Efficiency Works Business:
Energy Efficiency 101

May 24, 2018

Upcoming Events

- **June 7th – Xcel Selling Energy Efficiency, Denver**
  - Trade Partner Focused
  - Register: https://www.xcelenergy.com/xe/working_with_us/trade_partners/business_trade_partners/selling_energy_efficiency_trade_partner_workshop
- **June 28th – Efficiency Works Business Tour, Meet in Fort Collins**
  - CSU Bio Building, Walmart Distribution, Oskar Blues
  - Lunch Provided and Bus for Transportation
- **July 10th, 17th, 24th – Selling Energy Efficiency, Loveland**
  - In-Depth Three Part Series
  - Lunch Provided

Register for Efficiency Works Events: https://efficiencyworks.org/resources/events/

Improving Your Facility with Energy Efficiency

How Technologies Can Save You Money and Make You More Comfortable

Logan Jacobson

Analyst, E Source

E Source

Platte River Power Authority, *Efficiency Works Business Technical Training*

POWERING WHAT'S NEXT

Who we are

A research and consulting firm focused exclusively on utilities and their customers

Clients

We work with over 300 utilities and their partners

Founded

Founded in 1986, we've been in the industry for over 30 years

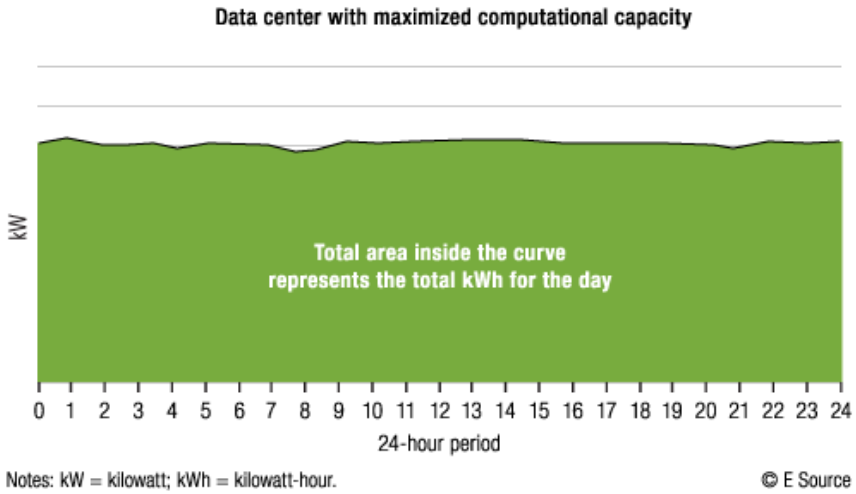
Headquartered

Boulder, CO

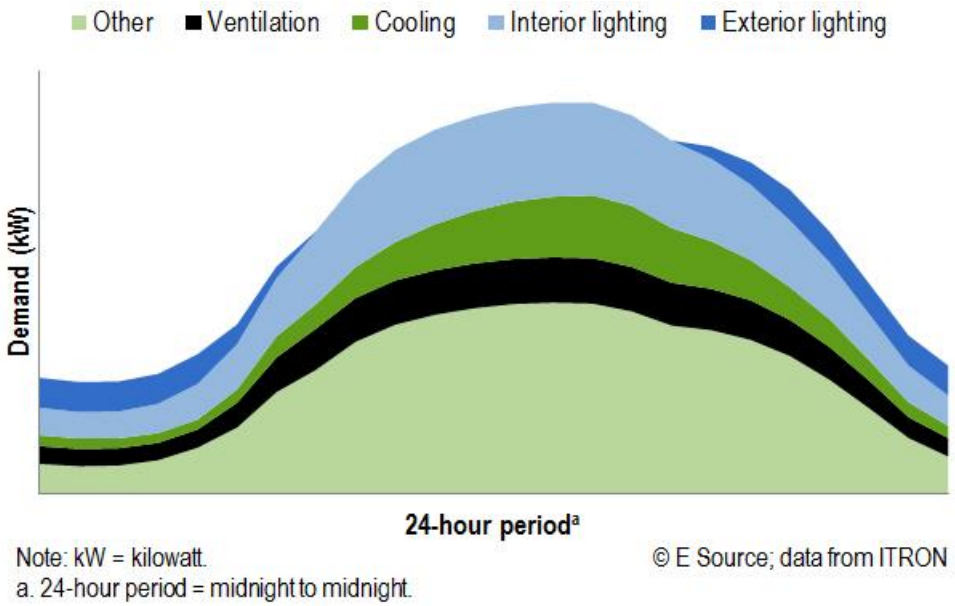
Energy efficiency basics

Demand vs consumption

Data Center Demand Curve



University Demand Curve

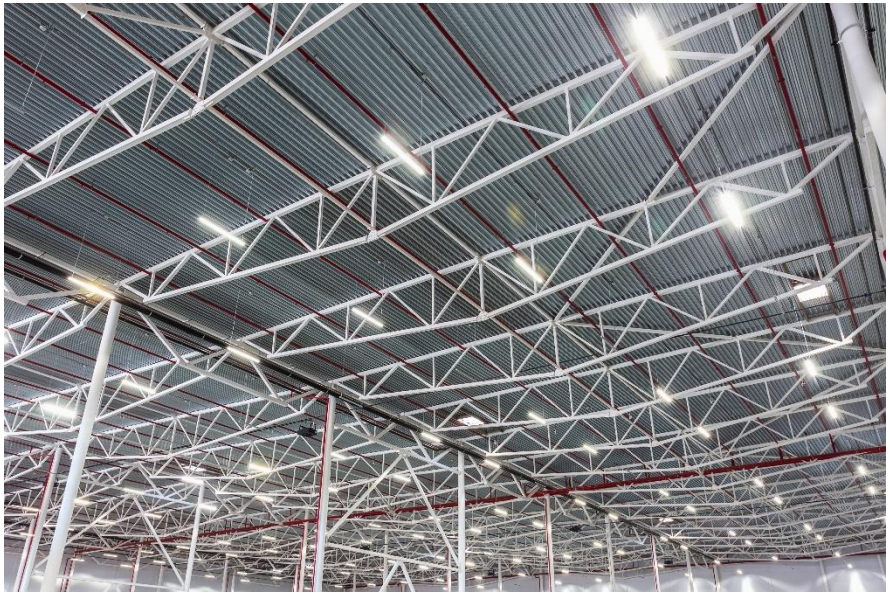


Benefits of consuming less energy

- Cost savings
  - Reduced energy bills
  - Incentives from utility
- Non-energy benefits
  - Occupant comfort
  - Improved productivity and health
  - Environmental stewardship

Efficiency is environmentally friendly

Source: iStock

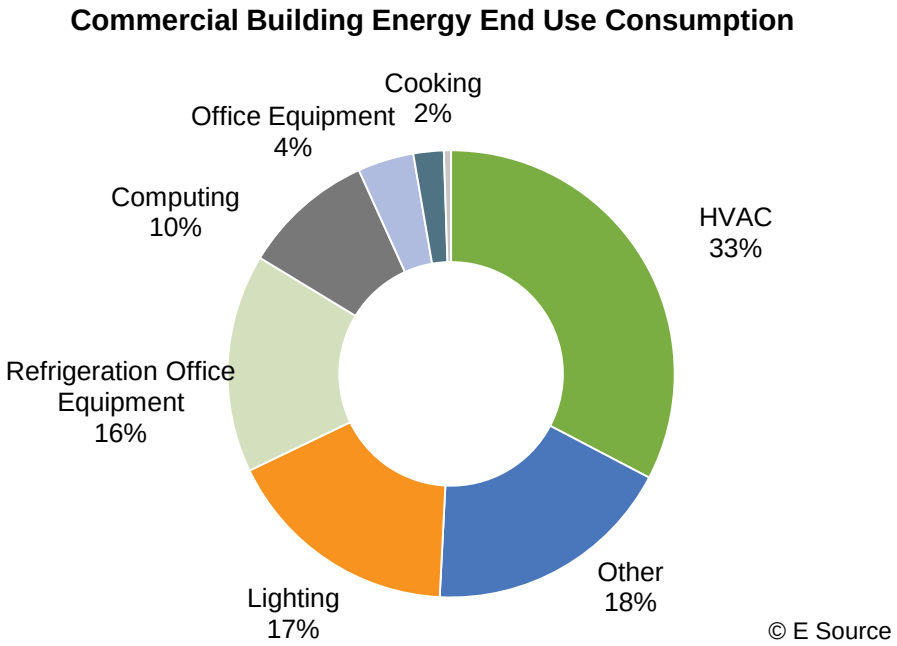


Source: iStock

… And postpones costly generation upgrades

Source: iStock

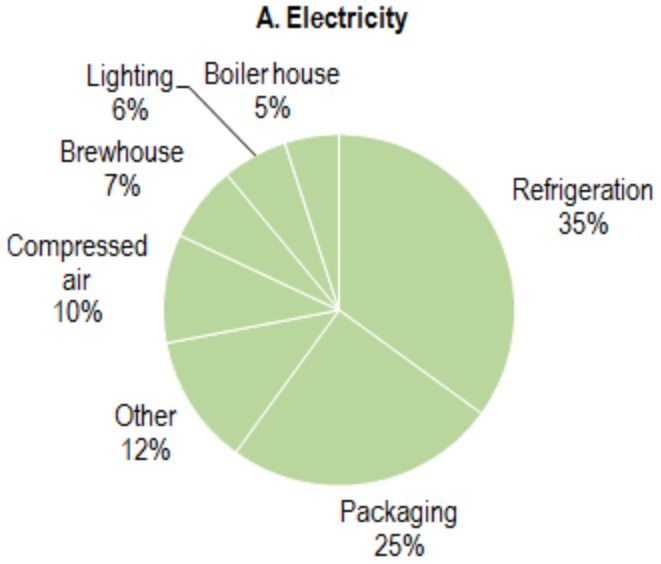
Research end use consumption to prioritize efficiency projects



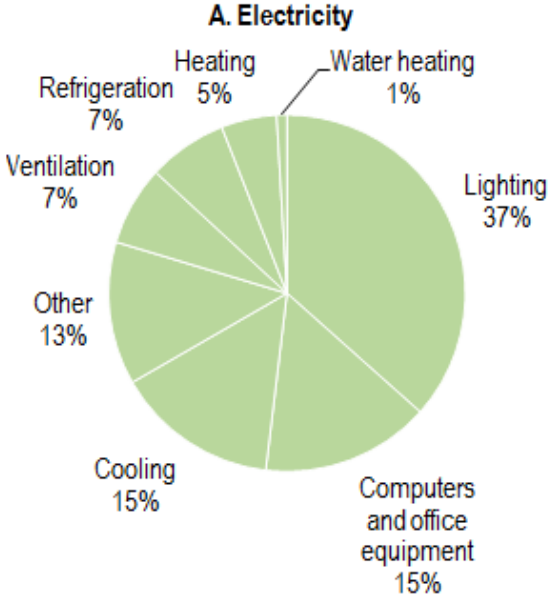
See the Commercial Buildings Energy Consumption Survey for more data

Energy Consumption Varies Depending on Facility Type

Microbreweries



Small and Midsize Offices



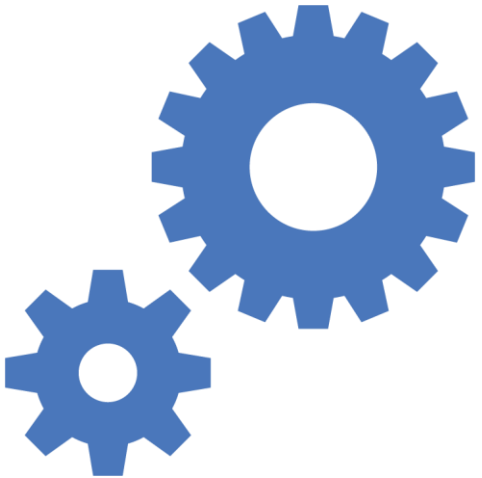
Audits help identify efficiency opportunities

- Customized info about your facility
- Sign up for an Energy Assessment with PRPA

HVAC

First steps

- HVAC maintenance can increase efficiency
  - Cleaning coils
  - Tuning the system
  - Checking that the economizer vents and settings
- Consider efficient replacements when upgrading



Evaporative cooling

- Uses latent heat from evaporating water
- Efficient cooling technology
- Great in dry climates like Colorado!

Demand-controlled ventilation

- Uses CO2 sensors to detect occupancy
- Reduces ventilation to meet the needs of occupants
- One sensor costs $200-$250 (Need one for every RTU)
- Best in facilities with long operating hours and widely varied occupancy

Estimating energy savings

- Estimate hourly occupancy during operating hours
- Compare to system design occupancy (usually defined in building codes)
- Carrier's Hourly Analysis Program assists in energy savings calculations

Cloud thermostats

Source: Nest Press Room

- Building automation systems (BAS) aren't cost effective for smaller buildings
- Cloud thermostats cost $200-$700
- Features include:
  - Easy remote programing
  - Occupancy sensors
  - Advanced controls
  - Increased data on HVAC system

Non-energy benefits increase value

- Occupant comfort and productivity
- Address malfunctioning equipment before problems arise
- Troubleshooting and diagnosing equipment failure
- Ease of use

Features vary by product

Criteria	75F	BAYweb	Ecobee	Honeywell	Nest	NetworkThermost	Proliphix	Venstar
Name	Central control unit	Cloud EMS thermostats	ecobee EMS and EMS Si	Wi-Fi 9000	Learning Thermostat	Net/X thermostats	IMT550	ColorTouch thermostats
Retail price (per thermostat)	NA (installed as part of a larger system)	$220–$300	$540–$700	$225	$249	$445–$530	$545	$200–$210
Communication protocols	Wi-Fi	Ethernet, X10	Wi-Fi, ZigBee	Wi-Fi	Thread, Wi-Fi, ZigBee	Ethernet, StrongMesh, Wi-Fi, Xbus	Ethernet, Wi-Fi	Wi-Fi
FDD features?	Yes	Yes	Yes	No	Yes	Yes	Yes	No
DR capable?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Built-in automated energy-efficiency strategies?	Yes	Not by default, but yes if occupancy sensors used	No	No	Yes	No	Yes	No
Occupancy-sensing?	Yes	Optional	No	No	Yes	Optional	No	No
Additional sensors possible?	No	Yes	No	No	No	Yes	Yes	Yes

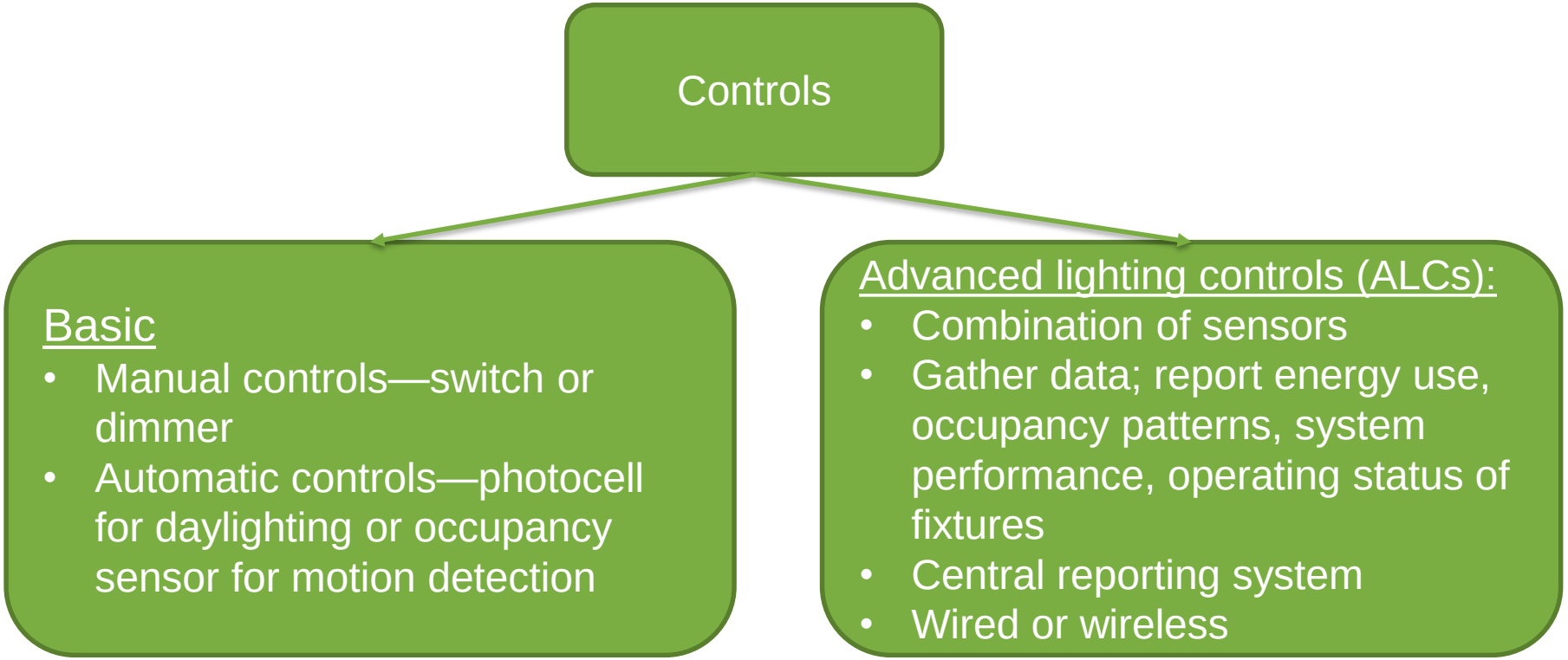
Notes: DR = demand response; EMS = energy management system; FDD = fault detection and diagnostics; NA = not applicable.

Lighting

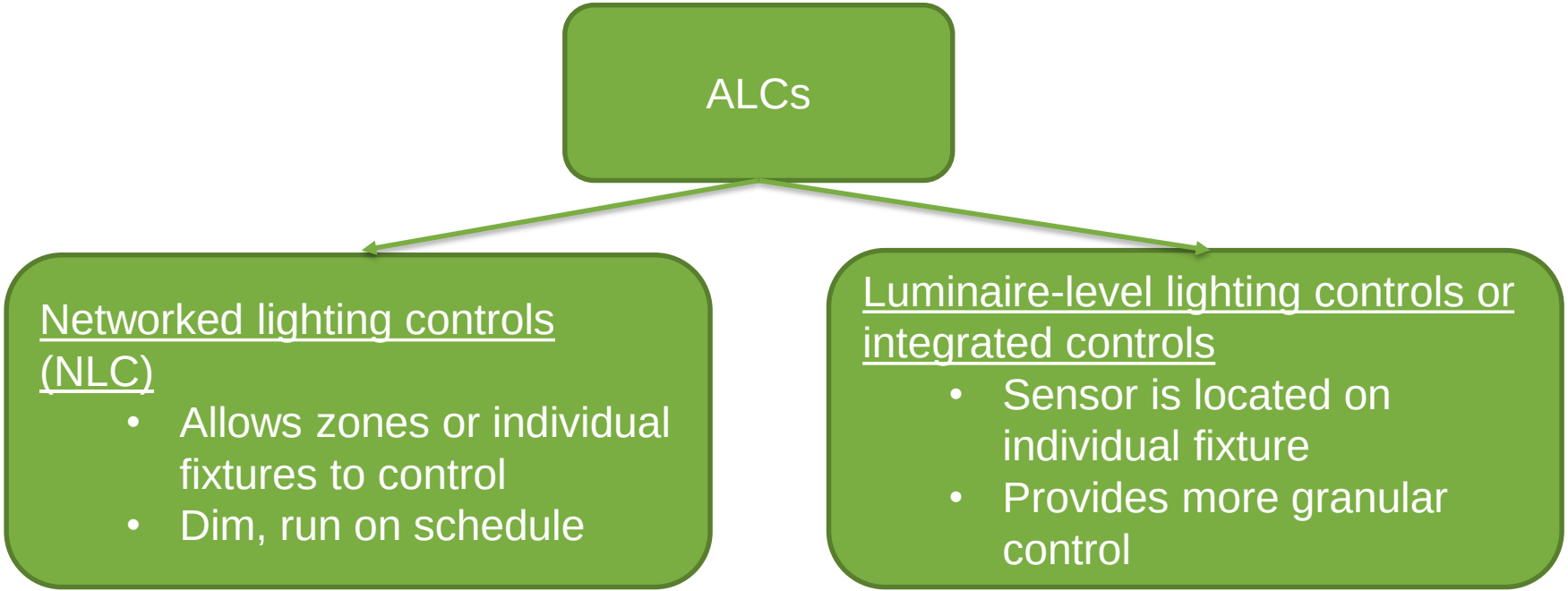
Two main lighting measures are LEDs and controls

- LEDs are efficient alternative to incumbent technologies
  - Can replace fluorescent, HID, halogen, incandescent
  - More lumens per watt (efficacy)
- Controls optimize the system
  - Take advantage of daylighting
  - Occupancy sensors reduce wasted energy when space is unoccupied

Variety of lighting controls



Variety of lighting controls



Suitable building types

Building type	Percent savings
Warehouse	82%
Office	63%
Restaurant	47%
Retail	44%
Manufacturing	30%
School	28%
Assembly	23%

Source: Energy Savings from Networked Lighting Control Systems

A few tips

- LEDs are point source; able to direct light where needed
- Consider foot-candles needed and not lumens
- Consider dimming
- Consult a lighting designer
- Color temperature (blue-tone can decrease productivity)

Visit DesignLights Consortium before investing in equipment

Qualified Products List (QPL) from DesignLights Consortium (DLC)

- 34 interior and exterior products currently listed
- More are continually added

Emerging connected opportunities

- Indoor asset tracking
  - Retail or hospitals
  - Locating people in a building
- Occupancy-based systems link to calendars
- Outdoor connected lighting could reduce crime

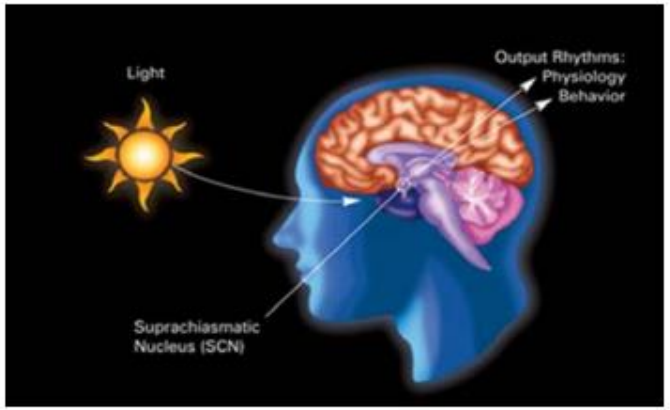
Source: iStock

Tunable systems have health benefits

Source: iStock

What is circadian rhythm?

- Pattern of behavioral and physiological changes over a period of 24 hours
  - Sleep/wake cycle
  - Cognitive functioning
- Light entrains our biological clock to the solar day
- Regulate melatonin production in our body



Source: A Case for Circadian Stimulus in Federal Buildings

Senior care center varied LED color temperature

6,500 kelvins (K)
7:00 a.m. to 2:00 p.m.
dimmed to 66%
of output

2,700 K
6:00 p.m. to 7:00 a.m.
dimmed to 20%
of output

4,000 K
2:00 to 6:00 p.m.
dimmed to 66%
of output

Source: DOE, “Tuning the Light in Senior Care”

Impressive results from senior care center

- Decreased
  - Target behaviors
  - Medication use
  - Number of falls
- Residents consistently sleeping well
- Nurses were alert at night

Assisted-living facility installed tunable LEDs

Source: Stack Lighting

Morning: 5,000 K

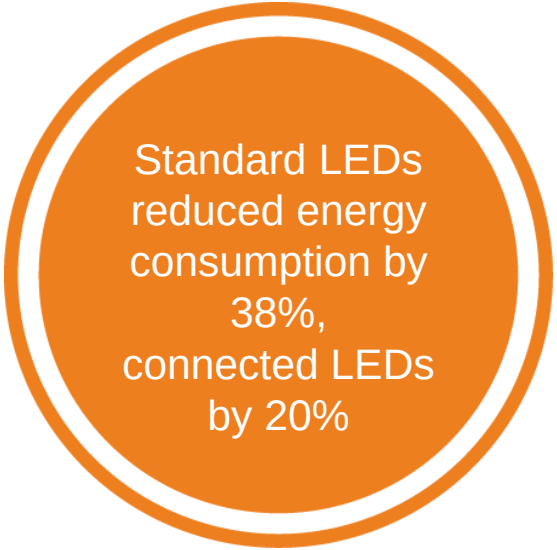
4,000 K

3,000 K

Evening: 2,200 K

More active residents at assisted living facility

- Decreased
  - Time needed to fall asleep: 22%
- Increased
  - Resident energy levels: 45%
  - Daytime activity levels: 72%
- Renewed confidence due to reduced fear of falling

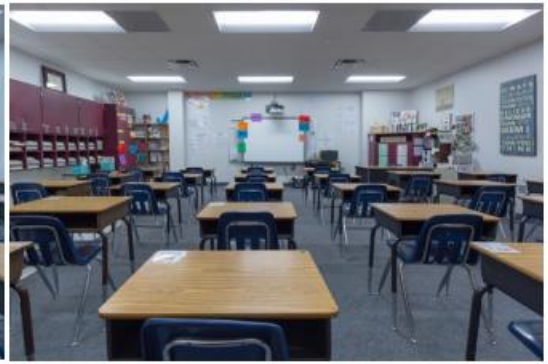


Color-tuning at schools

Reading:
3,000 K

Testing:
3,500 K

Energy:
5,000 K



General:
4,200 K

Students and teachers are happy

- Liked the flexibility to control lights
- Increased engagement
- Behavioral cues
- Reduced migraines in one teacher

Color-tuning at offices

- University of Twente, Amsterdam
- 124 participants for seven months
- Morning: warm; Afternoon: bright; Evening: warm, dim

Source: iStock

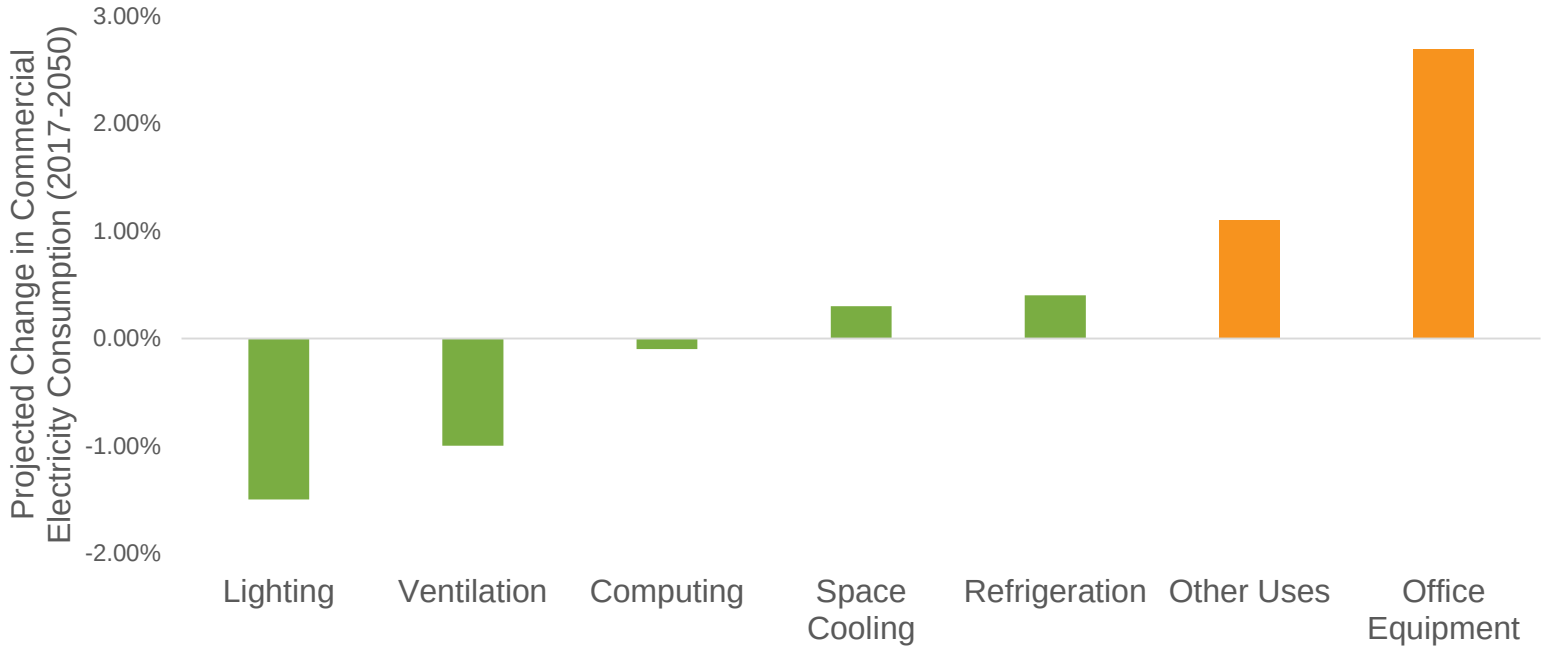
Results were impressive

Improvements
Work performance: 18% ↑
Accuracy: 12% ↑
71% occupants felt more energized
78% felt more happier
78% felt healthier

Source: CBRE- From Smart Office to Healthy Office

Plug Load Controls

Plug load energy use is growing



Advanced power strips have drawbacks in commercial spaces

- No way to know if building occupants have unplugged or bypassed the strip
- No data reporting functionality
- No demand management capabilities

Introducing smart plugs

- The next generation of plug load controls
  - Wi-Fi-enabled
  - Highly controllable
  - Built-in power meters
- Benefits include:
  - Automated savings
  - In-depth data reporting
  - Behavior change

Sources: ThinkEco Inc., Enmetric

Small business pilot in New York

- 10 small businesses in New York City
- 250 smart plugs installed
- 3 phases
  - “Blind”—establishing a baseline
  - Automated savings
  - Interoffice competition

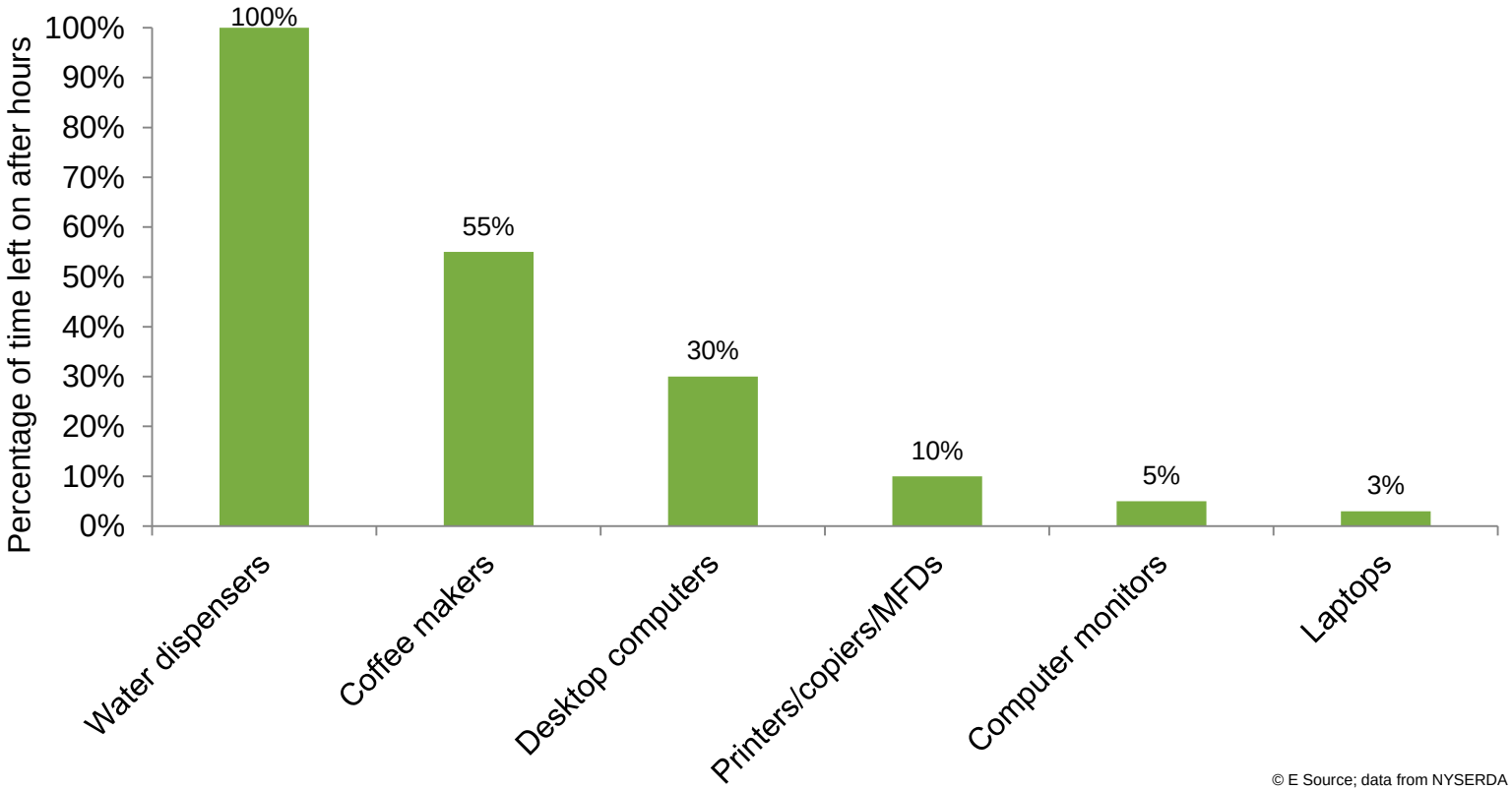
Automated savings

- Plug loads accounted for 10 to 40 percent of all the electricity consumed
- Automatic controls have enormous potential
  - Shutting off equipment after hours can reduce *overall* electricity bills by up to 10 percent in small offices

Individualized feedback

- People don’t know what to focus their efforts on
  - Concern about small things like cell phone chargers
  - Big opportunities (such as the many energy end uses that are left on 24/7) are often missed
- Data can quickly dispel common misconceptions
  - People can see how they actually consume energy

What's left on most often?



The behavioral element

- Interoffice competition
  - Designed to use data and competition as a catalyst for change
  - Used “normal” people in office environments (no college students)
  - Corporate leadership was vital to realizing savings
- Most participants reduced their energy consumption
  - Automated savings
  - More-efficient equipment
  - New habits

For more information

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How Efficiency Works for You

A Collaborative Effort

Efficiency Works™

Platte River Power Authority

EP®

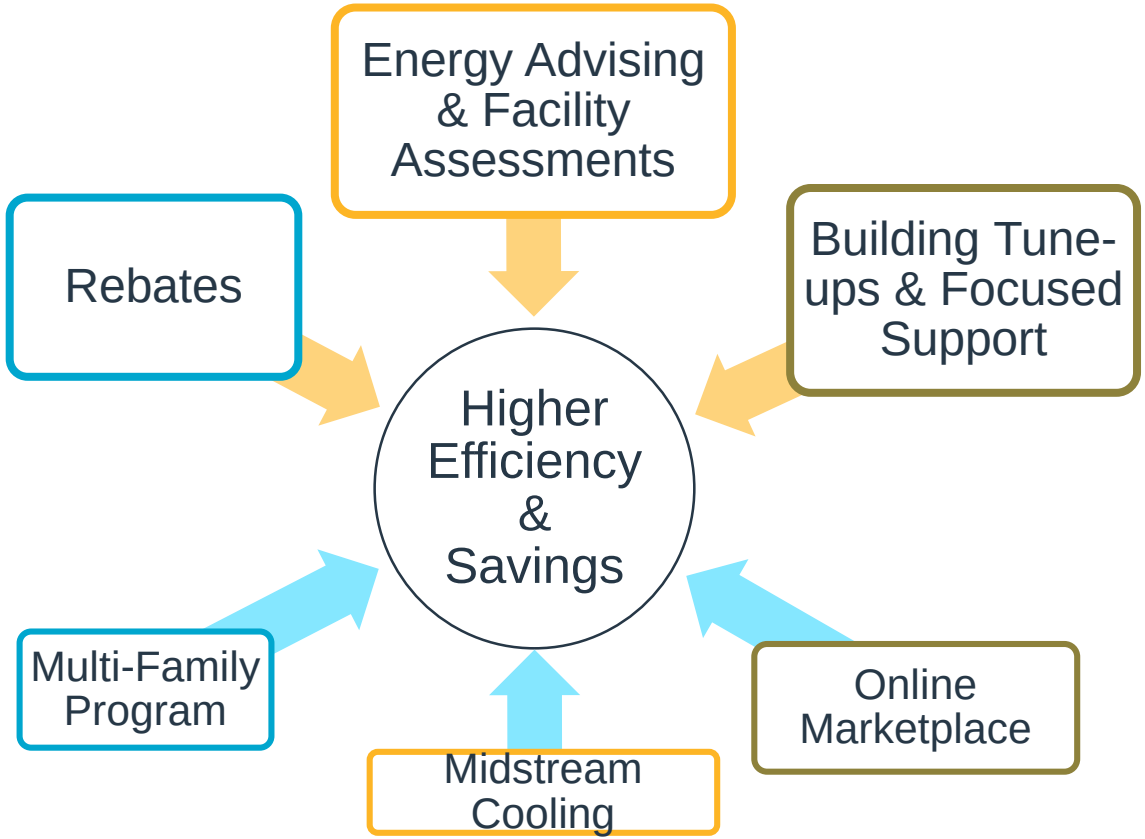
Efficiency Works™

City of Fort Collins Utilities

Power & Communications City of Longmont Colorado

Loveland Water and Power

Efficiency Works Business



Rebates

- **Lighting** – (LEDs and controls)
- **Cooling** – (economizers, controls, evaporative cooling, etc)
- **Envelope** – (windows, insulation & cool roof)
- **Food Service** – (cooking and refrigeration equipment, ice machines, etc.)
- **Grocery** – (refrigeration cases, controls & EC motors)
- **Office & IT** – (task lighting, ES computers & plug loads controls, thin client, server virtualization, etc)
- **VFDs** – up to $120 per HP, 75 HP max (fans, pumps, compressors)
- **Custom** – (NC lighting, evaporative coolers, compressed air, special controls, etc.)

Rebates based on $0.10/kWh annual savings or $500/kW

2018 Project and Customer Caps

- Rebate caps are based on a per customer per year allocation
  - Multiple projects will be counted towards this cap
  - Multiple sites with one customer will be included
  - Customer: who is paying for the project
- Per site cap is $50,000 per year per customer
- Customer annual cap is $100,000
  - Multiple non-adjacent sites

Facility Assessments

- Provides an efficiency plan
  - Current utility usage analysis
  - Benchmarking
  - Opportunities specific to your facility
  - Cost and savings information, including rebates
- Connects you to our technical resources

Optimizing Existing and New Buildings

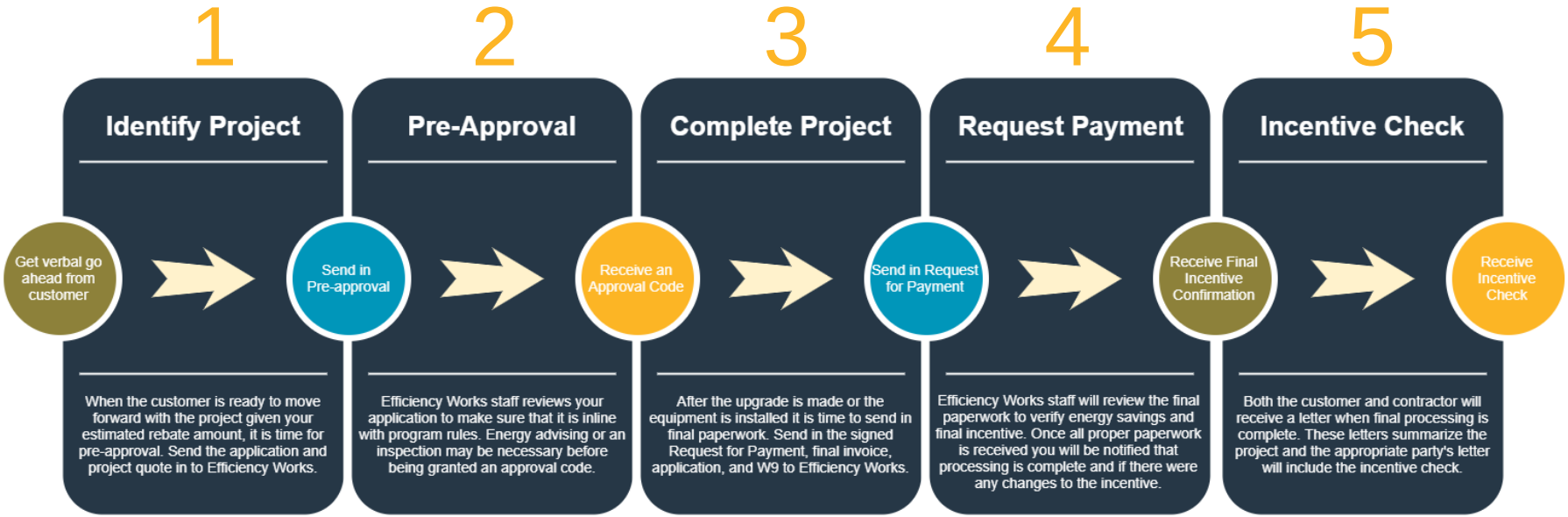
Building Tune-Up Program

Rebate is based on 100% of the cost of RCx study and implementation support and verification by RSP and customer commits $0.05 per sq ft for implementation of selected measures.

Integrated Design Assistance Program

Performance base incentive for designing high performance commercial buildings. Applies to new construction and major renovation projects in Fort Collins.

Complete a Project with Efficiency Works

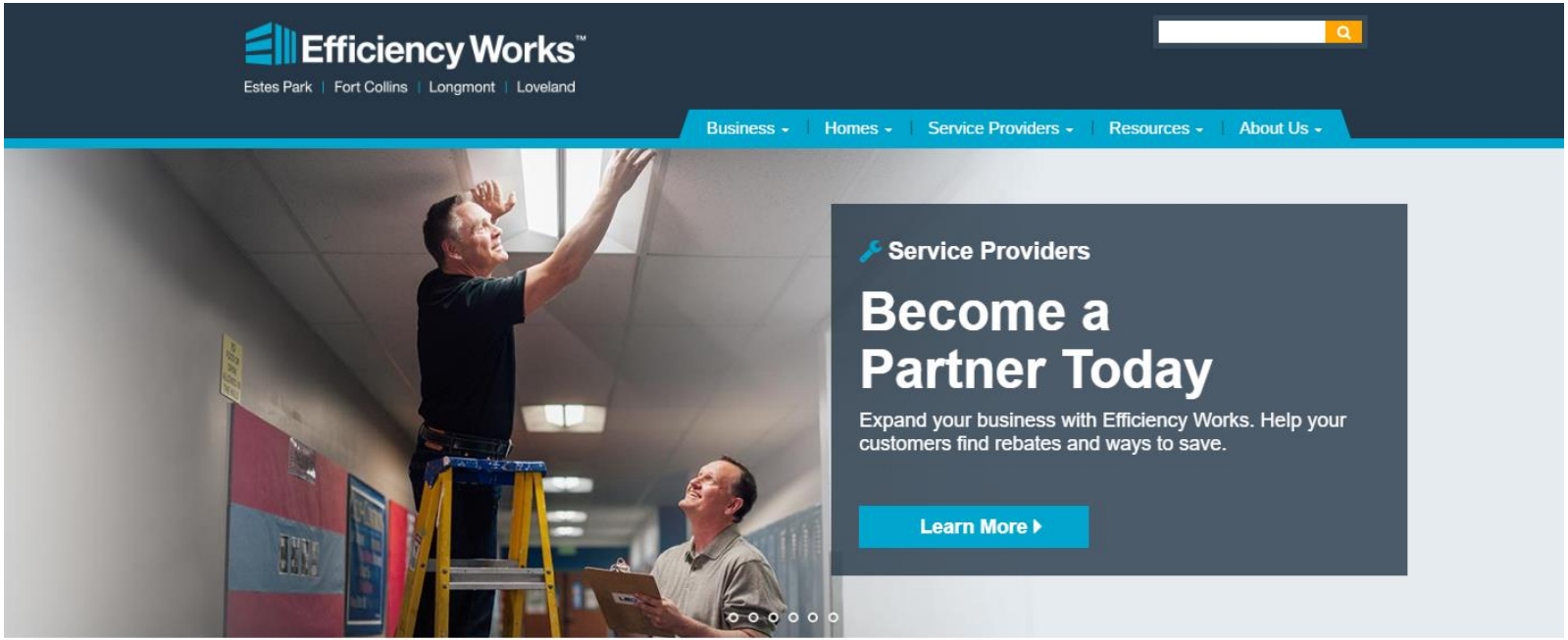


Both the customer and contractor will receive a letter when final processing is complete. These letters summarize the project and the appropriate party's letter will include the incentive check. Expect to receive letters and the rebate check in 4-6 weeks.

Energy Advising

- Required for incentives over $10,000 (before pre-approval)
- Quality Assurance for the Customer, Contractor and Program
- Connects you to our technical resources

EfficiencyWorks.Org



Efficiency Works Business – Rebate Change Announcement

End of the 25% bonus lighting rebate for **Loveland Water and Power commercial customers only** is effective as of 11:00 A.M. on April 3, the standard rebate offering is still available.

The 25% bonus for new LED fixtures is still in effect for Fort Collins, Longmont and Estes Park customers while funds last.

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Business > Rebates

How to Participate

Any business that is an electricity customer of Estes Park Light & Power, Fort Collins Utilities, Longmont Power & Communications or Loveland Water and Power is eligible to participate in any of our efficiency programs. We can help your business in a number of ways. Do you have a project in mind that would make your business more energy efficient? We provide rebates for virtually anything that saves electricity. A list of Efficiency Works Business rebate offerings is provided below. The Efficiency Works Business program also administers commercial water rebates to Fort Collins Utilities water customers.

Don't know where to start? Contact us today for free energy advising or facility assessment, we'll outline the best options for efficiency upgrades to your business. We can direct you to a list of service providers who are familiar with the Efficiency Works Business program to help get the job done. Our staff of efficiency experts is available to review quotes or to answer any energy or water efficiency related question you might have.

Connect with an Efficiency Works Business team member today!

Steps for Completing a Project

1: **Identify Project**
2: **Get Pre-Approval**
- Verify site and equipment eligibility
- Submit a Rebate Application, along with project proposal showing eligible equipment
- If project meets program rules, a pre-approval code will be issued reserving rebate funds*

*Energy advising or a facility assessment is required prior to pre-approval if the total rebate is $10,000 or more. *Projects are selected for pre-inspection on a random basis.*

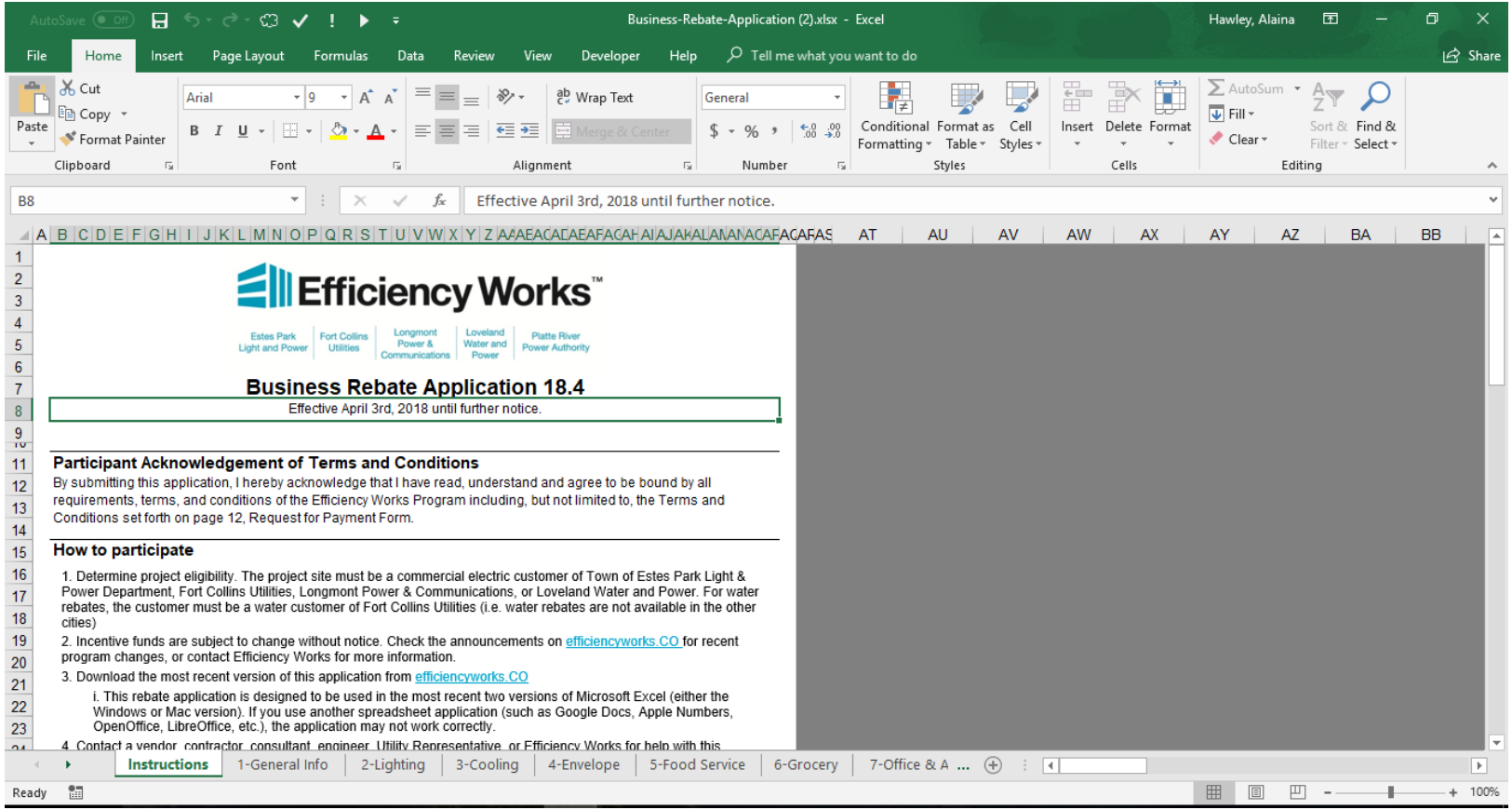
3: **Complete Project**
4: **Submit Final Paperwork**
- Document and inform Efficiency Works of any changes to the product installed or project scope – this may affect the final rebate amount
- Documents required to be submitted for rebate payment are listed on Page 12 of the Rebate Application

5: **Receive Rebate Payment**
- Rebate payment can be sent to the customer or contractor completing the project
- Rebate Applications are typically processed and paid within 4-6 weeks of submittal
- Post-project inspections may be required prior to release of rebate payment

Rebate Application

Reminder

Business Rebate Application



New Multifamily Program

Efficiency Works™

Efficiency Works™

Multifamily Program Application (must have at least 5 u

Reason For Application (select all that apply)

- [ ] I have a project in mind and want to verify it makes sense for my property
- [ ] I want to reduce my energy and/or water costs
- [ ] I want advice on what efficiency projects to pursue next
- [ ] My tenants are complaining about being hot and/or cold
- [ ] Other (enter reason):

Program Applicant Information

Contact Name* Contact Title*

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Business > Multifamily

Multifamily Program

Eligibility

Multifamily buildings must meet these requirements to participate:

- Be an electric customer of Estes Park Light & Power, Fort Collins Utilities, Longmont Power & Communications or Loveland Water and Power;
- At least one meter on the property is listed as commercial; and
- Five or more units per building.

Program guidelines will determine specific rebates and incentives available for each property.

Multifamily Program Application

Rebate Summary

Efficiency Works provides funding to help you conserve energy, water and reduce costs when upgrading to more efficient equipment in new construction or existing multifamily buildings. Rebates are available for the following items. For complete rebate details and requirements please consult the Efficiency Works Rebate Application.

- Lighting
- Cooling
- Building Envelope
- Food Service
- Grocery
- Office and Appliance
- VFD's
- Water
- Custom

Efficiency Works Business:

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Call direct at
970-229-4823