of individual and company experience in determining and recommending whole building, energy efficient design strategies to be implemented in the design of new construction and existing building projects.
- Demonstrated level of individual and company experience in the use of an energy simulation program consistent with the guidelines provided in the ASHRAE 140 standard.
- Certification as an ASHRAE Building Energy Modeling Professional (BEMP), AEE Certified Building Energy Simulation Analyst (BESA) and/or have gone through a minimum of 5 reviews with Green Building Certification Institute (GBCI).
- Experience in reviewing construction documents (CDs) for verification of the inclusion of a selected high performance design strategy.
- Ability to develop reports and lead technical discussions.
- Verifiable contacts and references for past energy simulation and design assistance projects.
- Demonstrated experience modeling one or more building types and summarizing the results in a clear/concise report to be presented to customer's of various backgrounds.

Heavy emphasis will be placed on the qualifications and experience of the key individual(s) identified to manage and provide quality control of deliverables. Individuals that have not been approved through the program, but are employed by an approved energy modeling firm, are permitted to provide energy modeling services for IDAP when project management and quality assurance are provided by approved staff.

2.2 ENERGY MODELING CONSULTANT REQUIRED TRAINING

Final approval to become a pre-approved IDAP energy modeling consultant is contingent on the attendance by all identified key personnel to attend an IDAP EC half-day training session. The EC training session will focus on the following topics:

- IDAP program process, timeline and incentives
- Energy modeling consultant's IDAP scope of work
- Roles and responsibilities for ECs supporting IDAP
- Program participation and incentives
- Review program materials and report templates
- Discuss the steps and rigor of the quality control process for deliverables and energy simulation models

ECs may be required to attend up to eight (8) hours of training and educational activities per year. These activities will be held at no charge for participating ECs, and Utilities will not reimburse ECs for time spent attending the training sessions.

For registration and details regarding upcoming training opportunities, please contact the IDAP Program Manager at (970)221-6700 or utilities@fcgov.com.

Section 3 Consultant Scope of Work

3.1 CONSULTANT SCOPE OF WORK

As discussed in Section 3 of the IDAP Participant Manual, the design team and the EC are required to complete the following 5 elements to receive 100% of the Design Incentive:

1) Hold a Schematic Design Charrette,
2) Submit a Schematic Design Energy Report (Utilities format) and drawings,
3) Hold a Design Development energy meeting,
4) Submit a Design Development Energy Report (Utilities format) and drawings, and
5) Submit a Final Energy Report (Utilities format) at the end of design and Construction Documents.

Further details regarding the IDAP scope of work are provided in the sections below.

3.1.1 MEETING 1: SCHEMATIC DESIGN PHASE CHARRETTE

An integrative design charrette is a focused, collaborative design effort occurring early in the design process. The Energy Consultant (EC) will attend the meeting and participate in technical discussions with the design team and building owner regarding high performance building design strategies and energy simulation modeling. In preparation for the meeting, the EC shall be prepared to discuss the project target EUI (See Section 4 for further information) and 3 or more potential high performance building design strategies to be analyzed based on the building type, size, and minimum code requirements. Strategies may represent "good", "better" and "best" design scenarios, based on life cycle costs and energy savings.

Please reference the IDAP Participant Manual, section 4.2.2 for EC, IDAP Program Manager, and design team/owner roles & responsibilities and further information regarding the schematic design phase charrette.

Key EC Schematic Design Phase Deliverables

- Participate in schematic design phase charrette, and technical discussion and acquire details for analysis
- Conduct simulation modeling for three or more high performance building design strategies for Schematic Design Energy Report to evaluate what is necessary to reach the Target EUI
- Submit Schematic Design Energy Report to IDAP Program Manager for QC

3.1.2 MEETING 2: DESIGN DEVELOPMENT MEETING

During the meeting, the EC will facilitate a discussion of the Schematic Design Energy Report containing energy simulation results, incentives and life cycle costs for each of the three high performance building design strategies discussed during the schematic design meeting.

Please reference the IDAP Participant manual, section 4.2.3 for EC, IDAP Program Manager, and design team/owner roles & responsibilities and further information regarding the design development meeting.

Key EC Design Development Phase Deliverables

- Participate in Design Development meeting, and technical discussion and acquire direction for design strategy
- Refine simulation model for selected high performance design strategy to document that the Target EUI is obtainable.
- Submit draft Design Development Energy Report to the IDAP Program Manager for QC

3.1.3 FINAL ENERGY REPORT AND CONSTRUCTION DOCUMENT REVIEW

The design team is responsible for providing the EC with the complete 100% CD package. The EC will develop a Final Energy Report (FER) containing refined model results, incentives and costs based on the complete 100% CD package.

The Final Energy Report is described in section 6.3 and a sample of the required template is provided in the Appendix of this manual. Deviations from this template must be approved in writing by Utilities. Please reference the IDAP Participant manual, section 4.3 for EC, IDAP Program Manager, and design team/owner roles and responsibilities and further information regarding the final energy report and construction document review.

Key EC Final Energy Report Phase Deliverables

- Review 100% CD package
- Revise energy simulation model as necessary to reflect actual Energy Efficiency Measures (EEMs) contained in CDs to ensure that the project is still designed to reach the Target EUI
- Provide necessary support and coordination with design team
- Submit Final Energy Report to the IDAP Program Manager for QC

3.2 EC ROLES AND RESPONSIBILITIES

In the context of providing energy engineering and modeling support for IDAP, ECs may be required to:

- Acquire necessary costs of implementation of high performance building design strategies from the design team.
- Prepare and present, as required, economic justification calculations, including simple paybacks, internal rate of return, discounted cash flow and net present value.
- Perform all required work within project specific timelines.
- Maintain working knowledge of City of Fort Collins energy codes, industry practices and standards.
- Maintain current working knowledge of project delivery channels including performance contracts, design-bid-build, design-build, CM/GC in order to effectively participate on project teams with any project delivery channel.
- Represent the owner and design team, including the vendor neutral aspects, in an accurate, positive professional manner.

- Maintain working knowledge of current Utilities and Platte River energy efficiency programs, including customer and equipment eligibility, customer screening, customer analysis needs and implementation requirements.
- Treat designated information as confidential.
- Understand, support and participate in the program evaluation process from project development through project completion.
- Participate as required in regular EC review meetings with Utilities.
- The EC will accurately inform Fort Collins Utilities' customers of energy efficiency program eligibility requirements, participation steps, and rebate opportunities. The EC agrees to fully understand available rebate programs including; qualifying products, rebate amounts, and eligibility requirements.
- ECs will aid the customer in the IDAP application process by accurately answering questions and directing customer to the current rebate forms, the customer service hotline at (970) 221-6700 and/or utilities@fcgov.com.
- Adhere to Fort Collins Utilities and industry standard best practices for energy modeling.

Section 4 IDAP Building Performance Goal

4.1 DEFINING BUILDING PERFORMANCE GOAL

IDAP requires new buildings and existing building major renovations to be designed and constructed to meet a site EUI target of 60% below the regional median for the project building type. This will increase to 70% in 2015. The EUI target goal will be established through use of EPA's ENERGY STAR® Target Finder for building types offered in that tool. For more complex buildings or building types not available in Target Finder, the IDAP Program Manager will work in collaboration with the design team to establish a reasonable target. This may be accomplished with the use of Architecture 2030® Target Tables, energy modeling, and/or other specialized tools. The final EUI target goal for the project is subject to approval by the IDAP Program Manager.

4.2 PERFORMANCE GOAL CODE EQUIVALENTS

To help design teams and building owners compare energy codes to Architecture 2030 targets, Architecture 2030 has released a white paper titled, '*Meeting the 2030 Challenge Through Building Codes'*. Code equivalents provided in this white paper can be interpolated to create approximate equivalents for performance targets of the 2030 Challenge and the IDAP program. A copy of this white paper can be accessed at: http://architecture2030.org/files/2030Challenge_Codes_WP.pdf

4.3 PROPERTY TYPES NOT LISTED IN EPA'S ENERGY STAR TARGET FINDER

If a project's building type is not available in Target Finder, another source for determining an appropriate median and target EUI must be used:

- Architecture 2030 has compiled the 2030 Target Tables, providing reduction targets for building types not available in the EPA's Target Finder. For further information, please visit http://architecture2030.org/files/2030_Challenge_Targets_National.pdf
- Labs21® has created an energy-benchmarking tool to determine energy reduction targets for laboratories. For further information, please visit http://labs21benchmarking.lbl.gov/
- In special cases, process loads may be exempted from the target EUI and sub-metering of those loads and other requirements may exist to remain eligible for performance incentives.

As mentioned above, in these special cases, the Utilities Program Manager will work with the design team to establish a reasonable EUI.

4.4 BUILDINGS WITH MULTIPLE END USES

If the project building has more than a single end use (e.g. one building has both office space and warehouse space), the building can be divided up based on square footage for multiple end uses in Target Finder.

If a project has a space type that is available in Target Finder and another space type that is not available, the metrics will be calculated based on the eligible space type and associated square footage only. Therefore, when designs for multiple end use building include space types not available in Target Finder, another source for determining an appropriate median & target EUI must be used and is subject to approval by the IDAP Program Manager.

4.5 ESTABLISHING EUI TARGET USING EPA'S ENERGY STAR TARGET FINDER

EPA's ENERGY STAR Target Finder is an easy to use, no-cost online tool that enables architects and building owners to set energy targets for new construction and existing building projects during the design process. **To access this tool, please visit https://portfoliomanager.energystar.gov/pm/targetFinder?execution=e2s1**

4.5.1 USING TARGET FINDER

Using EPA's ENERGY STAR Target Finder, the EC or other design professional, in collaboration with Utilities, will 'construct' a building based on parameters specific to the given building type. With these inputs, Target Finder calculates the EUI design target for the project.

Once a user is logged on to EPA's ENERGY STAR Target Finder webpage (see link above), the user will be asked to enter in the following property information:

- Project address
- Gross sq ft (as defined in Target Finder's input screen)
- Property type
- Weekly operating hours
- Number of workers on a main shift
- Number of computers
- Percent of space that can be cooled and heated
- Target percentage below the regional average EUI for the project building type

Figure 4-1, Figure 4-2 and Figure 4-3 below illustrate a step-by-step process and screen shots of example inputs for EPA's ENERGY STAR Target Finder tool. Target Finder allows for users to enter in details for multiple end use buildings that encompass multiple property types, and will automatically calculate the EUI target for these projects. The IDAP Program Manager will work with the design team to agree on inputs to Target Finder in order to establish a reasonable performance target.

Figure 4-1: ENERGY STAR Target Finder – Steps #1-3

Step #1: On the opening page in the 'My Porfolio' tab, click on 'Add a Property'

Step#2: Follow the directions to select the main property type, the number of buildings and the construction status. Select 'Design Project' for construction status.

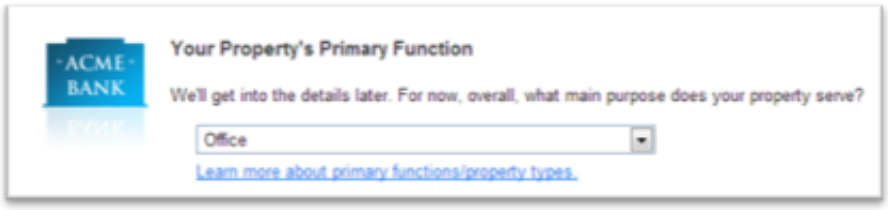
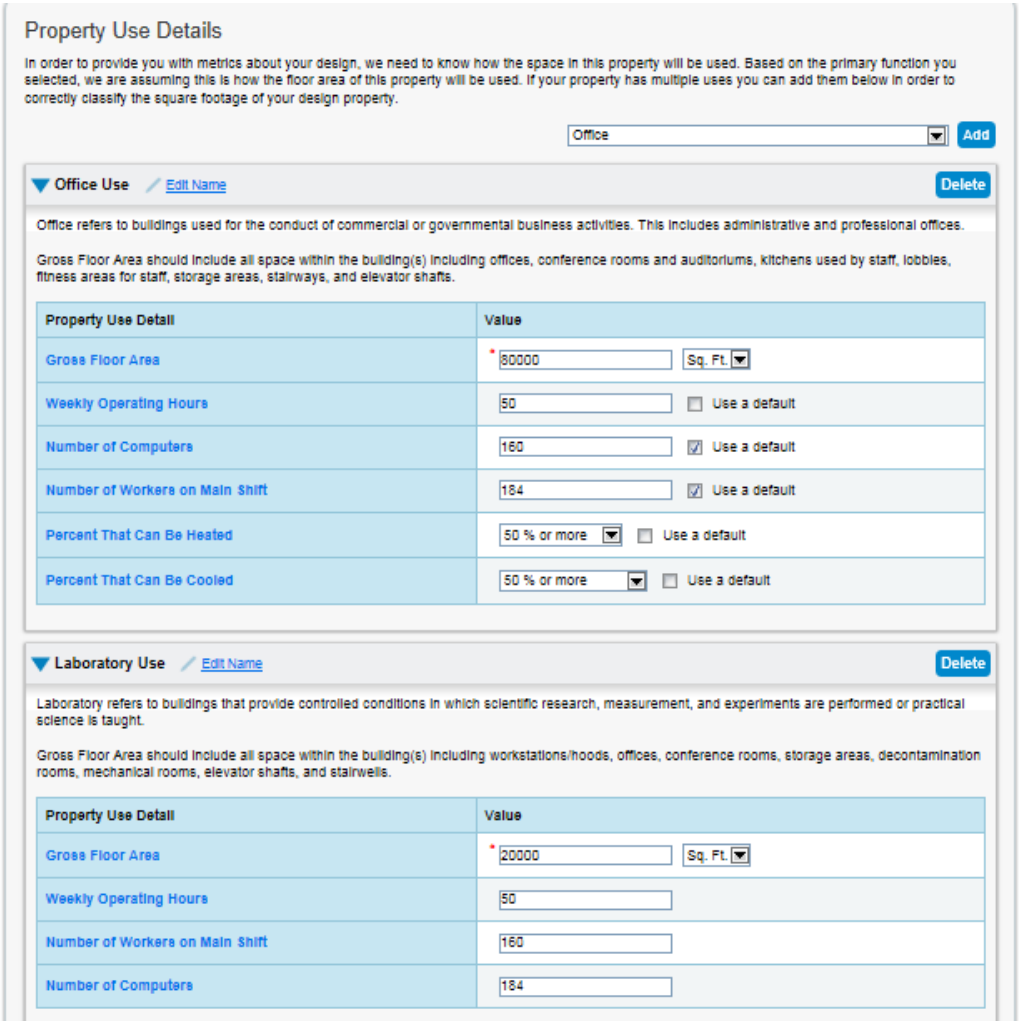


Figure 4-2: ENERGY STAR Target Finder – Steps #3-4

Step #3: On the next page, enter the geographical information for the property, expected construction completion, and the gross floor area. If the building has more than a single end use, the building can be divided up based on square footage for multiple end uses in the 'Property Use Details' section. Please note, the gross building square footage must be greater than or equal to the sum of the individual space end uses.



Step#4: In the "Estimated Design Energy (Optional)" box, check the box that says, "I don't have (or don't want to) enter energy estimates". Checking this box is important for consistent results.

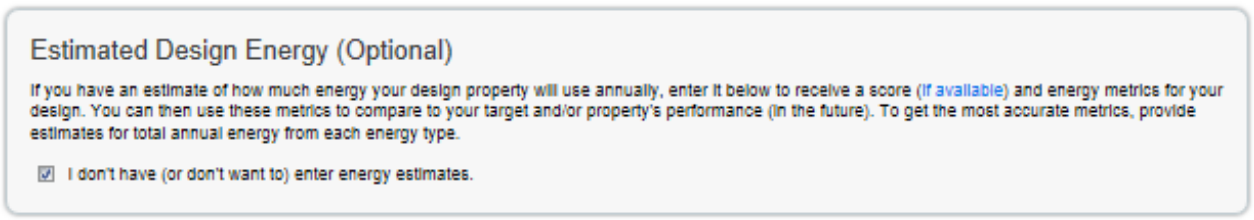
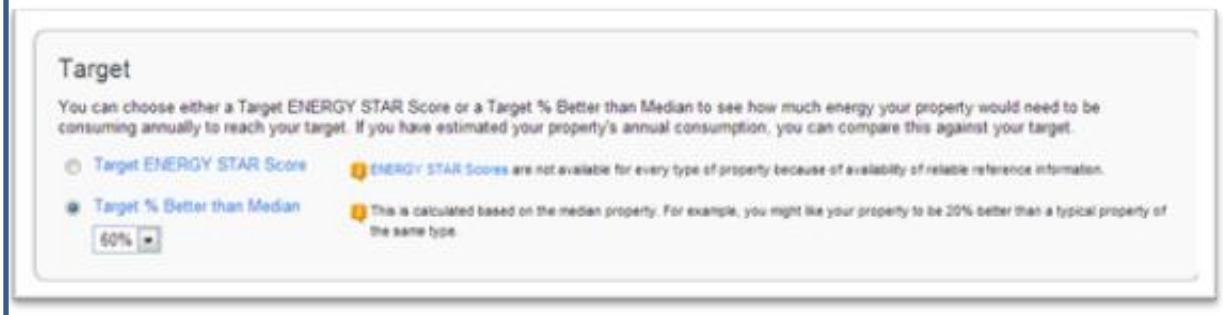


Figure 4-3: ENERGY STAR Target Finder – Step #5

Step #5: For IDAP, the building must come in at a target 60% better than the median building based on the inputs above. Under 'Target', select 'Target % Better than Median'. Set this value to '60%' and then click 'Create Design'.



4.5.2 TARGET FINDER OUTPUTS

Once the necessary inputs are entered into the Target Finder tool and results are generated, Target Finder then calculates a 'Target' EUI based on a 60% reduction in energy usage. Figure 4-4 shows a screenshot of the Target Finder results page. After the design is created, the summary of the design, design target, and median property is presented in the 'Design' tab. The values can be updated as the design changes to reach the target. The outputs from energy simulation model(s) and/or actual building EUI can be used to compare the project EUI to the target and median EUIs generated from Target Finder.

Figure 4-4: Example ENERGY STAR Target Finder Outputs

Metrics Comparison for Your Design and/or Target

Metric	Property Estimate at Design	Design Target*	Median Property*
ENERGY STAR score (1-100)	Not Available	97	50
Source EUI (kBtu/ft²)	Not Available	89	222.6
Site EUI (kBtu/ft²)	Not Available	37.1	92.7
Source Energy Use (kBtu)	Not Available	8900000	22260000
Site Energy Use (kBtu)	Not Available	3710000	9270000
Energy Cost ($)	Not Available	75097.17734226264	187742.9433556566
Total GHG Emissions (MtCO2e)	0	653.72	1634.3

* To perform calculations for your design target, we use the fuel mix that you've entered for your design energy estimates. If you have not entered estimated design energy, we'll use the average for your state. To perform calculations for the national median, we will assume the fuel mix and operational details of your property measurement in use, if available. Otherwise, we will use your design estimates.

5.1 ENERGY SIMULATION PROGRAM SELECTION

A high performance building design strategy that can reduce the overall energy usage (electricity and natural gas) of a building, exceed project performance targets, while meeting project budgets, can be considered a viable design strategy for IDAP. The objectives of IDAP with regards to energy modeling include:

- Optimize passive building elements, such as shape, orientation, envelope design (roof, wall, windows), insulation type and quantity, thermal mass (i.e., building "fly wheel" effect), and daylighting schemes;
- Identify multiple high performance building design strategies with regards to HVAC, lighting and other building systems;
- Select the most promising high performance building design strategy based on life-cycle cost and energy reduction goals.

It is up to the EC's expertise to recommend high performance building design strategies to the design team that will have a reasonable simple payback period (SPB), life-cycle cost, or meet the expectations of the design team.

Since there are limitations in the accuracy that certain energy building simulation programs can provide in modeling high performance building design strategies, it is up to the EC to choose a program that is appropriate for the anticipated design strategy.

However, the energy simulation program used by the energy modeling consultant is required to be tested in compliance with ASHRAE 140. Common ASHRAE 140 complaint programs are eQuest, Trane Trace 700, Carrier HAP and EnergyPro. The selected energy simulation program shall be capable of modeling all proposed building systems, outputting annual site energy use (electricity and natural gas) for the calculation of EUI and calculating a monthly, peak electrical demand profile.

If the selected energy simulation program cannot explicitly model a particular design strategy, the energy modeling consultant may utilize a thermodynamically similar component model that can approximate the expected performance. ECs shall have the flexibility to utilize industry accepted methodologies where such deficiencies in the selected modeling software occur.

5.2 ENERGY SIMULATION INPUTS & SETPOINTS

The following inputs shall be used in all energy modeling:

- Weather Input File: Fort Collins TMY3
- Utility Rates:
    - Electric:
        - For current City of Fort Collins Utility Rates , please visit http://www.fcgov.com/utilities/business/rates/electric
        - Electric rates used should include all appropriate PILOT (Payment in Lieu of Taxes) charges and city, county and state taxes. PILOT and taxes apply to both electricity (kWh) and electrical demand (kW) rates. An example of how PILOT and tax rates are applied to base rate charges is provided in Figure 5-1 below.

- Please contact the IDAP Program Manager for current PILOT charges and taxes at (970) 221-6700 or utilities@fcgov.com.

  - Natural Gas: Consult with natural gas utility to determine the likely billing rate for natural gas.

Figure 5-1: Example calculations in applying PILOT charges and tax rates to base charges

Charge	Rate %	Variable used in calculation
PILOT =	6.0%	A
City Sales Tax =	3.85%	B
County Sales Tax =	0.8%	C
State Sales Tax =	2.9%	D

Total kWh Charge ($/kWh) - Sum of Dist. Facilities Demand and Energy Charge						
Charge and variable used in calculation	**E=Base charge**	**F=PILOT**	**G=Subtotal**	**H=City**	**I=County & State**	**Total Charge**
Summer (Jun, Jul, Aug) ($/kWh)	0.0572	A*E= 0.0034	E+F=0.0606	E*B=0.0022	(E+F)*(C+D)=0.0022	G+H+I=**0.0651**

- Room temperature set points input into the model shall be specified by the owner or the appropriate member of the design team (Architect or Mechanical Engineer). When room temperature set-points are unknown early in the design phase, Utilities recommends the following default building set points are used, which is consistent with the DOE:

  - 70°F for occupied heating

  - 75°F for occupied cooling.

  - Unoccupied setback in heating mode is 65° and off for the unoccupied cooling mode. The occupied/unoccupied schedule will be defined by the owner and design team.

- Coincident Peak:
    - For explanations of Facility and Coincident Peaks, see http://www.fcgov.com/utilities/business/rates/electric/compare-facility-demand-and-coincident-peak
    - Use the load on the peak day for each month at the following hours to determine the Coincident Peak value:

Month	Hour Ending
Jan	7:00 PM
Feb	7:00 PM
Mar	7:00 PM
Apr	9:00 PM
May	5:00 PM
Jun	5:00 PM
Jul	5:00 PM
Aug	5:00 PM
Sep	5:00 PM
Oct	7:00 PM
Nov	7:00 PM
Dec	7:00 PM

5.3 QUALITY CONTROL PROCESS

In order to maintain consistency in the energy simulation process and to achieve high quality results, the IDAP has established a quality control checklist in Table 5-1: IDAP Deliverable Quality Control Checklist below. This checklist shall be utilized by the energy modelers prior to submitting deliverables to Utilities. *Energy modelers will be expected to follow their company required internal quality control process and quality control measures specific to each project, in addition to utilizing the quality control checklist below.*

Since the final Performance Incentive is based on reaching the Target EUI as predicted in the model, more modeling rigor is likely required compared to a traditional comparative modeling process. As such, detailed modeling of anticipated plug loads, baseload energy use and occupant schedules will be important to accurately predict the actual EUI.

Once the EC has gone through their internal quality control process, the deliverables will be sent to Utilities for review. Utilities will submit the report deliverable, containing design strategy information and assumptions to the design team prior to finalizing the deliverables. Utilities will provide a thorough quality control review of the energy simulation model, reports, incentives and provide review comments back to the energy modeling consultant. This initial review process typically requires 1 week, depending on the project schedule and size of the project. The energy modeling consultant will then be expected to respond to the comments, make necessary changes to the deliverables, and submit back to Utilities for review within 1 week or sooner. Once the review and quality control process is complete and deliverables are approved by the Utilities, the EC will then submit the report deliverable to the design team and building owner.

Table 5-1: IDAP Deliverable Quality Control Checklist

1	Early in the design process, verify the design team and customer are considering appropriate high performance building design strategies for the project.
2	Verify the IDAP Target EUI has been met.
3	Check all incentive calculations, simple payback estimates, life cycle costs, utility rates and appropriate design strategy costs are used. Check coincident electrical peak costs are calculated correctly.
4	Verify that selected energy simulation model meets program requirements.
5	Verify model includes all process, plug loads, and exterior lighting.
6	Check proper weather file is being used – Fort Collins TMY3.
7	Check peak cooling load is reasonable (sf/ton).
8	Check for appropriate fan sizing - energy consultants are encouraged to communicate directly with the mechanical design team to insure that they are using similar or the same values (e.g., envelope characteristics, occupant densities and heat gains, equipment and lighting power densities) for sizing the fans. Design airflows are typically input in the model based on sea level conditions (if required by model). Check that modeled airflows and zone temperatures are consistent with design airflows and temperatures.
9	Check building net area compared to known area.
10	Check that custom equipment performance curves are used when necessary.
11	Check lighting density in spaces (check no lights in plenums).
12	Check building schedules, thermostat settings and other control strategies match design team and owner requirements.
13	Check that wall/roof thermal performances includes thermal bridging
14	Check daylighting controls are properly modeled.
15	Verify that unmet hours cooling and heating hours are not excessive, and comply with project requirements Total unmet hours should be less than 300 for most projects.
16	Where default values are used, verify that they are appropriate: E.g.1) In eQuest, check whether water loop operation is modeled as "demand" or as "standby" E.g.2) In eQuest, if an IDEC system has been used, verify that an appropriate kW/CFM has been calculated, rather than accepting the default.
17	Verify that fan energy has been backed out of the SEER rating, if required by model.
18	Verify that appropriate glass values have been used (assembly vs. center of glass). Remember, the glass U-value entered in eQuest does not include the outside air boundary layer, so this must be removed (see eQuest help files for details). Check window model input VT (Visible Transmittance) matches design window VT.
19	Proofread report. Check that model inputs and outputs match model data contained in report.

Section 6 Calculation Methodologies

IDAP has established report templates and calculation methodologies for each design phase of the program. To maintain consistency of deliverables and results, energy modeling consultants will be required to utilize program report templates for the Schematic, Design Development and Final Design phases of IDAP (provided in the Appendix of this manual). The reports build off of each other and will be combined at each phase (i.e. The Final Energy Report will include the Schematic and Design Development Energy Reports). Please note that incentive calculation methodology can be found in the IDAP Participant Manual.

6.1 SCHEMATIC DESIGN ENERGY REPORT (SDER):

The intent of the SDER is to provide a whole building predictive energy modeling analysis, preliminary EUI and incentive estimates for multiple (3 or more) high performance building design strategies discussed in the schematic design charrette meeting. A sample of the required template for the SDER is provided in the Appendix. Deviations from this template must be approved in writing by Utilities.

Each design strategy modeled for the SDER shall contain varying architectural, mechanical and lighting design strategies, meeting owner, design, code and IDAP requirements. Efforts should be focused on reducing energy consumption by taking into account the whole building and not just individual components. An example of this would be investigating how the building orientation affects the heating/cooling loads or how duct size, lengths and configurations impact static pressure and fan motor sizes. The SDER is the first of three reports.

To properly portray the impacts of each measure within the interactive model, the ideal order in which the EEMs are modeled is based on the EEM type. Modeling ideally should start with measures that affect the building loads, then systems, and conclude with EEMs that affect the central plant. Table 6-1 shows examples of the types of EEMs and their hierarchy in determining the energy modeling order.

Table 6-1: Example EEMs Measures and Modeling Order

	Loads	Systems	Plant
EEMs	Envelope Measures	Premium Efficiency Motors	Chiller Plant
	Cool Roof	Air Handler VFDs	Plant Controls
	Lighting/ Plug Loads	Air Handler Controls	Pumping Arrangements
	Lighting/Equipment Controls	Dedicated Outside Air System	Cooling Tower VFD

In an attempt to provide the design team with useful information that can be incorporated into their design of an energy efficient building, the consultant may be required to dissect systems for the overall building down to the zone level. Some examples include modeling different daylighting control strategies for different zones in the building or modeling a varying window type for each building facade.

6.2 DESIGN DEVELOPMENT ENERGY REPORT (DDER):

After the design team selects a high performance building design strategy, the EC develops and refines a single model for the DDER. It is anticipated that this design strategy will be incorporated into the final construction documents. The DDER documents decisions related to selection of this strategy.

6.3 FINAL ENERGY REPORT (FER) AND CD REVIEW

Following the CD review process, the EC will develop a Final Energy Report (FER) containing refined model results, incentives and costs based on the complete 100% CD package. The FER serves to ensure that the modeled design is completely reflected in the construction documents and vice-versa. The goal is to identify inconsistencies,

inaccuracies, and omissions from the design that could impact the project's EUI. Following completion of the FER, Utilities will evaluate the report for approval and send the FER and FER Approval Form (located in the back of the report) to the customer to sign. Once the FER is approved and the Design Incentive Request for Payment is received, the Design Incentive will be paid to both the Owner and the Design Team representative.

6.4 ENERGY SIMULATION MODELING FOR THE FER

Under certain circumstances, design strategies may be changed and cause the energy use to approach the IDAP performance target threshold. In these situations, Utilities may request energy simulation modeling of the revised high performance building design strategy to ensure that the project is still viable under the program.

The FER will document the high performance design strategy implemented by the design team in the 100% CD drawing set. If the performance values of a given system (e.g., glazing) are different than the values used in the energy simulation model, the report will include both values and make recommendations to adjust the values accordingly before the final set of drawings are issued.

Following the submittal of the FER to the owner and design team, it is required that the building owner sign the Design Incentive Request for Payment and submit the signed form to the IDAP Program Manager, prior to receiving design incentives.

6.5 POST FER ENERGY SIMULATION MODELING

In some cases, it may be necessary to revise the energy model at or near the end of construction when the as-built condition differs from that reflected in the FER. In those situations the IDAP Program Manager may request an updated model to ensure the building is still on track to meet the Target EUI before authorizing payment of the Construction Incentive.

If the post-construction building inspection by the IDAP Program manager and the final commissioning report show that the as-built condition closely matches that in the FER, the Construction Incentive will be paid.

6.6 ESTIMATING DESIGN PACKAGE COSTS

Customer decisions and program cost-effectiveness are based upon accurate costs recorded for each design. As such, project costs shall be reviewed by the EC for accuracy and reasonableness. Costs shall be provided by the appropriate design team member (mechanical, electrical, architect, contractor, etc). However, if a general contractor (GC) or professional cost estimator is already a part of the team at the schematic design phase of the project, this would be the best resource. If neither has been hired then the architect shall provide the costs for envelope related measures, the mechanical engineer shall provide mechanically related cost data, and so-forth for the electrical engineer.

- **SDER:** The level of detail that the design team may be able to provide in terms of cost data will likely be based on cost per square foot. Since the project is typically unspecified at this point in time, building size, envelope parameters (e.g. quantity of windows), quantity, type and size of HVAC and lighting systems have not yet been determined. If the design team does not have this cost information at a cost per square foot level, at the minimum, the consultant may recommend the design team refer to data from other previous projects.

- **DDER:** During the DDER phase of the project, the building envelope parameters should be nearing finalization and the mechanical and electrical system types, quantity, and capacities should be defined. The consultant shall ask the design team if the costs from the SDER need to be revised or if they are still accurate. If they do need to be revised, it is the design team's responsibility to provide these revised costs.

- **FER:** The consultant should confirm with the project team whether the costs in the DDER are still accurate. The consultant should revise the costs in the FER if changes are required.

Appendix A Schematic Design Energy Report Template

Pending

Appendix B Design Development Energy Report Template

Pending

Appendix C Final Energy Report Template

Pending

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