ENERGY UPDATE

Campbell Union School District

October 6, 2016

Campbell
UNION SCHOOL DISTRICT

Energy Savings are Built into New Construction

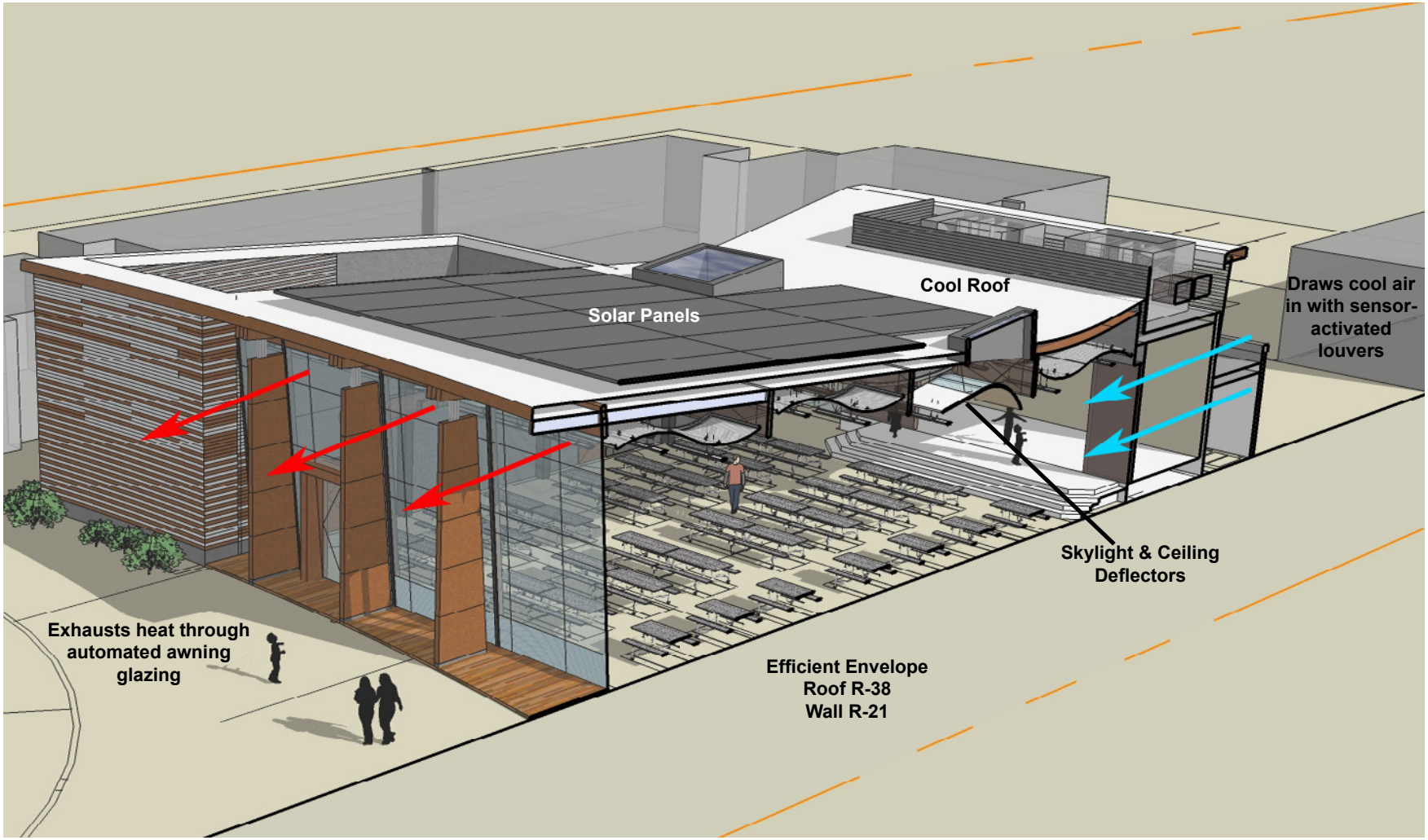
Designs for new buildings include systems for maximizing energy efficiency.

NET ZERO ENERGY/EMISSIONS MULTI-USE
Blackford Elementary

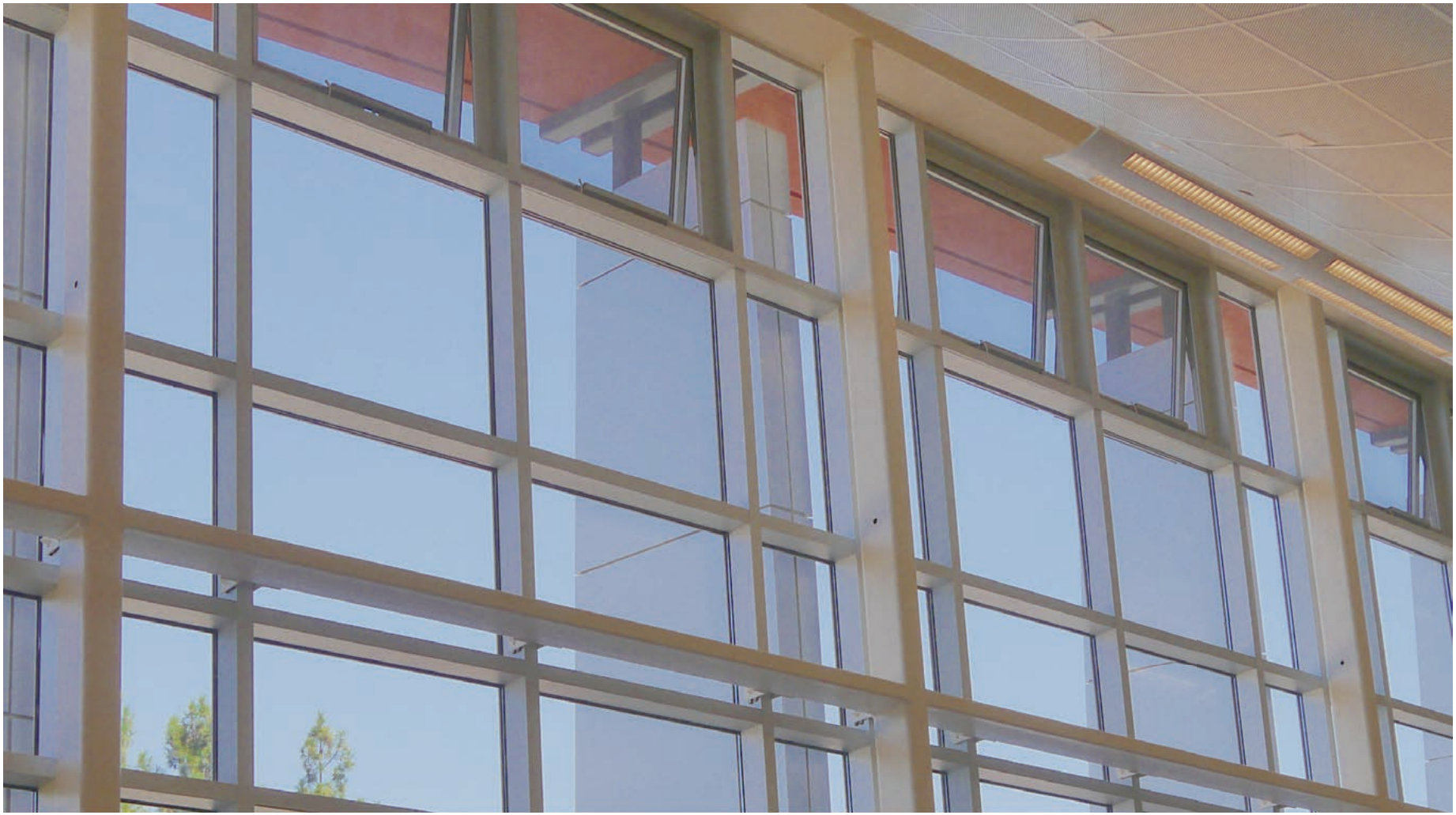
Daylighting

Daylighting

Passive Ventilation and Solar Panels



Passive Ventilation



Central Kitchen

Variable Refrigerant Cooling

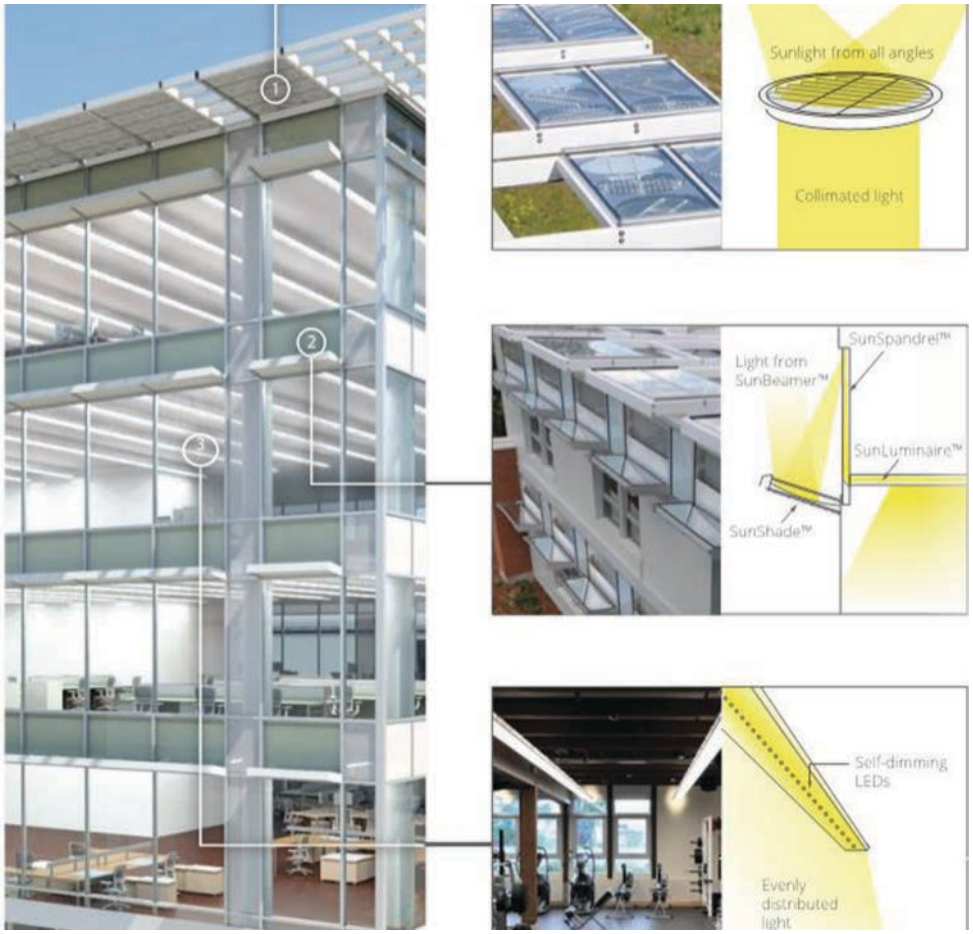
- System capacity is adjusted dynamically to meet actual loads
- Independent zone control so areas are not overheated or overcooled
- System can recover heat removed from one zone and use it in another
- Lowest life cycle cost of any system

Solar Panels

- High energy loads of refrigeration and ventilation are partially offset by rooftop panels
- Energy not used is fed back into grid to offset future use

SunBeamers, Occupancy Sensors, and Automatic Dimming

- Sunlight is collected by mirrors on perimeter of roof
- Sunlight is beamed into interior light fixtures and LED lamps are automatically dimmed

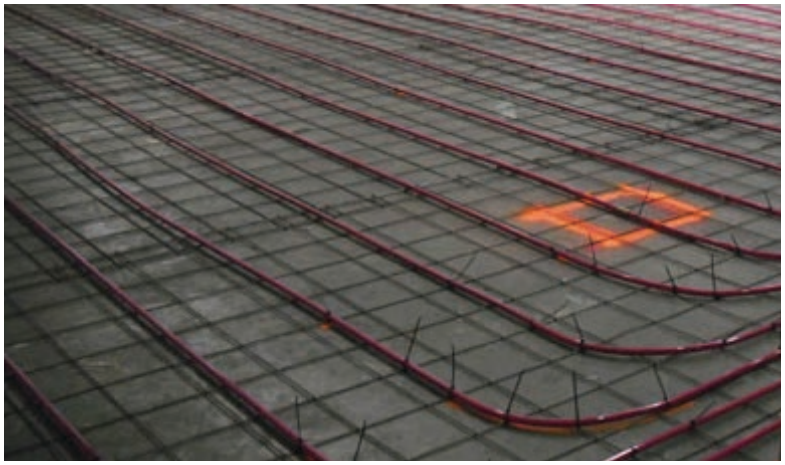


Exhaust Fan Control

- Kitchen hoods typically all run during all occupied hours
- Our fans are individually controlled by infra-red sensors
- Fans only run when cooking equipment is being used
- Save 80% of energy over standard systems

Saving energy through heat exchange

- When refrigeration equipment is used to cool the freezer, waste heat is normally transferred to the outdoor air
- In our freezer, the waste heat is captured and used to heat the coils in the floor
- This prevents freezing of the water in the soil which could cause building damage



Ecospace Elevator

- Compact hoisting machine is located on the side of the hoistway eliminating the need for elevator tower
- Compact machine is 70% more efficient than traditional hydraulic compressor
- Elevator also recovers excess energy when empty car travels up or full car travels down
- This recovers another 25% of the total energy used by elevator

Window Replacement

Old windows

New windows

“Gen7” Buildings

Solar Photovoltaic Project, 10 Sites

Solar Photovoltaic Project, 10 Sites

- Blackford
- Campbell Middle
- Capri
- Corporation Yard
- Forest Hill
- Marshall Lane
- Monroe
- Rolling Hills
- Rosemary
- Sherman Oaks

Additional Savings through Upgraded Equipment, Controls, and Monitoring

Solar Installation Monitoring/Maintenance

- Tigo Monitoring and Management System
  - Overview
    - Site Installations
    - Environmental Comparisons
  - Dashboard
    - Site layout
    - Solar system current condition and production levels- overall and per panel
    - Historical data
  - Charts
    - Summarize production at various intervals- day/week/month
    - Entire system or granular production
  - Alerts/Reports
    - Daily, weekly, monthly production reports
    - System alerts- inverter, strings, panels

https://installations.tigoenergy.com/base/login/logout

Facility Energy Management Systems

- The Big 3
  - Electricity - Lighting and H.V.A.C.
  - Natural Gas - H.V.A.C.
  - Water - Irrigation systems

Lighting Controls

- Wattstopper Lighting Control Systems
  - Astronomical programming
  - Network control of exterior/interior lighting systems
  - Real time activity display

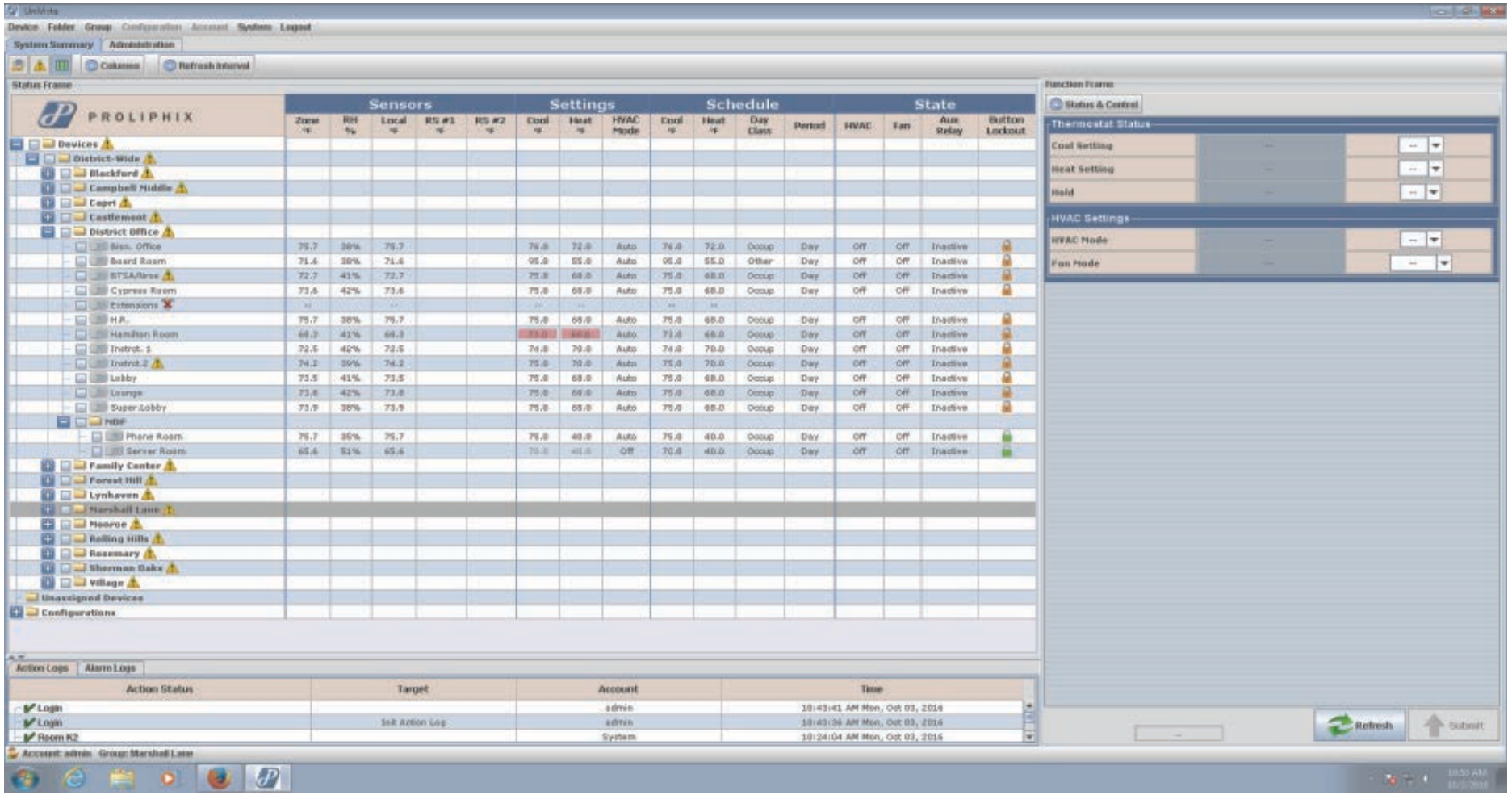
Old, manual controls

New centralized controls

H.V.A.C. System Control

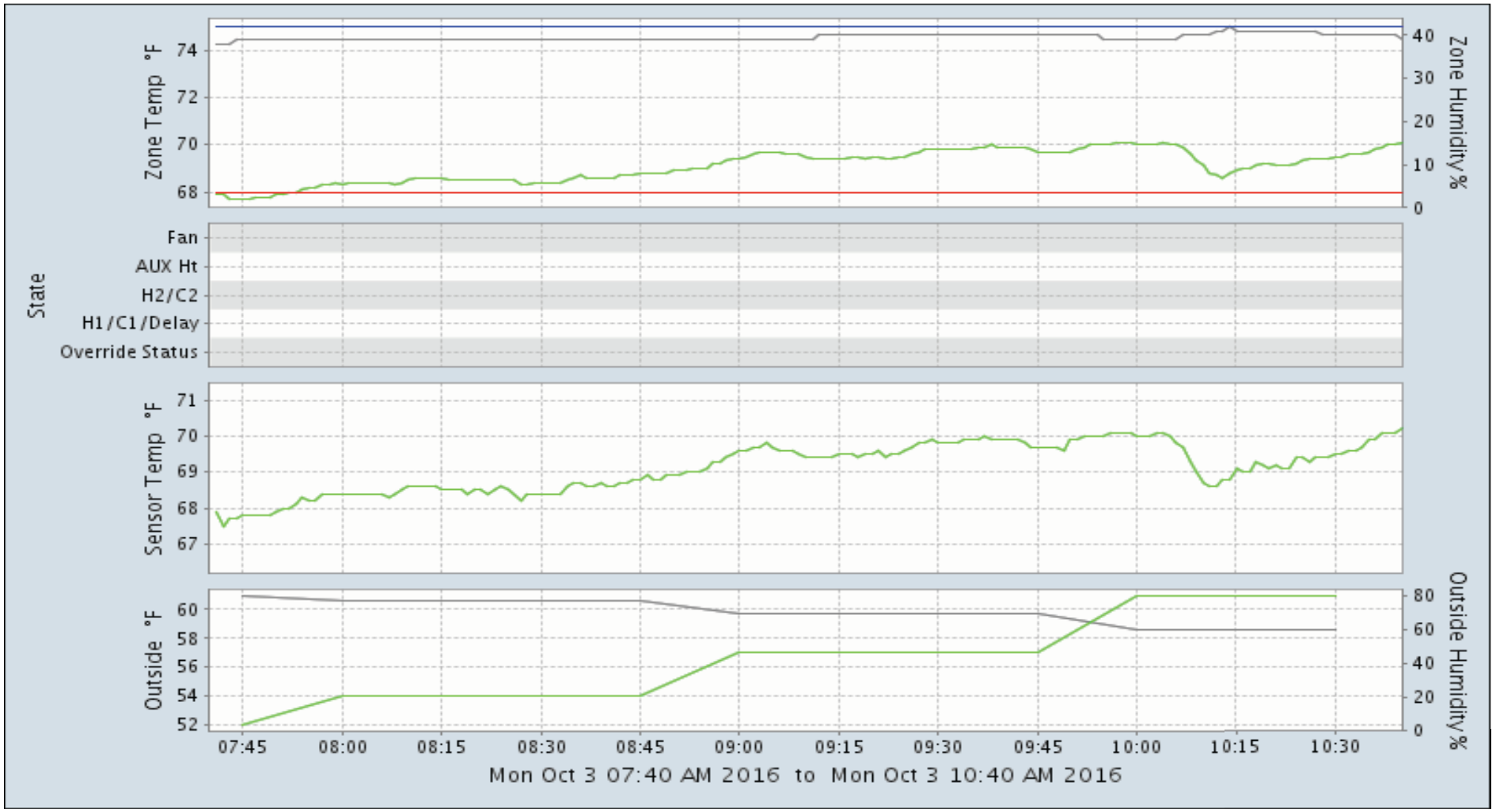
- Proliphix Energy Management Software
  - Browser based interface
    - Oversee current classroom conditions
    - Proactively respond to malfunctions
  - Central schedule programming
    - Conserves staff time, ensures schedule uniformity
  - Address special events efficiently
    - Back to school night
    - Winter vacation, legal holidays
  - Conservation
    - Conserves electricity and natural gas = dollar savings
    - Cuts emissions
    - Reduces energy

H.V.A.C. System Control



Centralized system monitoring

Centralized system monitoring

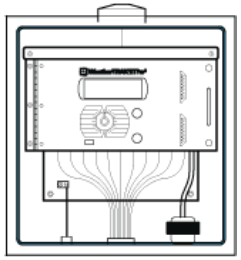


Water Management

Smart Irrigation Contollers

- Irrigation water accounts for 85% of District water usage
- Weathertrak system by Hydropoint
- Remote monitoring and control of sprinkler systems to maximize efficiency and improve maintenance
- Silicon Valley Water Conservation Award winner, 2010
    - Greenscape Management

Smart Controller



Flexible and Powerful On-site Management

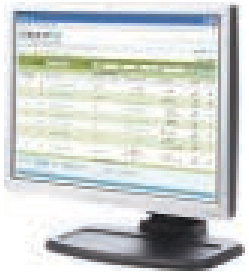
- More than just a timer
- Automated Scheduling Engine
- Site-specific data inputs (plant, soil, slope, etc.)
- Water use and system monitoring

Hi-Resolution Weather

Reliable Water Use/ Measurement of Water Needs

- Multiple data sources (stations, satellites, Doppler)
- No single point of failure (single sensor)
- Temp, wind, solar, humidity

Remote Monitoring and Management



Internet Applications - Management Platform

- Off-site programming and setup
- Instant changes
- Web-based irrigation/landscape asset inventory
- Ongoing measurement and verification
- Real-time monitoring and alert notification
- Operational efficiencies

Lighting Advancements

- Proposition 39 Contributions
  - Grant designed to improve energy efficiency at public school districts
  - LED lighting
    - Emergency and exit LED retrofits
    - Exterior lighting upgrades
      - 33% less energy used
      - Dimming controlled by occupancy sensors = additional savings
      - Photo sensors for autonomous control if controls are not adequate
      - Focused lighting patterns
      - Improved aesthetics

New lighting

Old lighting

Lighting Advancements - Next Up

- Linear fluorescent bulbs to LED retrofit

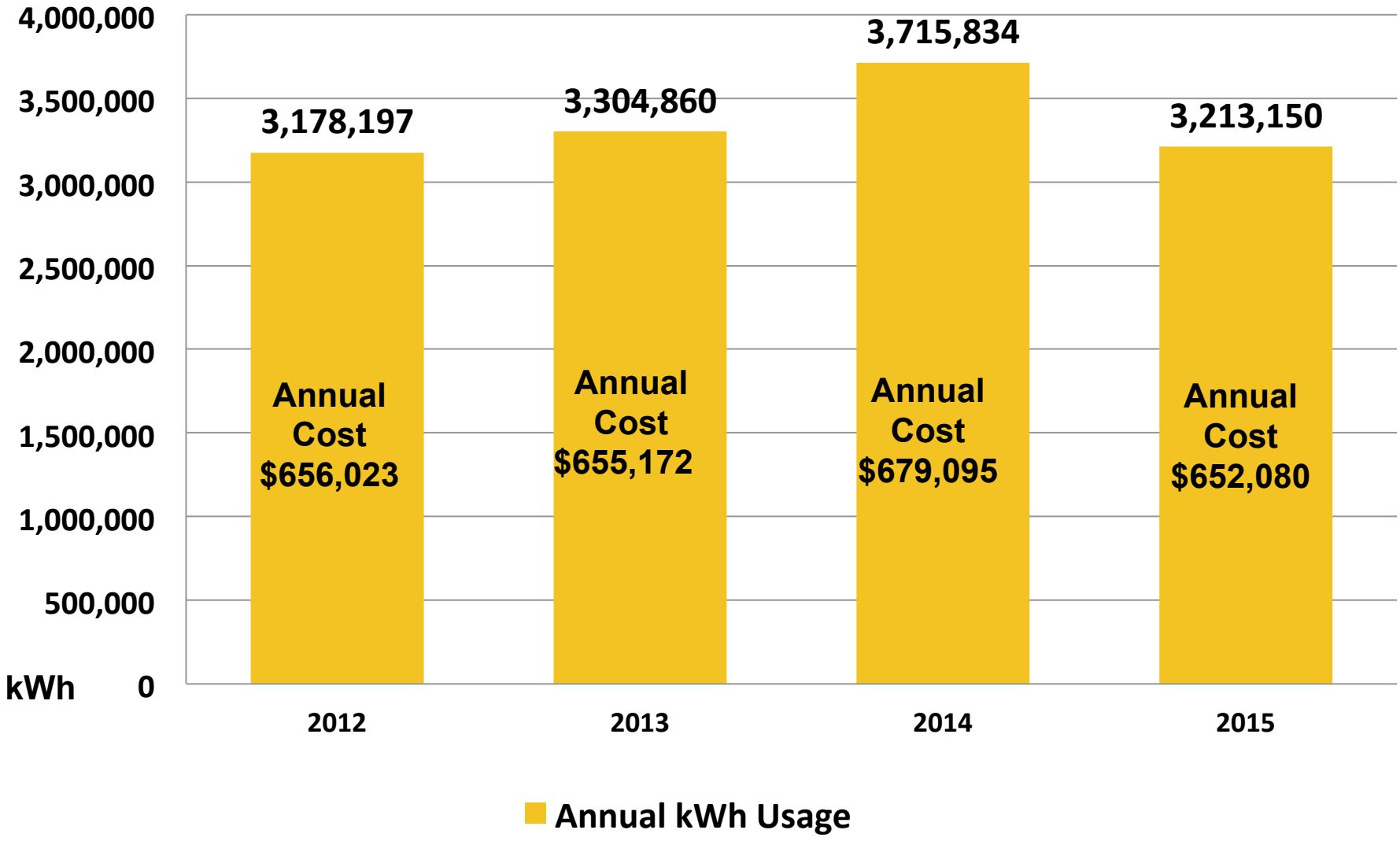
- Castlemont/Lynhaven done Winter 2015
  - Phillips 18w bulb replaces 32w fluorescent bulbs

- Monroe, Village, CMS, Blackford
  - Winter 2016
  - Everline LED modules include packaged driver and light bar
    - Less is more- directed lighting throw
    - Improved color
    - No fluorescent flicker
    - Dimmable

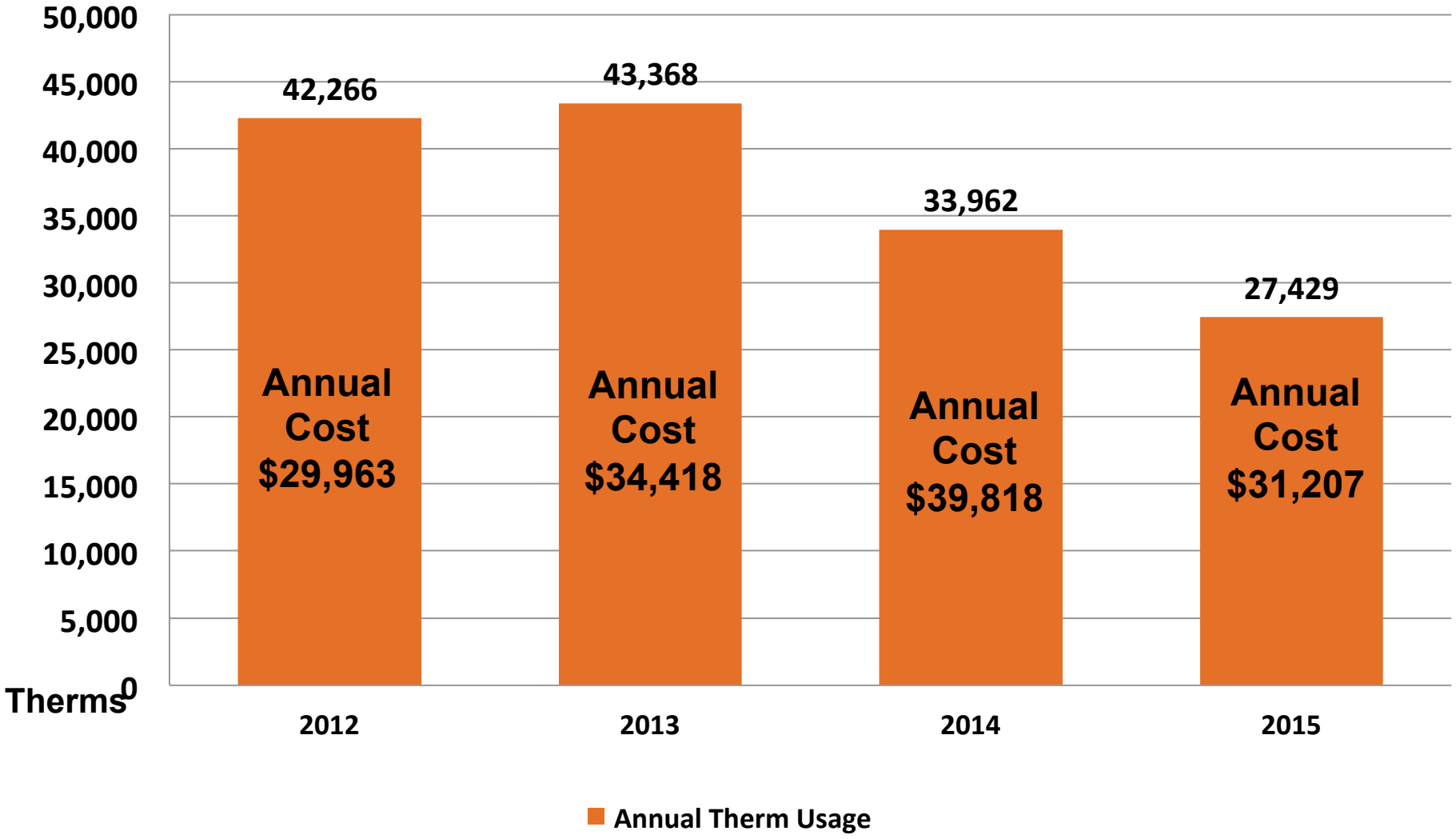
Impact on Energy, Water and Fiscal Savings to Date

Additional savings anticipated
after recently installed solar panels
are activated in December 2016.

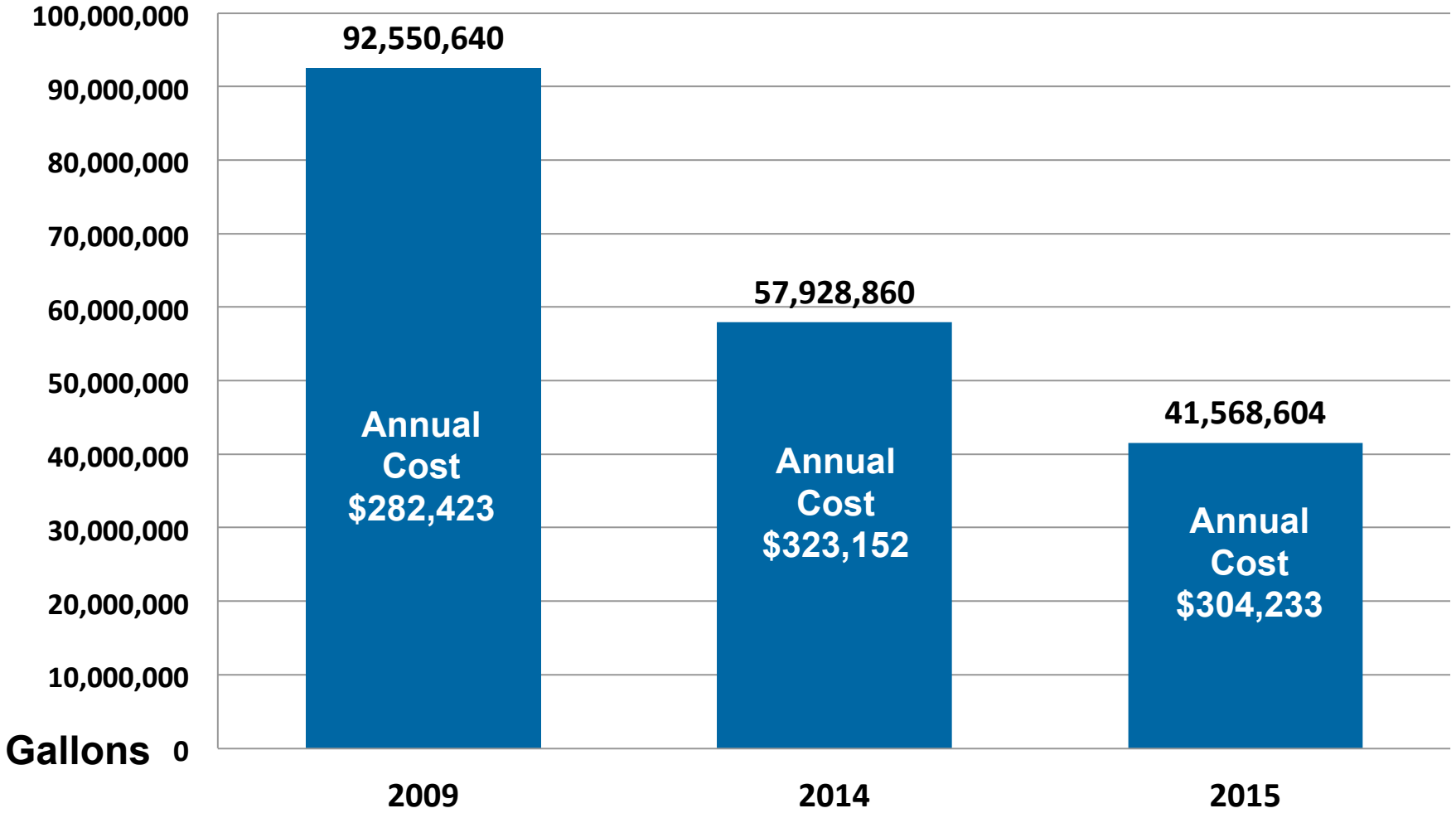
CUSD Electrical Usage



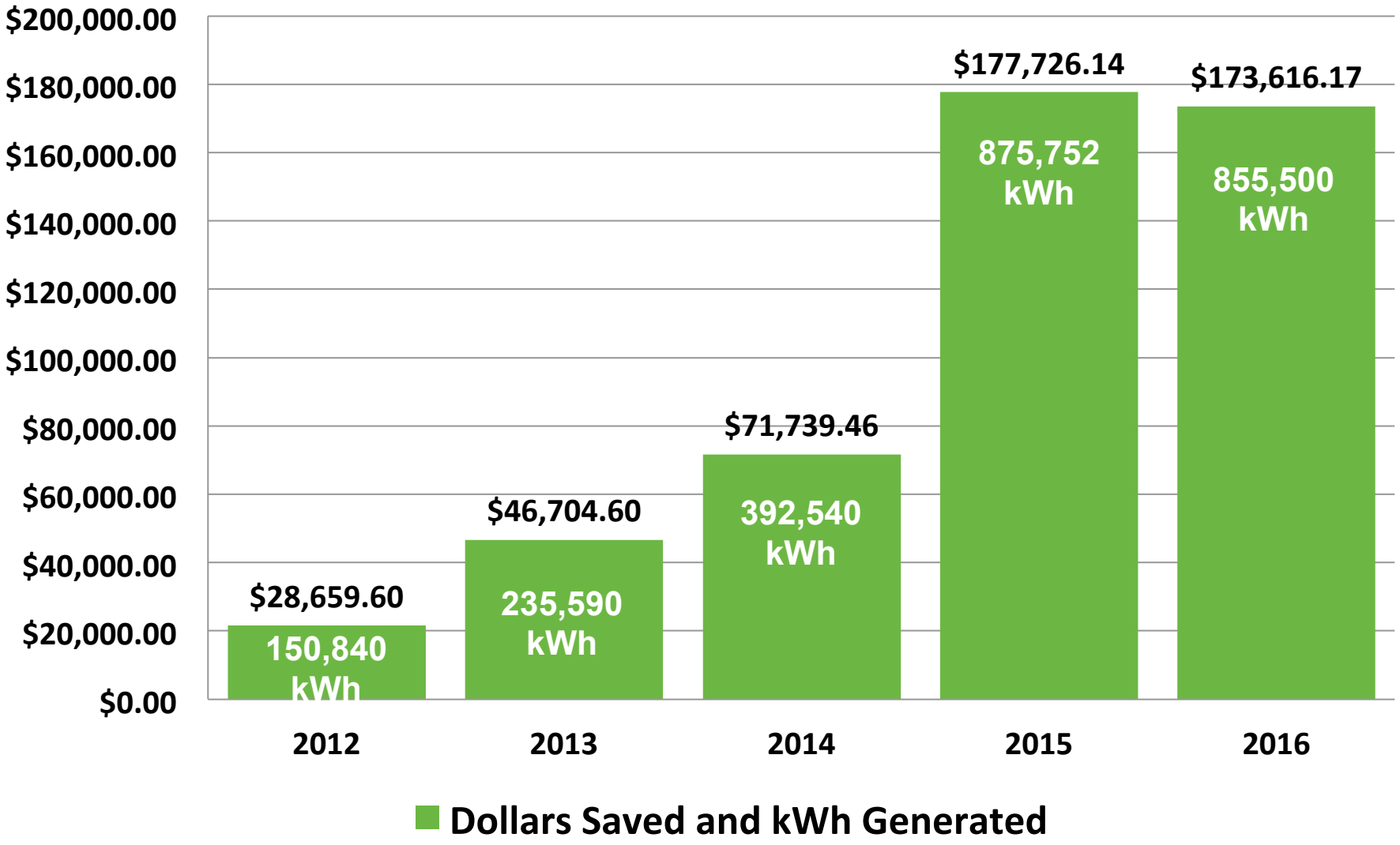
CUSD Gas Usage



CUSD Water Usage



CUSD Solar Production



Energy Star Program

- Utility data tracking and benchmarking tool sponsored by EPA

- Energy Star Designation Program
  - Data Review
  - Comparison with other similar facilites
  - Signifies that your building meets or exceeds the national standards for energy consumption compared to similar buildings located across the nation