Colorado Energy Office's Energy Savings for Schools Program

September 3rd, 2015
CASDEM

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Energy Office

The CEO's mission is to improve the effective use of all of Colorado's energy resources and the efficient consumption of energy in all economic sectors, through providing technical guidance, financial support, policy advocacy and public communications.

The CEO's vision is to help Coloradans live more prosperous and healthy lives by promoting innovative energy production and efficient energy consumption practices that are beneficial to the economic and environmental health of the state.

United States K-12 schools spend more on energy than on computers and textbooks combined, (NREL, 2013).

Average age of school building is 42 years, nearly equal to expected serviceable lifespan of the building, (NREL, 2013).

US EPA estimates that K12 schools waste 30% of energy through inefficient buildings.

Through HB 1309, the State legislature has dedicated funds to help support energy efficiency efforts in K12 schools. In response to this bill, CEO has created energy efficiency programs for K-12 schools, including the Energy Savings for Schools (ESS) Program, to launch in 2015.

In the 2015, the CEO will launch a new K-12 program called the Energy Savings for Schools (ESS) Program. The ESS program will provide a formalized and systematic approach to energy management for schools by providing preliminary energy audits and technical support services for qualified schools, with a geographical emphasis on small, rural schools. ESS will also leverage, under one umbrella, other school programs supported by CEO including:

- Renewable Energy and Energy Efficiency for Schools (REEES) Loan Program
- Supplemental Environmental Projects (SEP)
- High Performing Schools Program (HPSP)
- Renew Our Schools Competition

Difference of ESS and other Programs

- Small, rural focus
- Free audit and renewable energy assessment
- Support beyond audit to prioritize, implement, and confirm projects
- Other technical support for larger issues
- Energy coaching for long-term monitoring and operations/behavior mods
- Exchange among participants to share lessons
- Recognition of success

Brendle Group as administrator

- Broad K-12 experience in Colorado
- Energy/renewable energy audits
- Utility data support
- Tech and implementation support
- Sustainability planning
- Technical specification updates
- Access to other schools and their experiences
- Bridge to other CEO program and networks

Components of ESS Program Support

- Free energy audit and preliminary renewable energy assessment
- Receive free technical assistance and energy management program development support
- Support services may include:
  - Utility bill tracking and high level M&V support
  - Energy education
  - Energy assessments
  - Strategizing, planning, and program development
  - Implementation support
  - Funding and financing support

Benefits from ESS Program Participation

- Save MONEY by saving energy
- Improve building's energy performance and comfort
- Replace antiquated systems
- Address staff and student energy behaviors
- Better manage energy usage on an on-going basis
- Support productive learning environment
- Recognize schools for their efforts

Before and after images of lighting upgrade in bus barn.
Savings will be reallocated to help pay for a new school bus.

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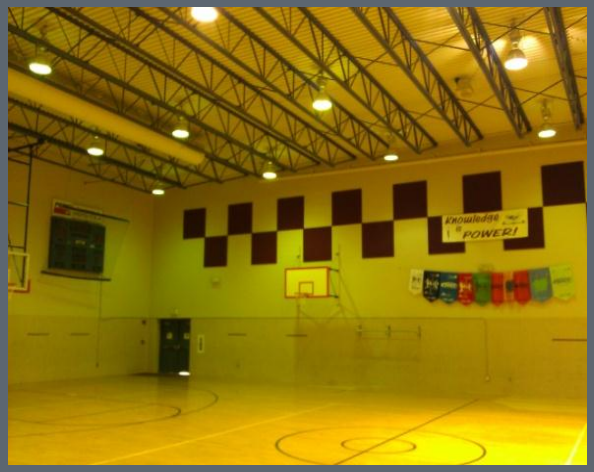
Saving Money and Energy is Paramount

Simple no- to low-cost measures can greatly improve function of building

- In a LBNL study, K12 schools buildings achieved savings of 11%, resulting in an average payback of 1.5 years



Before and after images of lighting upgrade at school gymnasium.
Estimated savings of 75% for upgrade and lighting scheduling changes.

Saving Money and Energy is Paramount

Significant investments can create a high performance building that will continue to yield substantial energy savings for years to come

- In a LBNL study, K12 schools buildings achieved average savings of 20% or more when significant upgrades were made

LEED certified school building.

Example Project: Cripple Creek Victor Re-1

- Goals: lower energy usage and costs, boost equipment reliability, and improve comfort for staff, teachers, and students.
- Saved 20% electricity costs
- Received free energy assessment, energy education, utility bill analysis tool, implementation support
- Received 60% lighting rebate and interest free financing from utility company
- Upgraded lighting and building automation system

"Stuart Peterson, Maintenance Director, said the project was a 'great' experience and they are looking to continuing their energy efficiency efforts into the coming years."

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How to Get Started

- Sign Agency/CEO Memorandum of Understanding and reference the ESS Standards of Success
- Meet with Brendle Group Energy Advisor to develop program plan
- Implement changes!

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Discussion Questions

- What services will provide most value?
- What are schools already doing to inform our approach?
- Are smaller school districts participating?
- Who are best targets among network?
- How do we make it as easy as possible for under-resourced schools and how do we maintain persistence?
- Who might be good potential advisory board members?

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State of Colorado

John W. Hickenlooper, Governor

1580 Logan Street, Suite OL1

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The Colorado Energy Office

@coenergyoffice

Green Stars Program
&
Energy Challenge Competition

Julie North

Aurora Public Schools

27-Aug-2015

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Agenda

- Energy Conservation & Sustainability
  - Who, What, Why?
- Achievements to Date
  - Lighting & Equipment Retrofits, Student Engagement, Building Dashboard
- Green Stars Program & Energy Challenge Competition
  - Green Stars Playbook
  - How to get started

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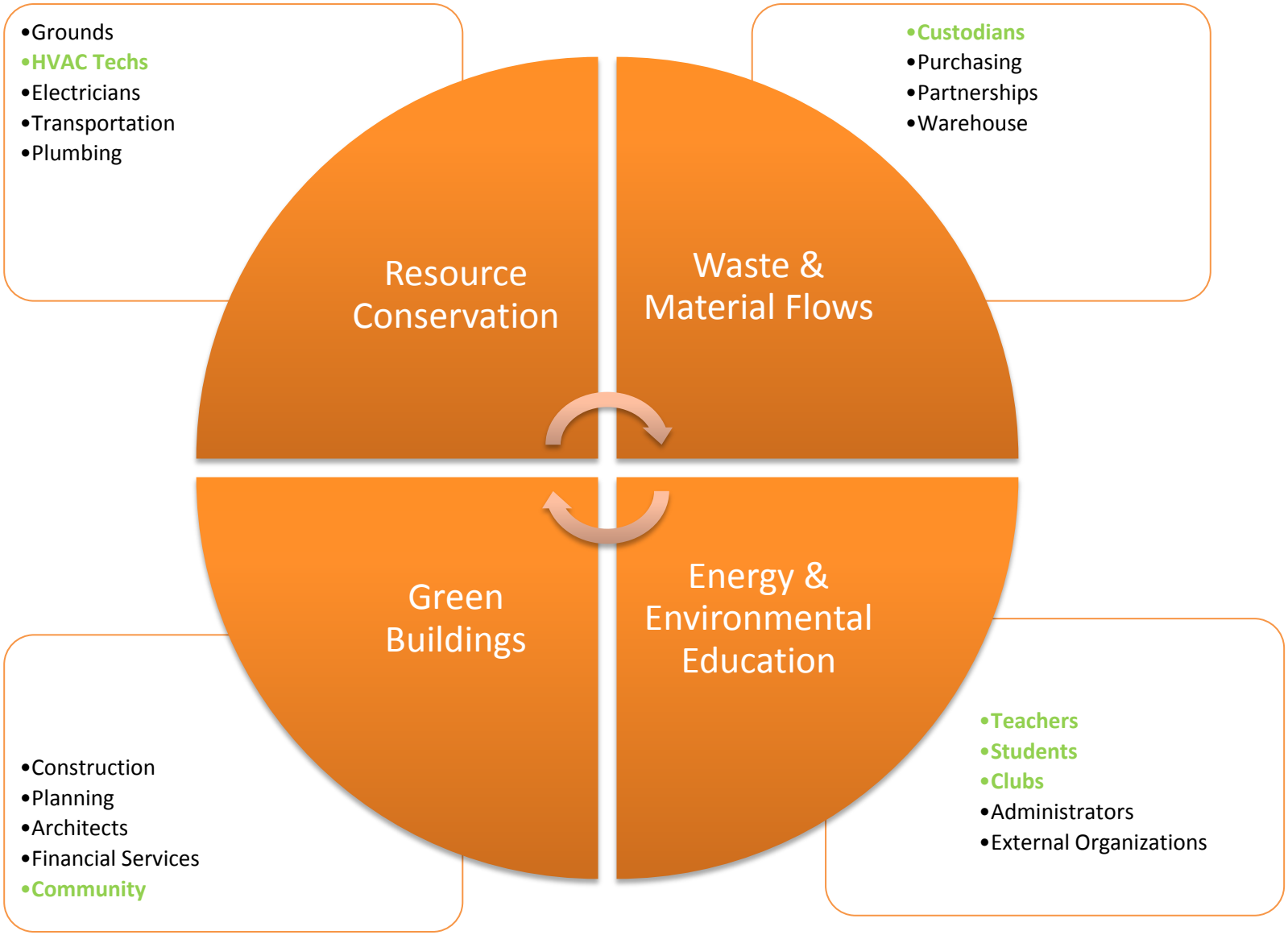
•Grounds
•HVAC Techs
•Electricians
•Transportation
•Plumbing
•Custodians
•Purchasing
•Partnerships
•Warehouse
Resource Conservation
Waste & Material Flows
Green Buildings
Energy & Environmental Education
•Construction
•Planning
•Architects
•Financial Services
•Community
•Teachers
•Students
•Clubs
•Administrators
•External Organizations

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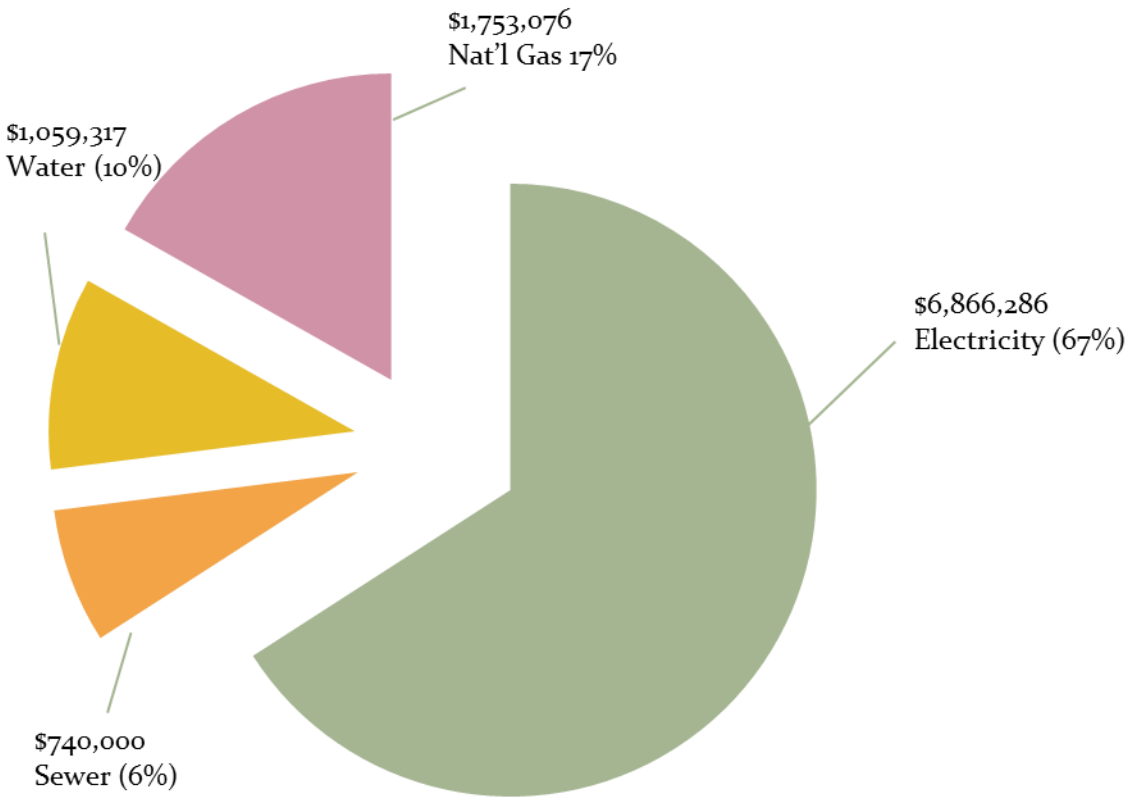
Total Utility Cost for APS



$10,418,679 --- Total Utility Cost

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Energy Conservation & Sustainability: Why

"Sustainability, specifically through energy

conservation is important because <u>every dollar</u>

<u>that we provide to our energy service providers is</u>

<u>a dollar less than what we have here to impact</u>

<u>student achievement.</u>"

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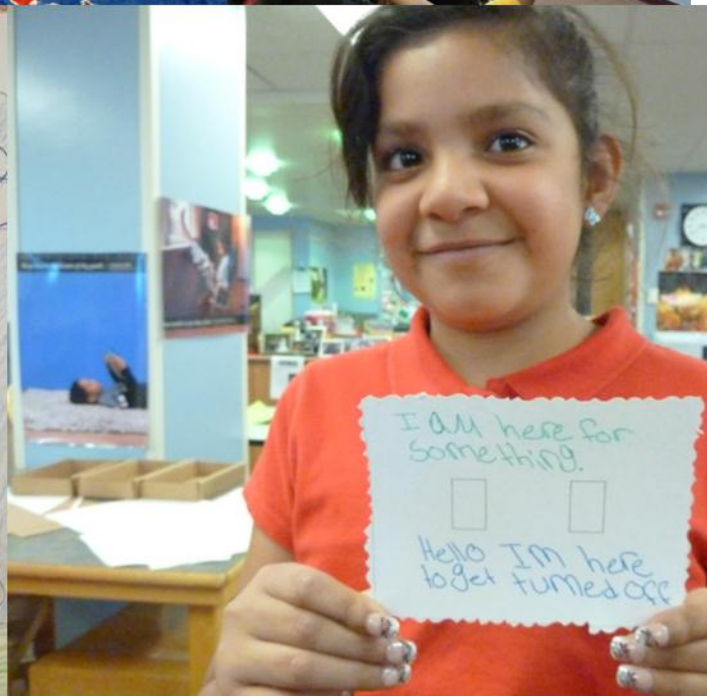
Underline the question
Messi
Multiplication
Basket ball Game
Have Fun
Cause Effect
Fact Opinion
Point View
Always
text
12x5
Repeated Addition


GO GREEN
SAVE A TREE


A tree brings people togeter

Lights OFF...
Savings ON.
ACE
LIGHTS OFF WHEN NOT IN USE


I AM here for something.
Hello IM here to get turned off

Achievements to Date

HVAC Retrofits

Efficient Lighting Projects

Building Dashboard

Green Stars Program

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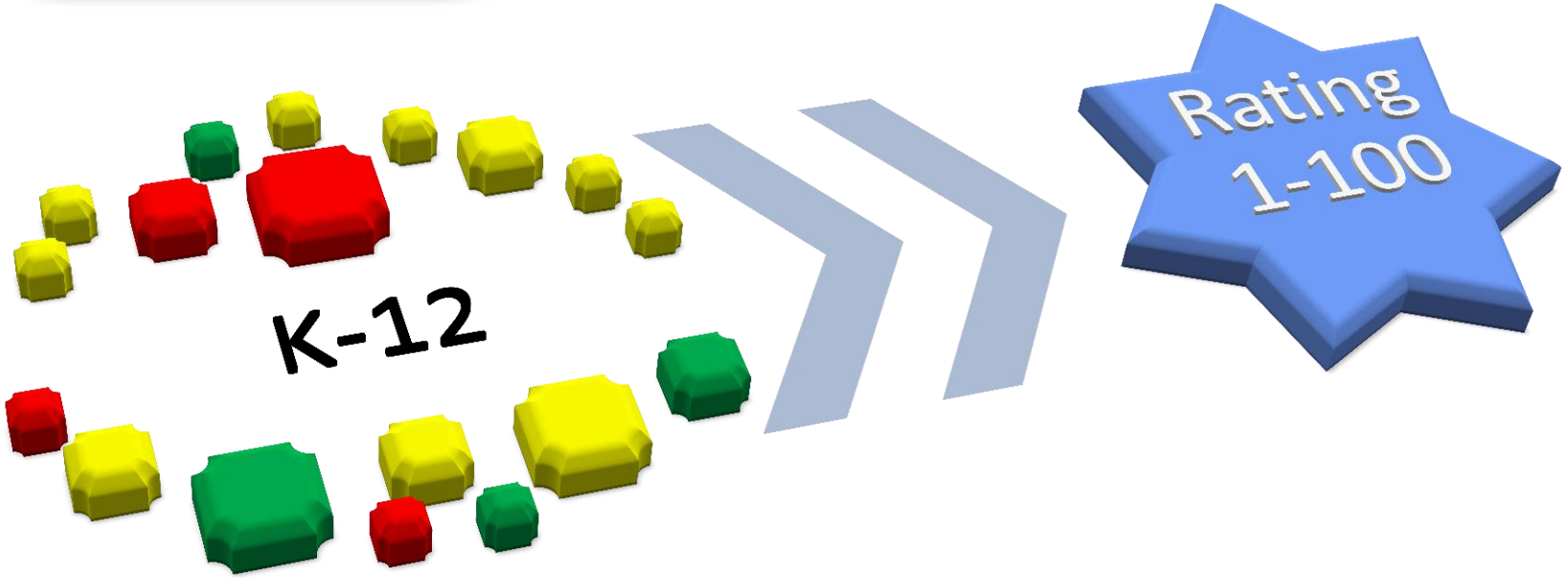
- 51,000 Schools Nationally
- 0ver 1,000 in CO
- All 53 of APS schools



- **60 is the average for APS**

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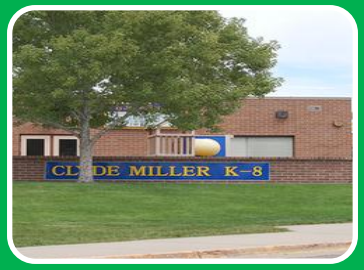
Incentive Tiers

- Three Levels (Tier 1, Tier 2, Tier 3)
- Minimum thresholds at each level to qualify
- Must meet both of 2 distinct criteria
  - Improvement of school's Energy Star® points
  - Prescriptive Green Stars:  Out of 10 available

Tier Performance – Energy Points



Rating Range: 76-100* (as of September 1, 2014)

- 5 points or more = **Tier 3**
- 3-4 points = **Tier 2**
- 1-2 points = **Tier 1**

Rating Range: 45-75 (as of September 1, 2014)

- 8 points or more = **Tier 3**
- 5-7 points = **Tier 2**
- 2-4 points = **Tier 1**

Rating Range: 1-44 (as of September 1, 2014)

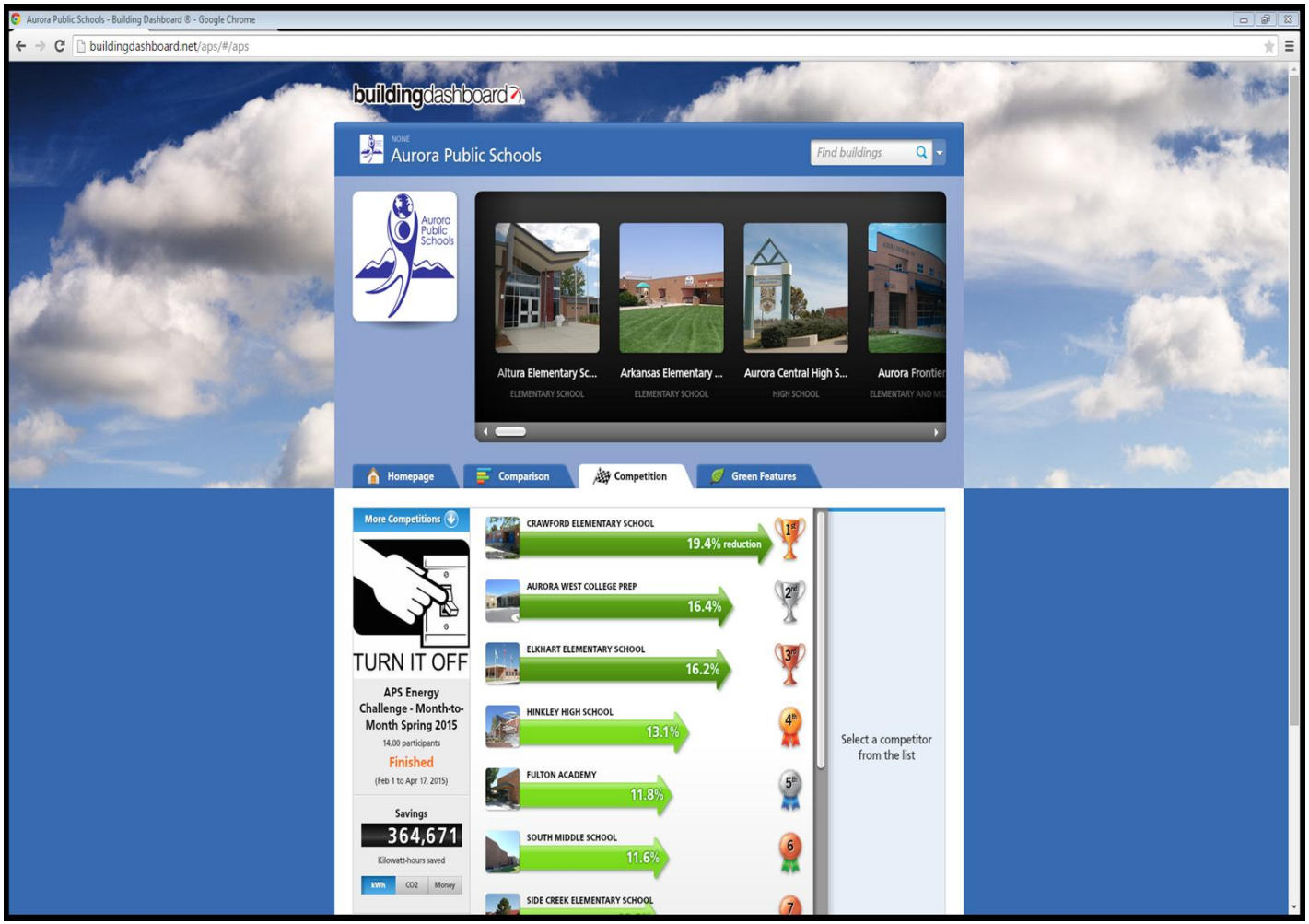
- 10 points or more = **Tier 3**
- 6-9 points = **Tier 2**
- 3-5 points = **Tier 1**

*Schools starting year with Energy Star® ratings 90 or better have full school year to demonstrate performance.

Tier Performance – Prescriptive ★'s

*Minimum criteria to meet. Star awards reevaluated each fall and spring. Some persist all year.

Building Dashboard



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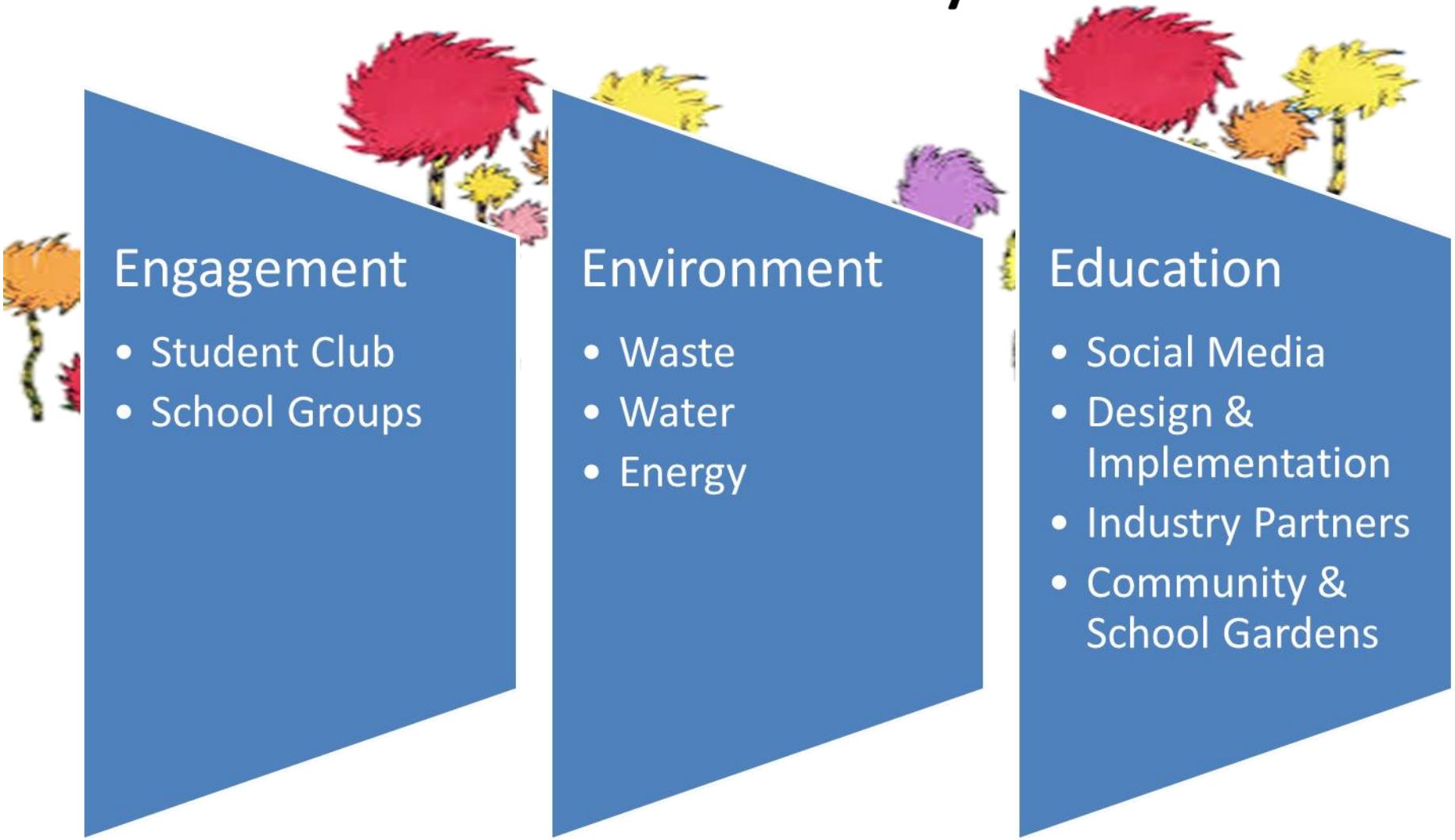
Green Stars Playbook



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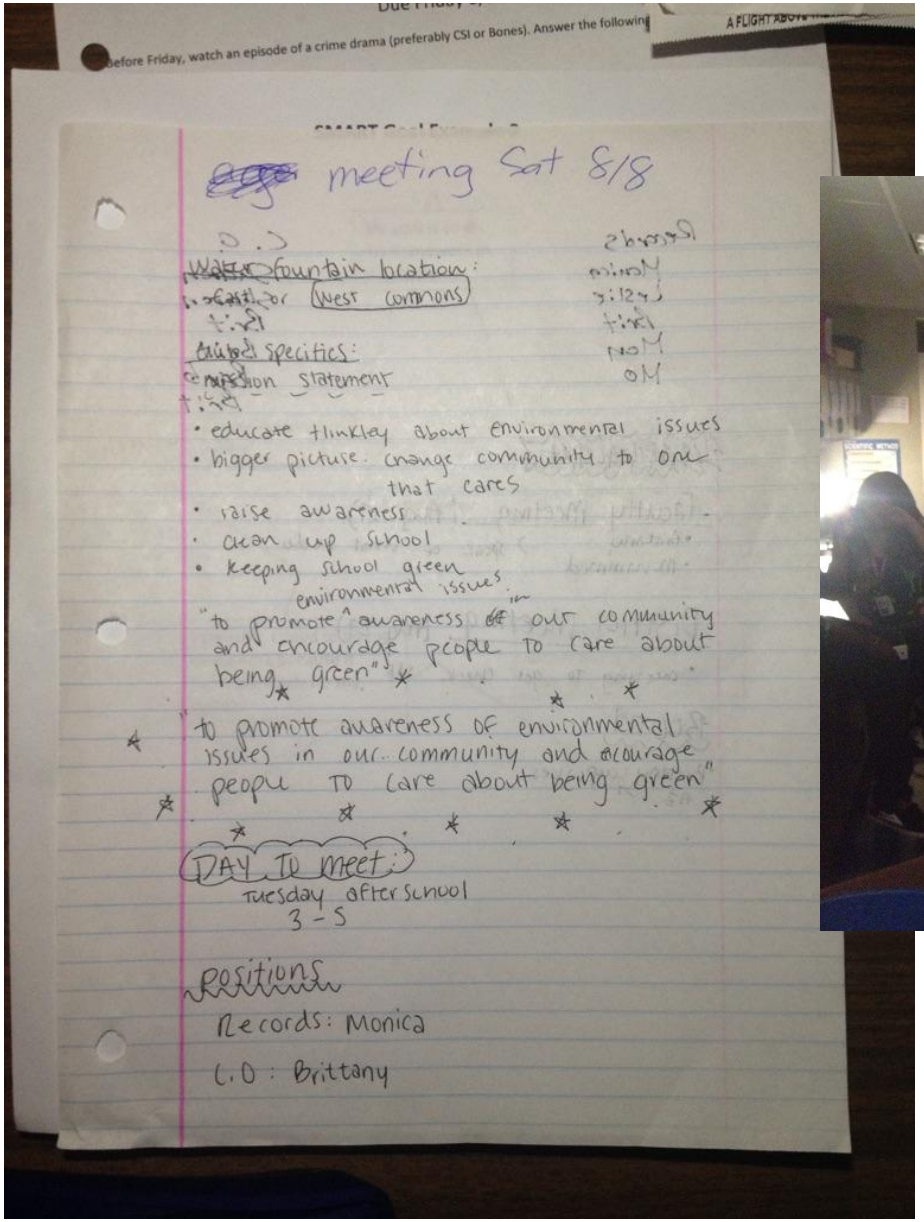
Category	Action Item	Deliverables	Points
Engagement	Establish school's own group to promote and implement resource conservation & environmental stewardship.	Create and foster school camaraderie around environmental education & how club goals align with school's overall vision and goals.	
Student Club 	*Suggested Activities:* 1. Classroom discussion/presentation on environmental themes – peer-to-peer education 2. Sign-in sheets **3. Designate a student(s) to fill out minutes & list of action items for each meeting** 3. Written mission and vision statement 4. Club Motto or Mascot 5. Brainstorm & develop 3 semester-long goals that align with school's overall vision 6. **Other Opportunities?**	-Minimum of 9 meetings/ Fall 2015 -**Documented Club Agendas (Mandatory*)** -****Student-prepared minutes or list of action items for each meeting, must be sent to Julie at jenorth@aps.k12.co.us to receive credit*** *Please include* -School and club name -Dates -Names of students in attendance -Notes/tasks carried over from last meeting -Discussion points for present meeting -Goals accomplished	Your club earns  1. Set up a club, 2. Meet 1x/week 3. Submit completed action items


Before Friday, watch an episode of a crime drama (preferably CSI or Bones). Answer the following
meeting Sat 8/8
Water fountain location:
or West commons
Project specifics:
mission statement
• educate tlinkley about environmental issues
• bigger picture: change community to one that cares
• raise awareness
• clean up school
• keeping school green
"to promote awareness of environmental issues in our community and encourage people to care about being green"
"to promote awareness of environmental issues in our community and encourage people to care about being green"
DAY TO MEET:
Tuesday afterschool
3 - 5
positions
Records: Monica
C.O: Brittany

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Category	Action Item	Deliverables	Points
Environment	Promote best practices to educate & implement resource conservation and environmental stewardship	Reduce waste, increase awareness & engage avenues for innovation & opportunity	
Waste 	*Suggested Activities:* 1. Conduct Trash & Recycling audit to determine recycling rates & provide recycling receptacles to each class room 2. *Bonus:* Earn extra $ by conducting school-wide competition for clothes & textile recycling through Red Apple Recycling 3. Cost analysis for implementing reusable plates/trays and/or silverware 4. Reclaimed materials for artwork or murals; recycled paper activities. 5. Paper towel "I'm a Tree" reduction campaign	-Increase single stream recycling rates by 50% (i.e. increase recycling service rates on a weekly basis in exchange for trash service pick up)	Your club earns  1. Pick 4 Activities, 2. Submit evidence of completed action items

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Category	Action Item		
Waste (cont'd)	*Suggested Activities cont'd:* 6. Partner with TerraCycle to recycle juice boxes from lunch 7. Partner with Green Up Our Schools to increase recycling rates 8. Designate "Green Team" to help reduce waste at after school & sports events 9. Flag recycling bins with posters to increase rates 10. Want to participate in next semester's compost pilot? Register with Julie & designate a group of Compost Champions to carry out the campaign for 2016!		

Category	Action Item	Deliverables	Points
Environment	Promote best practices to educate & implement resource conservation and environmental stewardship	Promote water conservation efforts and education	
Water 	*Suggested Activities:* 1. Work with Water Conservation Specialist from Aurora Water (AW) to conduct a school water audit training for students. 2. Conduct a water audit throughout the whole school & provide 3 solutions to saving water. 3. Survey & installation of retrofits with M&O support. 4. Host Presentations by AW Specialists. Visit "Water Education" at auroragov.org for lists of grade appropriate presentations. 5. Complete "All About Aurora Water" activity booklet and sign Water Savings Pledge Cards (Elementary Schools). 6. Promote electronic water savings pledge by use of an app or website and have at least 50% of students in your school commit to the pledge (Middle & High Schools).	-Work towards reducing indoor water consumption by 20	Your club earns 1. Pick 4 Activities, 2. Submit evidence of completed action items

Category cont'd: Environment	Action Item		
Water (cont.)	*Suggested Activities cont'd:* 7. Label sinks and drinking fountains with water source and water use information: • *"The source of this water is mountain snowmelt. How long do you think it takes to get from the mountains to you school?"* • *"This faucet uses 2 gallons per minute."* • *"Do you have the nerve to conserve?"* 8. Start a Water Conservation Poster Contest in your school and send the posters to Natalie Brower nbrower@auroragov.org at Aurora Water for judging. The winning poster will be printed for use throughout the city. 10. Create a video of water conservation tips with at least 5 ways to save water 12. Track water waste around Aurora and upload at least 5 pictures to Aurora Water's Water Tracker App 13. Download a map of your school and analyze the landscaping. Create a Xeriscape Design for your school that would reduce your outdoor water use.		

Category cont'd: Environment	Action Item	Deliverables	Points
Energy *Energy Challenge* 	*Suggested Activities:* 1. Map school's energy use with *Kill-A-Watt* Energy Kits 2. Create a Building Block for School's Website via BuildingOS 3. Designate "green heroes" in each grade to promote "lights off" in common areas. 4. Upload photos to Instagram using *#apsbeflippin* promoting "Flip the Switch" for lights off 5. Present to other classes on best practices for energy efficiency and upload videos to twitter. 5. School-wide "Unplugged" campaign - reminders to unplug electronics when not in use & on "Fried"-days 6. Create Pledge Cards and run a pledge drive 7. Classroom Energy Report Cards.	-Increase Energy Star rating (check Building Dashboard for schools' ratings) -Promote awareness and action about natural resource and energy conservation	Your club earns  1. Pick 4 Activities 2. Submit evidence of completed action items

Category cont'd: Environment	Action Item		
Energy (cont'd)	*Suggested Activities cont'd:* 8. "FASTing" or the "Friday Afternoon ShuTdown" By 2:00p lights off in common areas, etc for a jumpstart on the weekend. 9. Pool analysis for High Schools, w/ weekly temperature readings & Lucid Project Mgmt & Baseline App 11. Download app to track personal energy use (Middle & High School) 12. **Other Opportunities?**		

Energy Challenge Competition

- Goal: Reduce energy use throughout the whole building and the district!
- Collaborative effort between admin, staff, and students
- Education is key and student club leads the charge!
- If your school wants to earn money, you have to show a *demonstrated reduction in energy use* over the whole semester

Category	Action Item	Deliverables	Points
Education	Increase student engagement in community	Create and foster community camaraderie around environmental education & how school goals align with community's overall vision and goals.	
	*Suggested Activities* 1. Leverage use of outside professional resources in student meetings for knowledge sharing & support in goal completion. 2. Field trip to approved site: -Aurora Xeriscape Garden -Delaney Farm -Aurora Reservoir -Water Treatment Facilities -Denver Zoo's Waste to Energy -NREL -Alpine Waste & Recycling Facility 3. Conduct School/Community Garden analysis 4. *Bonus:* Earn extra $ and enroll in the American Lung Association's CASEO Program and earn up to $500! 5. Write letters to City Officials regarding school projects & comment on Aurora's Environmental state (pros & cons)	-Build & foster local community relationships with between school and area businesses, organizations -School as "change agent" for resource conservation & environmental education	Your club earns  1. Pick 4 Activities 2. Submit evidence of completed action items

So, in a nutshell…

1. Start a school club, meet at least 1x per week
   - Register as a club sponsor with Angelic White
2. Use Building Dashboard to monitor energy use (and don't forget to incorporate outside resources)
3. Document and submit club minutes & completed activities to earn Green Stars for cash incentives
   - Use Green Stars Playbook for ideas – available on google docs
4. Have fun!

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Questions, comments, suggestions, concerns, high fives?!

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jenorth@aps.k12.co.us
303-367-3000 ext. 28668
720-400-3148

Lucid Video

Commercial Refrigeration Energy Efficiency Program

September 3, 2015

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Featured Project

- Aurora Public Schools
  - 40 facilities across the city of Aur

RESULTS SNAPSHOT	
Project details: Replaced old motors with ECMs and controls. Installed Defrost and Door Heater controls.	
kWh Saved	303,000
Xcel Energy rebate	$51,000
Annual savings	$40,000/year

Overview: Customer Experience

- In-person meeting with customer
  - Program overview
  - Equipment recommendations, energy savings values and rebate opportunities identified

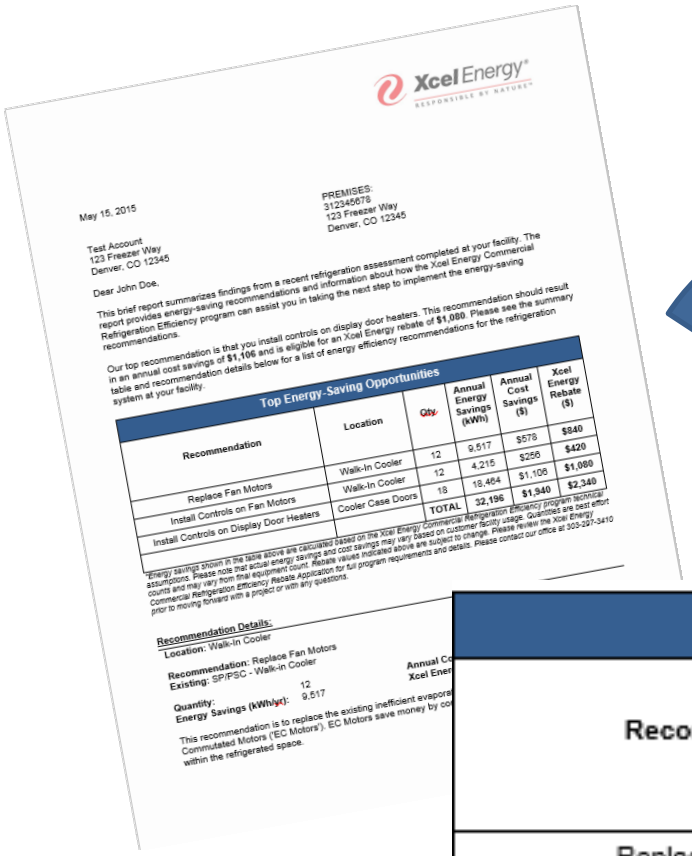
- Start to finish assistance
  - Communicate report findings
  - Facilitate RFP bids
  - Post-Inspection
  - Complete rebate paperwork

- Free Direct Installation
  - Energy / water saving:
    - Faucet aerators, pre-rinse spray valve
  - Electric saving:
    - LEDs in walk-in, coils on self-contained units

Aurora Public Schools Direct Install

- 100 self-contained coolers serviced (coil cleaning)
- 70 LED light bulbs installed within walk-in coolers/freezers
- Total DI Savings of 80,000 kWh

Overview: Customer report



May 15, 2015

PREMISES:
312345678
123 Freezer Way
Denver, CO 12345

Test Account
123 Freezer Way
Denver, CO 12345

Dear John Doe,

This brief report summarizes findings from a recent refrigeration assessment completed at your facility. The report provides energy-saving recommendations and information about how the Xcel Energy Commercial Refrigeration Efficiency program can assist you in taking the next step to implement the energy-saving recommendations.

Our top recommendation is that you install controls on display door heaters. This recommendation should result in an annual cost savings of **$1,106** and is eligible for an Xcel Energy rebate of **$1,080**. Please see the summary table and recommendation details below for a list of energy efficiency recommendations for the refrigeration system at your facility.

Top Energy-Saving Opportunities

Recommendation	Location	Qty.	Annual Energy Savings (kWh)	Annual Cost Savings ($)	Xcel Energy Rebate ($)
Replace Fan Motors	Walk-In Cooler	12	9,517	$578	$840
Install Controls on Fan Motors	Walk-In Cooler	12	4,215	$256	$420
Install Controls on Display Door Heaters	Cooler Case Doors	18	18,464	$1,106	$1,080
		TOTAL	32,196	$1,940	$2,340

Energy savings shown in the table above are calculated based on the Xcel Energy Commercial Refrigeration Efficiency program technical assumptions. Please note that actual energy savings and cost savings may vary based on customer facility usage. Quantities are best effort counts and may vary from final equipment count. Rebate values indicated above are subject to change. Please review the Xcel Energy Commercial Refrigeration Efficiency Rebate Application for full program requirements and details. Please contact our office at 303-297-3410 prior to moving forward with a project or with any questions.

Recommendation Details:

Location: Walk-In Cooler

Recommendation: Replace Fan Motors
Existing: SP/PSC - Walk-in Cooler

Quantity: 12
Energy Savings (kWh/yr): 9,517

This recommendation is to replace the existing inefficient evapora
Commutated Motors ('EC Motors'). EC Motors save money by co
within the refrigerated space.

Top Energy-Saving Opportunities

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		TOTAL	32,196	$1,940	$2,340

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Equipment Upgrades

- Electronically Commutated Motors (ECM) and Motor Controls

The evaporator units found within low-temp walk-in coolers are equipped with defrost technology which utilizes electric resistance heaters to mitigate condensation build up/freeze over within the evaporator units. Those defrost heating elements are currently controlled by time clocks, set manually, to run 4 times each day for 30 minutes. Defrost heaters are energy intensive in two ways. First, they have high input energy requirements, often operating at 1000W per evaporator fan. Second, the refrigeration system itself is required to revamp up in order to remove this added heat from the space. The addition of a control to every evaporator within low temp walk-ins will reduce both the quantity of defrost cycles each day as well as the amount of energy required to perform each defrost cycle.

140,000 kWh
$10,000 Annual Cost Savings
$12,000 Xcel Energy Rebate
3 Year ROI

Equipment Upgrades

- Defrost Controls

The evaporator units found within low-temp walk-in coolers are equipped with defrost technology which utilizes electric resistance heaters to mitigate condensation build up/freeze over within the evaporator units. Those defrost heating elements are currently controlled by time clocks, set manually, to run 4 times each day for 30 minutes. Defrost heaters are energy intensive in two ways. First, they have high input energy requirements, often operating at 1000W per evaporator fan. Second, the refrigeration system itself is required to revamp up in order to remove this added heat from the space. The addition of a control to every evaporator within low temp walk-ins will reduce both the quantity of defrost cycles each day as well as the amount of energy required to perform each defrost cycle.

54,000 kWh
$20,000 Annual Cost Savings
$30,000 Xcel Energy Rebate
1.7 Year ROI

Equipment Upgrades

- Door Heater Controls

Walk-in coolers are equipped with entrance door and frame heaters that run constantly at ta constant output. This fixed output is liberally designed in order to prevent door freezing in the coldest of climates with limited HVAC interference. Adding a control mechanism will reduce the energy consumed by dialing down electric wire heaters to properly coincide with environmental conditions. This control module will save energy in two ways. First – it will adjust the maximum output to 80% of the current level, which correlates with the specific environmental conditions of Colorado. Second, this control module will vary the degree of heat output automatically based upon necessity. This will achieve a reduction in run time by 75% for med-temp cooler heaters and 50% for low temp cooler heaters.

109,000 kWh
$10,000 Annual Cost Savings
$9,000 Xcel Energy Rebate
5 Year ROI

For More Information:

- Call 1-855-671-5997
- Email xcelrefrigeration@franklinenergy.com
- Website: xcelenergy.com/commfridge

Xcel Energy®

RESPONSIBLE BY NATURE®

QUESTIONS?