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IDAP Integrated Design Assistance Program

IDAP Consultant Training

Agenda

- Program Background
- Program Elements
  - ASHRAE 90.1 Appendix G Methodology, Performance Target, IDAP Highlights, IDAP Process, Incentives
- Energy Consultant Eligibility Requirements
- Energy Consultant Scope of Work
- Energy Modeling Guidelines
- Getting Started
- Lessons Learned and EC tools
- Questions

Program Background

Program Summary

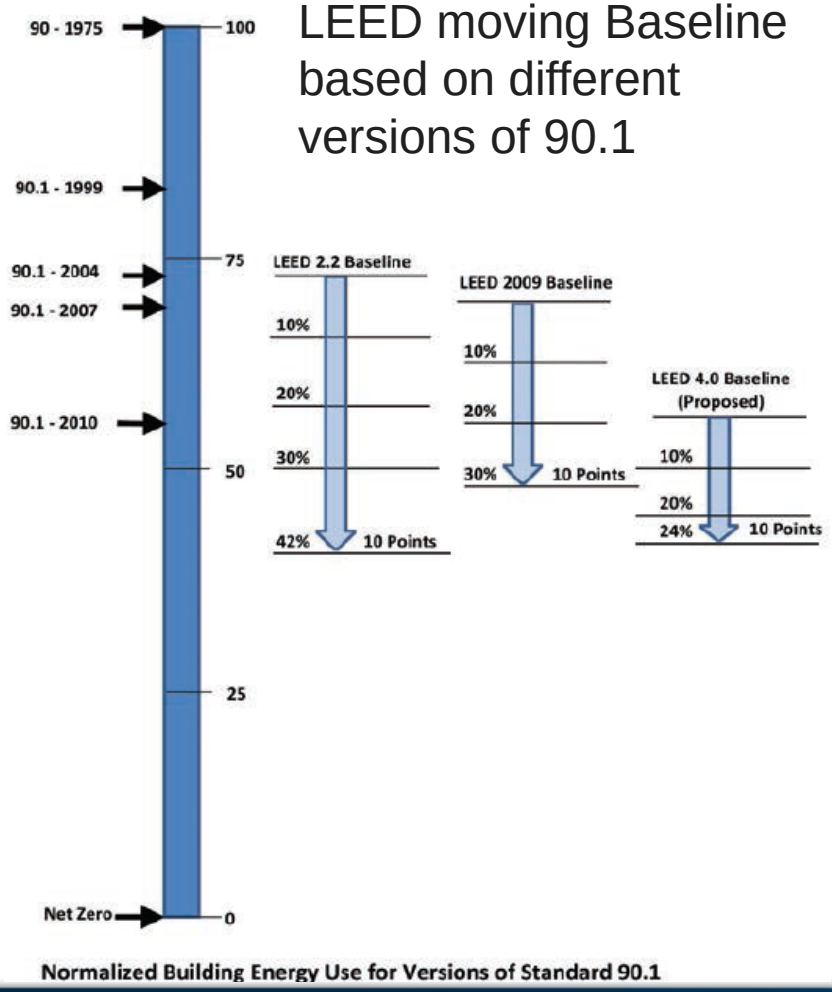
- Spring 2017 - Program went **FROM** EUI Target **TO** a minimum 10% energy cost reduction from code (for regulated loads)
- Predictive modeling to comparative modeling
    - Separating regulated and unregulated loads
- Performance Incentive became optional
- Simplified energy and incentive calculations
- Only offering an owner's incentive
- One program manual
- Simplified report templates

New in 2018

- Charrette process/requirements being updated in manual
  - Summary handout will be available
- IDAP provides facilitation services for charrettes for all projects
- Spreadsheet formula calculator for ECs to help with reporting
- New Program Manual to be posted soon.

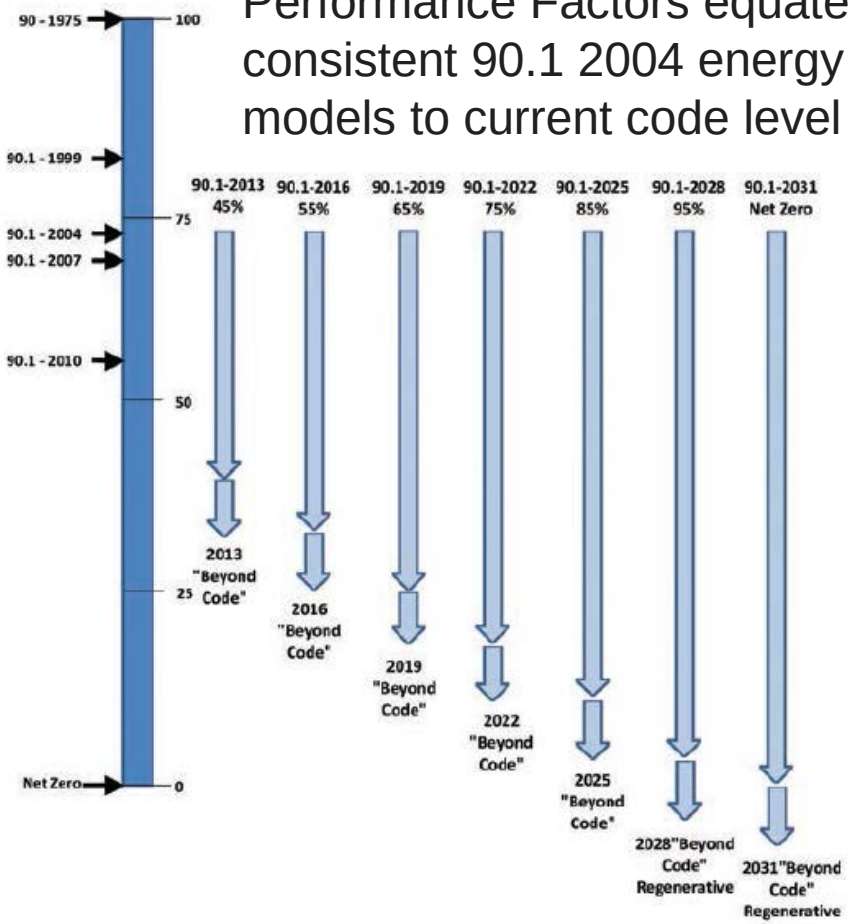
Program Redesign

LEED moving Baseline based on different versions of 90.1



Normalized Building Energy Use for Versions of Standard 90.1

ASHRAE Appendix G Building Performance Factors equate consistent 90.1 2004 energy models to current code level



90.1 App. G – 2016 vs 2004

Similar

- Envelope
- Lighting W/sf
- Lighting control
- Receptacle control
- HVAC efficiency

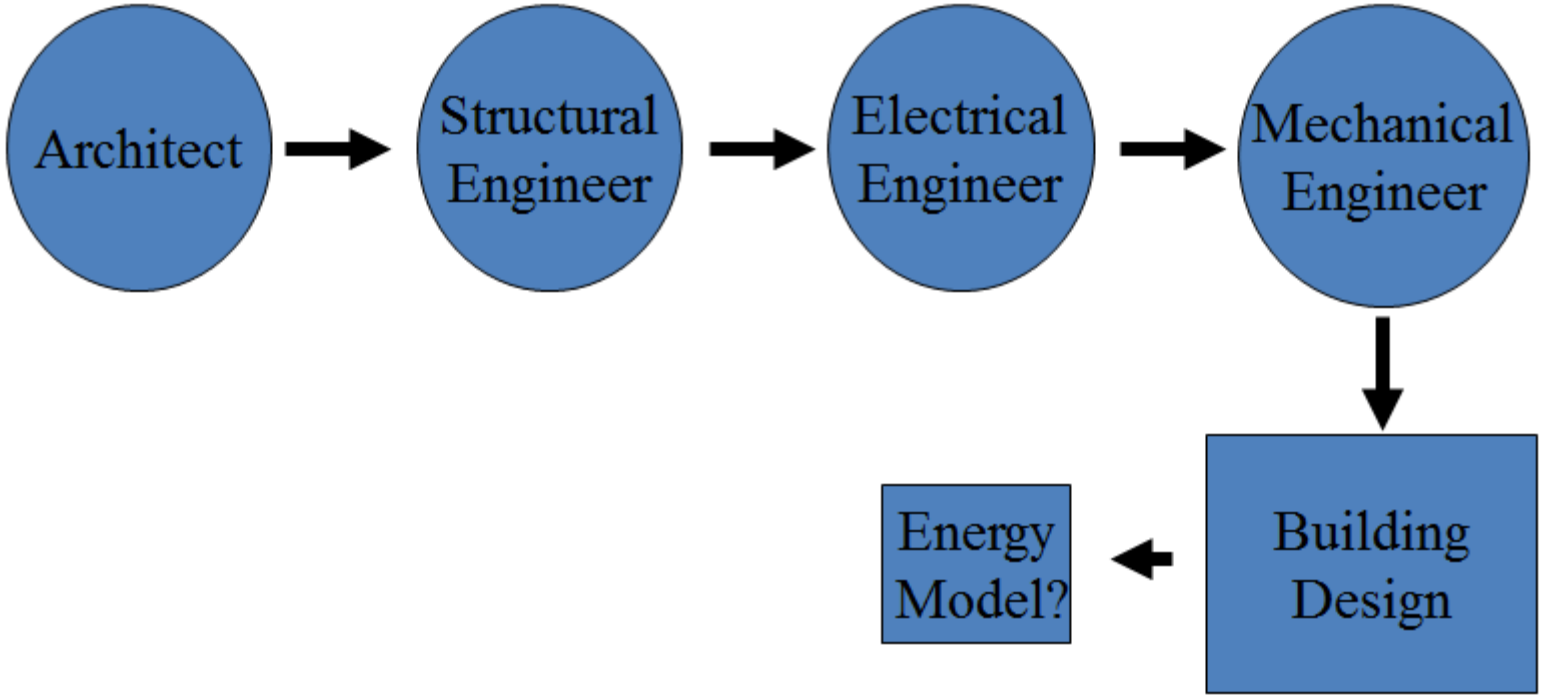
Different

- Window to wall ratio
- Infiltration
- Occupancy sensor
- Pump power
- Service water heating
- Elevator, refrigeration
- Room setpoints
- Ventilation

Slide courtesy of Ambient Energy

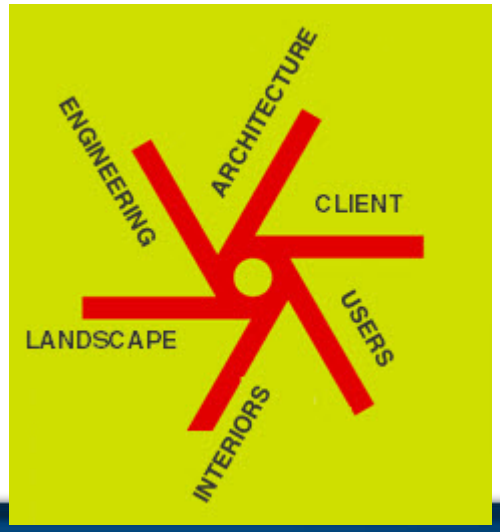
Program Elements

Traditional Design Process



Integrated Design Process

"Integrated building design is a process in which multiple disciplines are integrated in a manner that permits synergistic benefits to be realized. The goal is to achieve high performance and multiple benefits at a lower cost than the total for all the components combined."



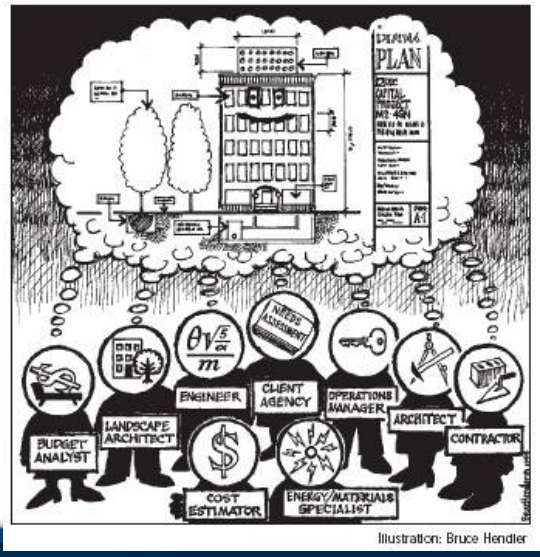


Illustration: Bruce Hendler

Integrated Systems

IDAP Highlights

- Approved energy consultants
- SD Charrette (w/ IDAP Facilitator)
- DD Energy meeting
- Quality control
- Deliverables aligned with architectural milestones

IDAP Project Requirements

- Owner and design team commitment to design assistance process
- Stretch goals: owner is motivated to pursue and fund a high performance design and exceed energy code with a comprehensive design approach
- Electricity provided by Fort Collins Utilities
- Year-round usage
- Facility size (scalable, but larger facilities provide more savings), minimum size of 5,000 SF

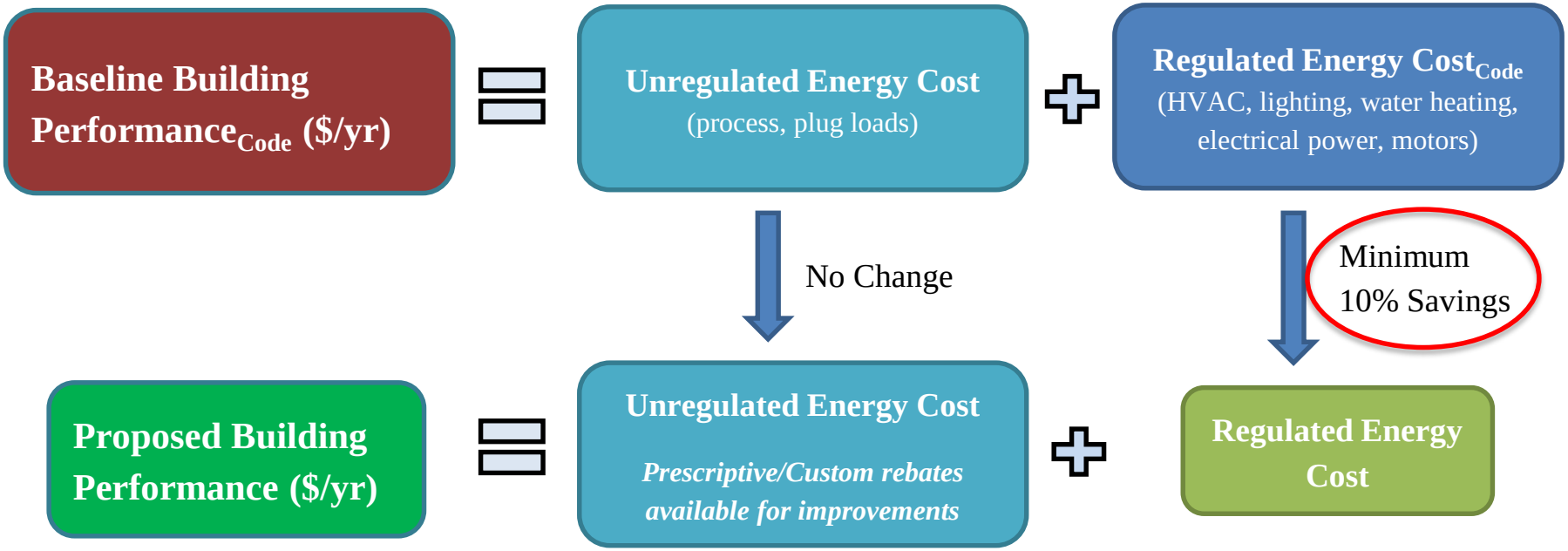
IDAP Project Requirements (cont.)

- Commercial or high-rise residential buildings planning for New Construction or Major Renovation (25% of bldg value, 25% of envelope)
- **Early involvement in design process (schematic or earlier); flexibility in building shape, orientation and systems selections**

- IDAP Program Administrator will be included in the meetings related to energy use and appraised of project process
- IDAP Program Administrator makes final decision on program eligibility

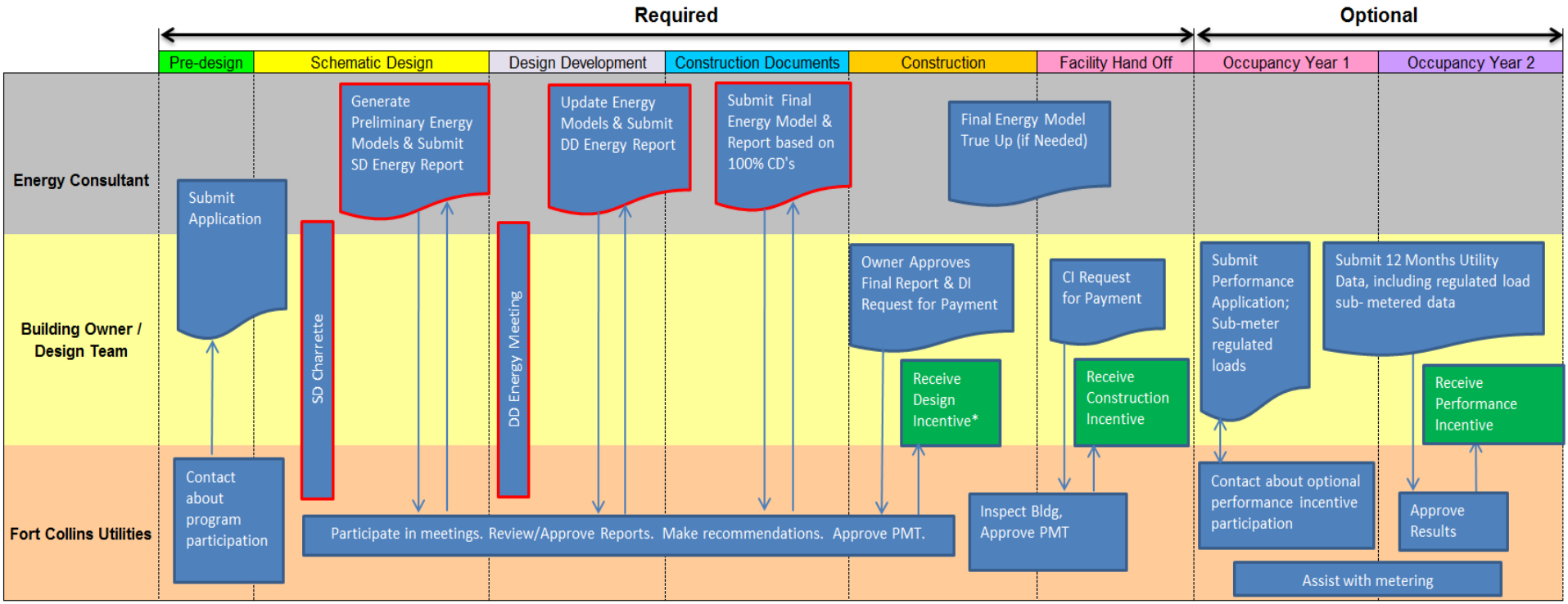
Energy Performance Target

- Minimum 10% savings in Regulated Energy Cost from current code baseline.



IDAP Process

Fort Collins Utilities Integrated Design Assistance Program



*Owner/Energy Consultant must complete all 5 items highlighted in red to receive the design incentive.

IDAP Incentives

Design

- Application (by early SD)
- Charrette (SD)
- Baseline Energy Model (SD)
- Determine Performance Target - 10% Savings (SD)[1]
- Energy Reports (SD, DD, CD)
- Energy Meeting (DD)
- Design Incentive (100% CD)[2]

Construction

- Commissioning
- Verification
- Construction Incentive (end of construction)[3]

Performance

Optional

- Energy Monitoring / Savings Verification (12 consecutive month's data within first 2 years)
- Performance Award[4]

Program Step | Deliverable | Incentive Payment

IDAP Incentives

- **Design Incentive** - $5,000 + $0.10/sf (paid at the end of design)

- **Construction Incentive** – 2 years modeled regulated energy cost savings (paid at end of construction)

- **Optional Performance Award** – 1 year actual regulated energy cost savings (paid after 12 months of occupancy, monitored via sub-metering)

IDAP Incentive Caps

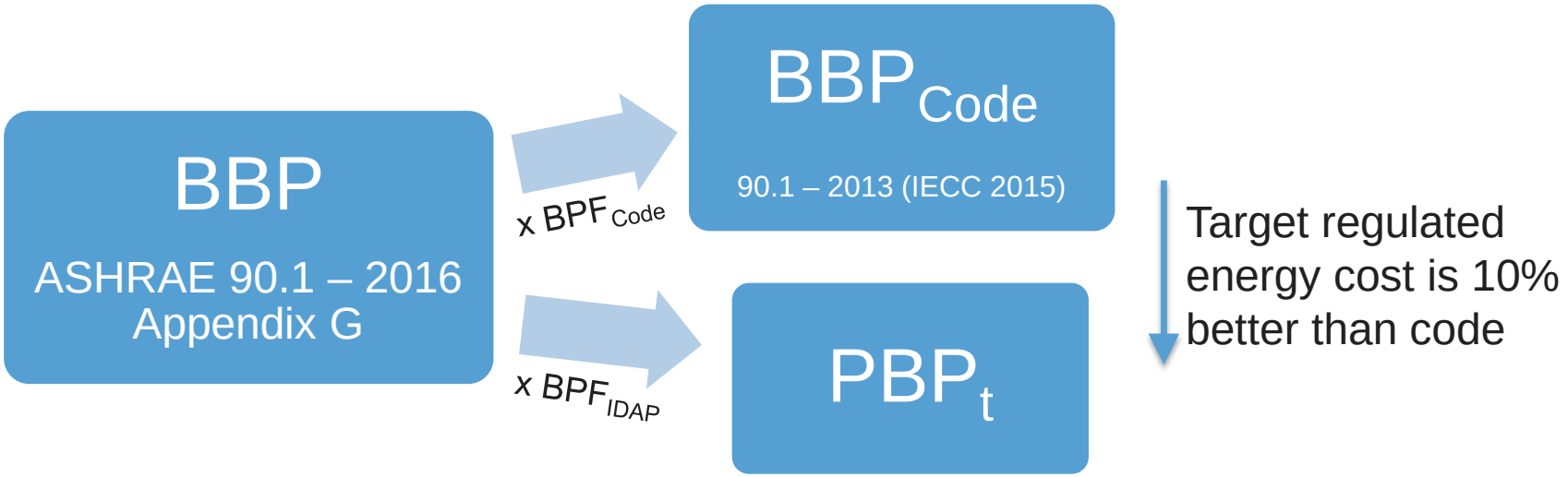
- Participants will be subject to a maximum annual amount of $100,000 for the Design and Construction Incentives combined
- The Performance Incentive is capped at $50,000 per year, per customer
- Utilities will reserve the right to waive or adjust the incentive caps on a case by case basis and determine at their sole discretion the program year to which an incentive is attributed
- In some cases the incentive cap may be exceeded depending on funding and the IDAP Program Administrator’s discretion.

IDAP Modeling Methodology

- Build Baseline energy model per ASHRAE 90.1 – 2016 Appendix G methodology(similar to new Performance Rating Method)
- Break out Regulated and Unregulated Energy Costs
- Apply Building Performance Factors (BPFs) to Regulated Energy Cost to create code baseline and IDAP energy cost targets
  - Use BPFs from 90.1- 2013 (equivalent to IECC 2015)
  - *Fort Collins will be adopting IECC 2018 at the beginning of 2019, which will shift BPFs to ASHRAE 90.1 - 2016*
- Build Performance energy model and modify as design progresses

Baseline Model - BBP_{Code}

The code baseline building performance (energy cost) and proposed building target are derived from the BBP, built from ASHRAE 90.1 - 2016 Appendix G



IDAP Building Performance Factors

Building Type	BPF_{Code*}	BPF_{IDAP**}
Multifamily	0.85	0.77
Healthcare/Hospital	0.57	0.51
Hotel	0.66	0.59
Office	0.66	0.59
Restaurant	0.63	0.57
Retail	0.64	0.58
School	0.55	0.50
Warehouse	0.66	0.59
All Others	0.62	0.56

Soon changing to 90.1 - 2016

*ASHRAE 90.1 – 2013 = Fort Collins IECC 2015 Code

** 10% savings from code

Code Baseline Building

BBP_{Code} = BBUEC + (BPF_{Code} x BBREC)

BBP_{Code} = Baseline Building Performance adjusted for current code (unregulated + adjusted regulated annual energy cost)

BBUEC = Baseline Building Unregulated Energy Cost *(from baseline energy model)*

BPF_{Code} = Building Performance Factor (BPF) of a building meeting the City building code *(2015 IECC, represented by ASHRAE 90.1 – 2013 BPF table)*

BBREC = Baseline Building Regulated Energy Cost, *(from Baseline Building Performance 2016 Appendix G model)*

Proposed Building Target

PBP_t = BBUEC + (BPF_{IDAP} x BBREC)

PBP_t = Proposed Building Performance energy cost target, the maximum total energy cost of Proposed Building (unregulated + regulated cost). Unregulated energy cost will be the same in the proposed and baseline.

BPF_{IDAP} = IDAP BPF, represents 10% savings from current code

Construction Incentive

Modeled Energy Cost Savings

Construction Incentive = 2 x (BBP_{Code} – PBP_m)

PBP_m = Modeled energy cost of proposed building

PBP_m must be ≤ PBP_t to receive Construction Incentive (can still receive Design Incentive)

Optional Performance Incentive

Optional Performance Incentive =

Baseline Regulated Energy Cost

$(BPF_{Code}$ x BBREC) – Actual Regulated Energy Cost*

Actual Regulated Energy Cost Savings

*monitored

Incentive Example Summary
Utility Administration Building

Given: **Office Building in Fort Collins**

37,500 square feet

BPF_{Code} = 0.66

BPF_{IDAP} = 0.59

BBP_{Code} = BBUEC + (BPF_{Code} x BBREC)

BBP_{Code} = \$4,818 + (0.66 x \$36,608) = \$28,980

PBP_t = BBUEC + (BPF_{IDAP} x BBREC)

PBP_t = \$4,818 + (0.59 x \$36,608) = \$26,416

PBP_m must be ≤ PBP_t to receive Construction Incentive

PBP_m = \$23,558

Incentive Example Summary
Utility Administration Building (cont.)

Design Incentive = $5,000 + $0.10/sf
= $5,000 + $0.10/sf x 37,500 sf
= $5,000 + $3,750
= $8,750

Construction Incentive = 2 x (BBP_{Code} – PBP_m)
= 2 x ($28,980 - $23,558)
= 2 x ($5,422)
= $10,844

$PBREC_m$ = $18,740 (Proposed Building Regulated Energy Cost from Energy Model)

Performance Incentive = (BPF_{Code} x BBREC) – Actual Regulated Energy Cost
(OPTIONAL) = (0.66 x $36,608) - $18,740
= $24,162 - $18,740
= $5,422 (estimated)

Energy Consultant Eligibility Requirements

IDAP Energy Consultant Requirements

- Attend training on program
- BEMP or BESA certification and/or 5 GBCI reviews
- Demonstration of individual and company experience
- Experience in reviewing construction documents
- Ability to develop reports and lead technical discussions
- Experience modeling different building types
- Reference checks

IDAP Energy Consultant Roles & Responsibilities

- 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, standards, available energy efficiency programs including; qualifying products, rebate amounts, eligibility, and implementation requirements
- Maintain current working knowledge of project delivery channels including performance contracts, design-bid-build, design-build in order to effectively participate on project teams with any project delivery channel

IDAP Energy Consultant Roles & Responsibilities

- Treat designated information as confidential
- Since EC's are hired by the Owner, they are not representing Utilities
- Understand, support and participate in the program evaluation process from project development through project completion
- Participate as required in regular modeling review meetings with Utilities
- Energy Consultants will aid Utilities' customers by accurately answering questions and directing them through the IDAP eligibility requirements, IDAP application process, participation steps, and rebate opportunities
- Adhere to Utilities and industry standard best practices for energy modeling

Energy Consultant Scope of Work

IDAP Consultant Scope of Work (SOW)

Communication/Coordination

- Develop a plan to work across project consultants
- Provide access to a central file storage directory (i.e., FTP)
- Design team should factor IDAP deliverables into tracking

Overall Scope to Receive Design Incentive

1. Participate in a Schematic Design Charrette,
2. Submit a Schematic Design Energy Report (Utilities format) and drawings,
3. Participate in 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.

IDAP Consultant SOW Meeting 1

Meeting 1: SD Design Phase Charrette

- **Attendees:** IDAP facilitator, IDAP Program Administrator, Energy Consultant (EC), Design Team (DT)/Owner, Project stakeholders (e.g. future occupants, maintenance staff)
- **Key Elements:**
  - Collaborative effort and dynamic exercise
  - Scope of IDAP is presented and discussed
  - DT and EC need to be prepared to discuss one or multiple high performance building designs to be analyzed
  - Energy Consultant will get direction on designs, building characteristics, schedule for design team to have costs for each design, schedule, and future meeting dates
- **Deliverable/Next Steps:**
  - Multiple models/results/LCCAs analyzed and summarized in SD Energy Report then sent to IDAP Team for review

IDAP Consultant SOW Meeting 2

Meeting 2: DD Energy Meeting

- **Attendees:** Same as Meeting 1
- **Key Elements:**
  - Scheduled once the SD Energy report is approved by IDAP Team
  - Energy Consultant will facilitate discussion of report/energy models/pros and cons of different design packages
  - Design team selects design
  - Energy Consultant collects final details on selected design to finalize model and discusses energy efficiency measures (EEMs) that can be added to the main design to yield additional savings
- **Deliverable/Next Steps:**
  - Refine and finalize selected model/EEMs/results/LCCA and summarize in DD Energy Report and then send to IDAP Team for review
  - Once approved, report sent to design team/owner to incorporate into CDs

IDAP Consultant SOW Final Report

Final Energy Report and CD Review

- **Key Elements:**
  - Design team provides energy consultant 100% CDs for review to confirm the high performance design modeled matches the CD package (and EEMs)
  - If key features are overlooked they are noted and discussed with design team for incorporation
  - If they aren't incorporated then the model is updated along with the modeled energy performance
- **Deliverable/Next Steps:**
  - Update and finalize model, if necessary, and summarize results of CD review and model in Final Energy Report
  - Submit report to IDAP Team for approval
  - If 100% CDs match one of the modeled packages in the DD Energy Report then EC can fill out the Tabular Memo appendix and submit to IDAP team
  - Once approved, report sent to design team/owner to review
  - Design incentive provided to owner based on results of FER

IDAP Additional Req's

Additional Project Requirements

- **Required by City Code and IDAP:**
  - Air barrier test all new buildings and additions
  - Cx (by code if 15,000 SF or greater) but required for all buildings under IDAP
- **Cx and Air Tightness is the Responsibility of the Owner:**
  - Electronic copies of both reports need to be submitted to the IDAP team in order to receive the Construction Incentive
- **Final Construction Inspection:**
  - Deficiencies identified and not resolved during Cx need to be factored into energy model if they cannot be rectified
  - If the Proposed Building Performance energy cost target (PBPt) can still be met at this point, then the construction incentive will be paid to the owner
- **Optional Performance Incentive:**
  - Based upon 12 months of actual sub-metered Regulated Energy Consumption multiplied by blended utility rates provided by Utilities

Energy Modeling Guidelines

IDAP Whole Building Strategy

- **Modeling high performance strategies:**
  - It's up to the energy consultant to chose an ASHRAE 140 compliant tool that is capable of modeling the proposed high performance design(s) accurately
  - Common ASHRAE 140 compliant programs include: eQUEST, Trane Trace 700, Carrier HAP, and EnergyPro
  - "Work Arounds" to model specific strategies need to be approved by the IDAP Program Administrator
- **Model Inputs**
  - Fort Collins TMY3 weather data (8,760 hrs/yr)
  - Utility Rates
  - Schedules and controls need to be held constant and be realistic

IDAP Whole Building Strategy

- **Model Outputs**
  - Annual and monthly site use (electricity and natural gas)
  - Monthly and peak electrical demand profile
  - Provide hourly reports to demonstrate a strategy is working correctly as necessary (i.e., modeling thermal mass)
- **Model QC**
  - Use IDAP Deliverable Quality Control Checklist (Table B-1 in Program Manual)
  - IDAP Team will review model (1 week)
  - Energy Consultant has 1 week to address/respond to comments

Examples of Specific Measures

Category	Measure	
Envelope	Continuous air barrier Improved wall insulation High efficiency glazing	Improved roof insulation Cool roof
Lighting	High efficiency fixtures (Interior) Lower ambient lighting levels Highly reflective ceiling	Occupancy sensors Efficient exterior lighting fixtures
Daylighting	Light conveyors Interior/exterior light shelves Sloped ceiling Reflective ceiling	Stepped daylighting controls Dimming daylighting controls Skylights/roof monitors Tuned glazing
HVAC Systems	High efficiency chiller High efficiency boiler Water side economizer Ground-source heat pump Water-source heat pump Variable refrigerant flow heat pumps Building thermal mass Point-of-use domestic hot-water heaters	Evaporative cooling technologies VFDs on pumps and cooling tower fans Infrared heating Displacement ventilation Radiant heating/cooling Natural ventilation Chilled beams High efficiency refrigeration equipment
On-site renewable systems	Onsite micro-wind Photovoltaic solar	Solar water heating
Passive design strategies	External overhangs Building orientation Low pressure drop duct & piping design	Optimizing window to wall ratio Trees for shading and wind protection

Not Counted in IDAP Energy Savings

Next Steps

- Fill out consultant application for review and pre-approval by IDAP Program Administrator
- Program design documentation can be found on the Utilities website www.fcgov.com/idap:
  - Program Application
  - Consultant Application
  - Program Manual
  - Approved Energy Consultants
  - Schematic Design Energy Report (SDER) Template
  - Design Development Energy Report (DDER) / Final Energy Report (FER) Template
  - Blended utility rates for use in Construction/Optional Performance Incentive Calculations
- If you have potential/future projects get in touch with IDAP Program Administrator

Lessons Learned

Lessons Learned

- Charrettes – format, participants, timing
  - Manual will be updated
  - Facilitation services coming
- Report timeliness important
- Function of red text in report templates
  - Insert information or remove text
- Understand difference between BBP and BBP_{Code}
- Use blended rates - $0.08/kWh, $0.60/therm

Feedback

What has your experience been?

Suggestions for program improvement?

Thank You!

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