Best Practices in Energy Data Management

Lionel Hill, Maryland Department of General Services

Adam Agalloco, Philadelphia, PA, Mayor's Office of Sustainability

Debra Hall, Massachusetts Department of Housing & Community Development

MARYLAND STATE ENERGY DATA TRACKING

Lionel Hill, PE, CEM

Maryland Department of General Services

OFFICE OF ENERGY PERFORMANCE & CONSERVATION

Energy Performance Contracts

- DGS develops and manages EPCs for State Agencies
- 21 EPC projects approved by BPW during O'Malley/Brown Administration
- Greenhouse Gas Savings of 130,000 tons of CO2 annually
- Cost Savings of $21.3 Million Annually

Electricity & Natural Gas Purchasing

- Purchase 1.5 Billion KWH of deregulated electricity & 4 Million DTH on behalf of all Executive Agencies & University System locations
- Lock in favorable rates to save State money
- Documented cost savings of $18.4 Million in FY13

Tracking State Government Energy Usage & Cost

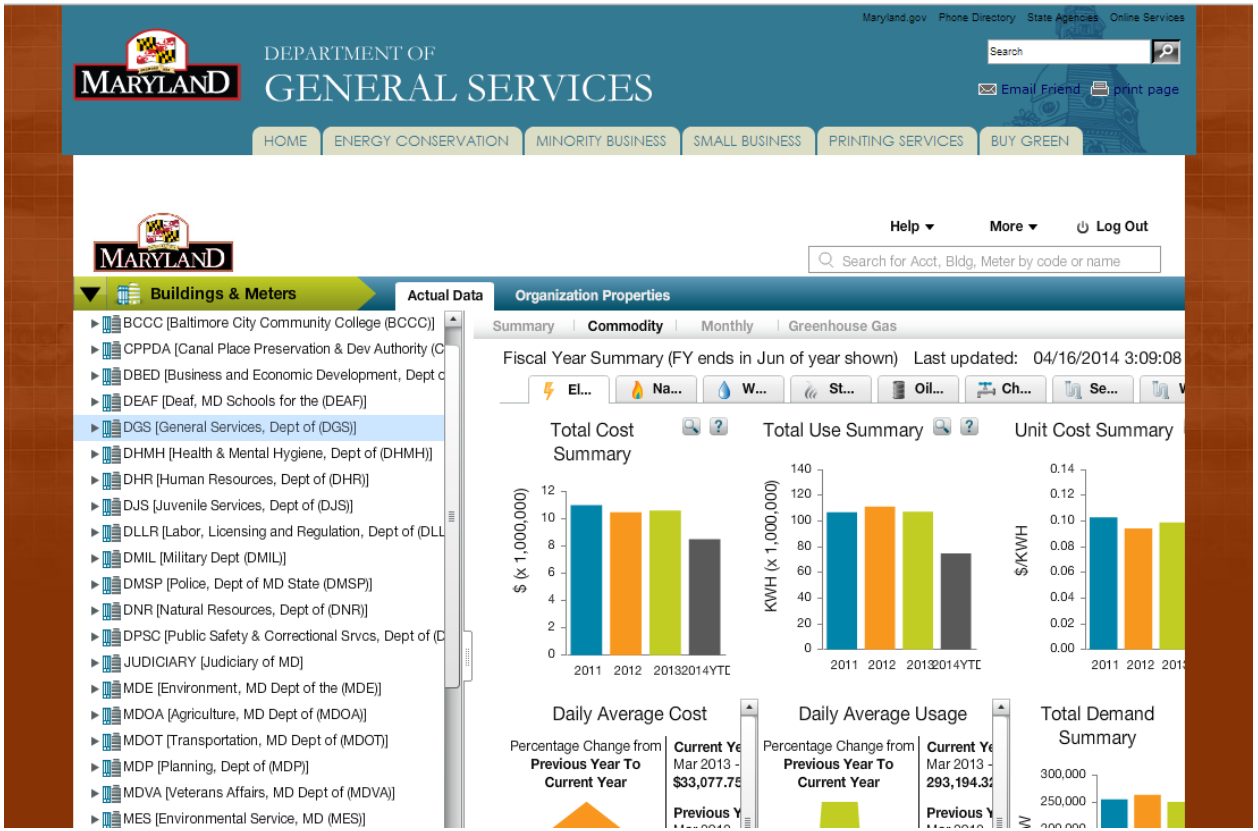
- Topic of this presentation

STATE ENERGY DATABASE

- Tracks **all commodities**: electricity, gas, oil, propane, water, sewer, steam, and chilled water
- **All energy using facilities** (buildings, traffic lights, stadiums, hospitals, fisheries, university campuses, etc.)
- **58 State Agencies** (including the University System of Maryland)
- Includes over **22,000 accounts** (16,128 active)
- Gather data from **120 accounts payable offices**
- Bills are from **124 vendors**
- Over **1 million invoices** in the database
- Comprehensive utility database services contract (~ 1.1M /yr)
- Runs on EnergyCAP software

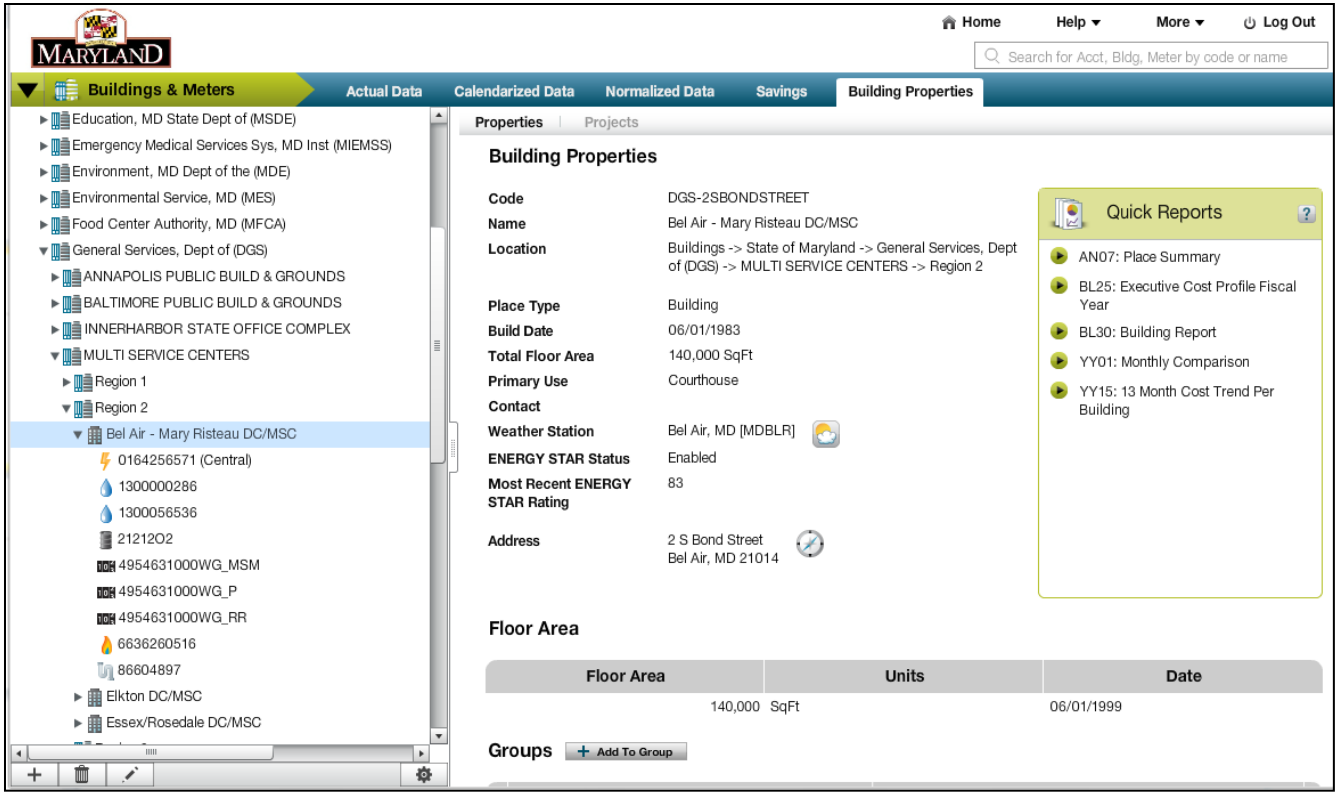
STATE ENERGY DATABASE

- Public-facing database

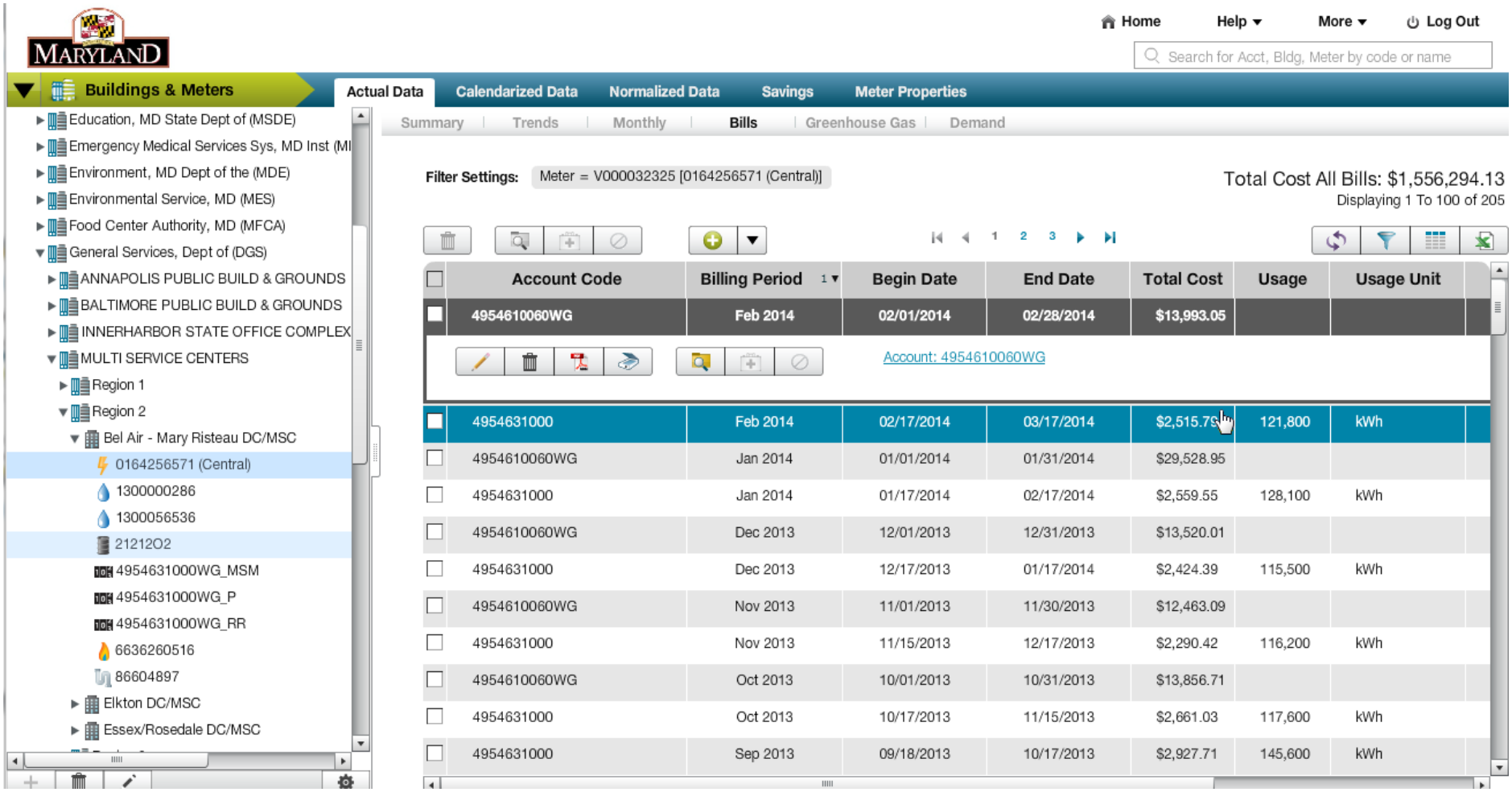


STATE ENERGY DATABASE

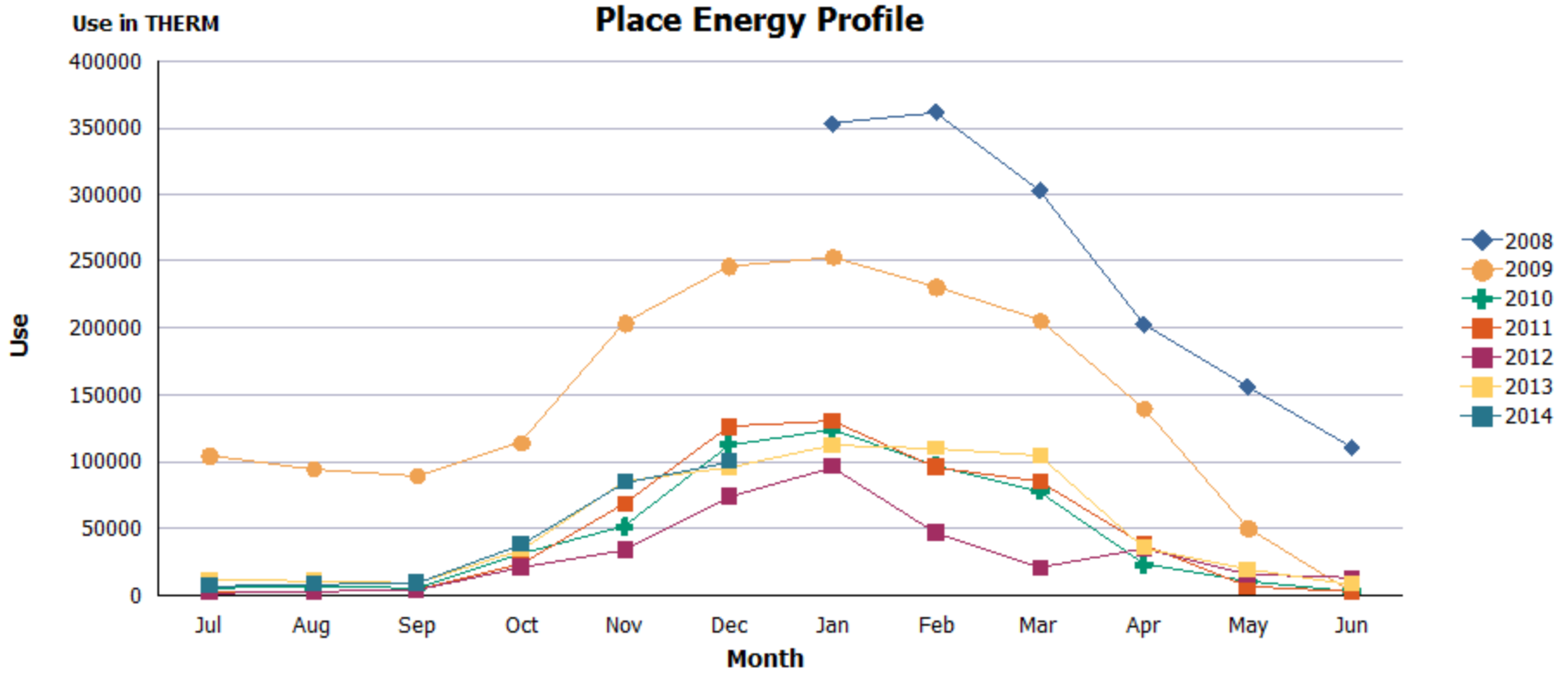
- Additional detail available to over 300 users with login rights



STATE ENERGY DATABASE



Place: [DHMH-SPGROVHOSP03] Spring Grove Hospital Center
55 WADE AV
Catonsville, MD, 21228



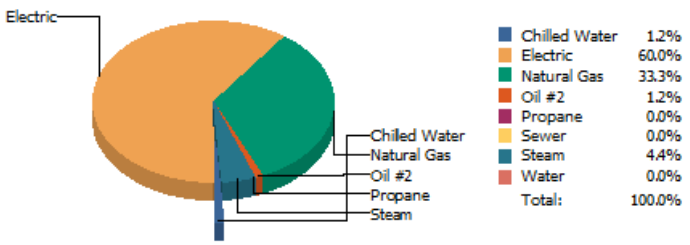
Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Totals
2008	0	0	0	0	0	0	352,736	361,702	302,737	202,853	156,281	110,832	**1,487,141**
2009	104,979	94,917	89,835	114,589	203,894	246,356	253,502	230,881	205,927	140,091	50,685	3,352	**1,739,008**
2010	5,172	6,314	5,905	31,765	51,596	112,635	123,760	97,152	78,214	23,026	10,167	3,400	**549,106**
2011	3,197	2,520	4,199	23,307	68,164	126,810	130,849	95,797	84,958	37,522	6,903	2,812	**587,038**
2012	1,971	2,328	3,587	20,984	33,920	74,065	96,268	46,431	20,424	34,904	15,338	12,898	**363,118**

REPORTING

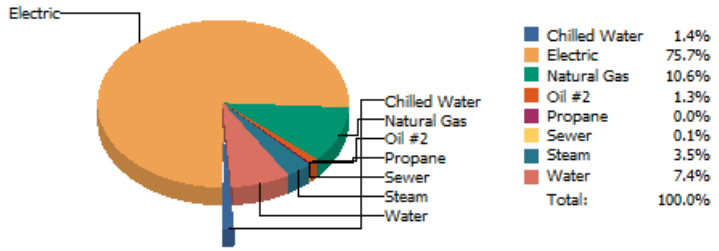
State of Maryland

Executive Summary by Commodity with Account Charges BL - 12A

Energy Use Percentage



Cost Percentage



Billing Period between Jul 2012 and Jun 2013

Commodity	Common Unit		Energy Use		Energy Percentage	Cost	Cost Percentage
	Common Use	Cost/Unit	MMBtu	Cost/MMBtu			
Chilled Water	625,021 Ton Hr	$0.3137 / Ton Hr	7,500	$26.1429 / MMBtu	1%	$196,078.62	1.40%
Electric	107,208,318 kWh	$0.0987 / kWh	365,795	$28.9351 / MMBtu	60%	$10,584,319.63	75.65%
Natural Gas	2,028,276 THERM	$0.7330 / THERM	202,828	$7.3298 / MMBtu	33%	$1,486,688.66	10.63%
Oil #2	51,280 Gal	$3.4754 / Gal	7,112	$25.0589 / MMBtu	1%	$178,219.83	1.27%
Propane	252 Gal	$3.6677 / Gal	23	$40.0840 / MMBtu	0%	$922.79	0.01%
Sewer	3,161 MGal	$5.9252 / MGal				$18,726.63	0.13%
Steam	23,234 MLB	$20.8033 / MLB	26,719	$18.0898 / MMBtu	4%	$483,334.79	3.45%

MARYLAND'S ROAD TO PRESENT… 1990S (EARLY EFFORTS)

- 1997 Energy Reduction Legislation
- Worked with Excel spreadsheets of all known electric accounts for energy purchasing
- Energy Performance Contract (EPC) energy baselines and M&V were completed with physical boxes of utility bills

LEGISLATION (2006-2008)

2006 - SB267

- Leading By Example
- State Government commits to a 15% reduction in energy usage (MMTBU) by 2015
- DGS must track and report on energy reduction across all State government facilities

2008 - EmPOWER Maryland Energy Efficiency Act

- Mandates a 15% in per capita electricity consumption and peak demand by 2015
- New set of goals for Leading By Example:
  - DGS to continue to track and report on State energy usage
  - Committing to transparency in government
  - Governor O'Malley "The things that get measured are the things that get done"

FIRST DATABASE CONTRACT (2008)

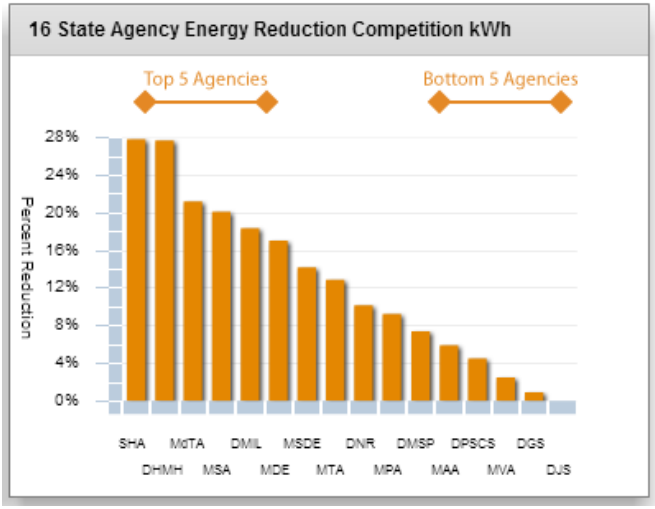
- Competitive Solicitation
- Awarded to BITHGroup Technologies, Inc., a Baltimore-based MBE and SBE
- Contract term: 3 years with 2 optional renewals
- Contract amount: ~800k/year
- Contracted responsibilities:
  - Creating and maintaining a comprehensive utility bill database
  - Processing ~12,000 invoices per month

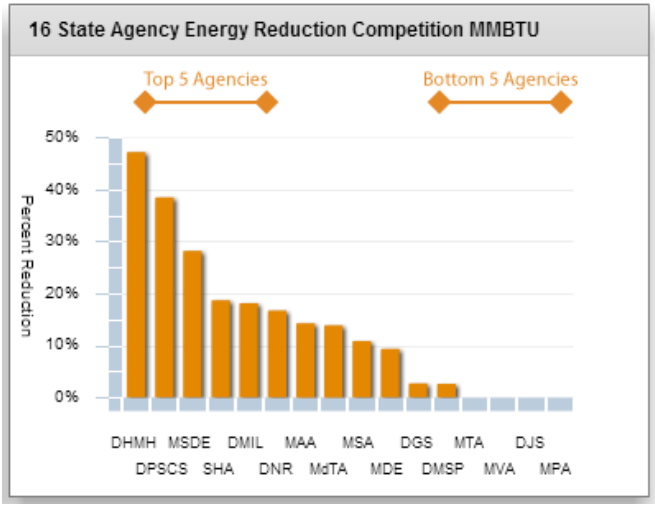
RECENT ADVANCES (2013-2014)

- Negotiating for electronic data from vendors
- Hiring full-time Program Manager
- New solicitation (new contract began Dec 2013)
  - Improved language of RFP and contract to better reflect State's needs
  - Added requirements for database security
  - Added training requirements
- Getting Agencies on Board – developing good relationships and communication strategy
- Recognizing Agencies and promoting efforts

16 AGENCY ENERGY COMPETITION

- **16** State Agencies consume **80%** of State Government Energy
- Competition ranks 16 Agencies by kwh and MMBTU % reductions
- Compares current fiscal year compared to FY2008 baseline for % reduction
- Started 2011, has evolved each year



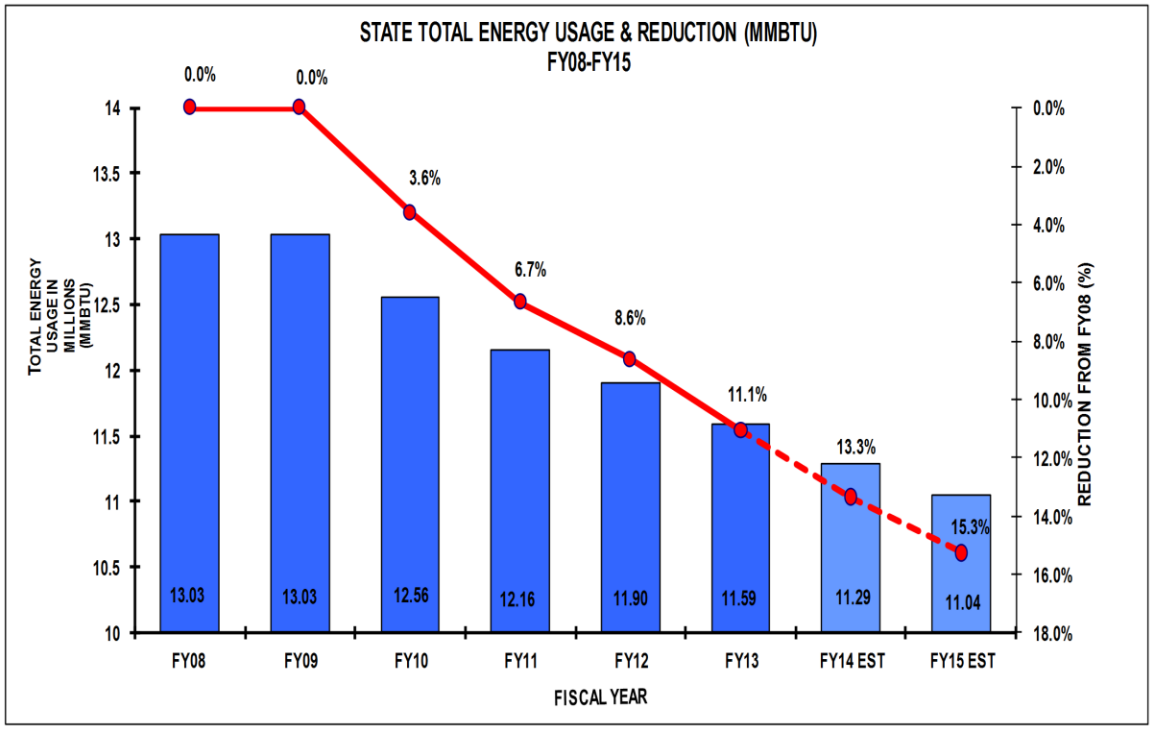


MARYLAND ENERGY CUP

- First event to recognize agencies - 2/6/14
- Governor O'Malley featured speaker
- ~250 attendees (agency energy coordinators, staff, leadership, vendors, legislators)
- Awarded the winners of the 16 Agency Energy Competition, also a database participation award, and Most Improved

TRACKING STATEWIDE PROGRESS

Maryland State Government Progress Towards EmPOWER Maryland Goal



On Track to Reduce Energy Consumption by 15% by 2015

RECOMMENDATIONS & LESSONS LEARNED

DOs

- Insist on centralized management & control
- Secure high level buy-in
- Track all agencies
- Track all utilities – usage & cost
- Track most if not all bill detail

DON'Ts

- Allow voluntary participation by agencies
- Rely on agencies to self-report
- Assume contractor understands your organization and processes better than you do

RECOMMENDATIONS & LESSONS LEARNED (cont.)

DOs

- Build positive & productive relationships with stakeholders
- Provide training opportunities

DON'Ts

- Lose track of original goals

QUESTIONS?

Lionel Hill, PE, CEM

Chief, Energy Records & Verification

Office of Energy Performance & Conservation

MD Dept. of General Services

Lionel.Hill@maryland.gov

(410) 767-4386

Emily H. Soontornsaratool

Energy Data Program Manager

Office of Energy Performance & Conservation

MD Dept. of General Services

Emily.Hunter@maryland.gov

(410) 767-3061

THE CITY OF PHILADELPHIA

MAYOR'S OFFICE OF SUSTAINABILITY

GREENWORKS PHILADELPHIA

DOE Better Buildings Summit
Best Practices in Energy Data Management

—May 9th, 2014—

Overview of Presentation

ENERGY

- Background Information

- Leveraging Data in the City of Philadelphia
  - Find Projects
  - Incentivize Good Behavior
  - Track Projects for Performance

GREENWORKS
PHILADELPHIA

Energy — PHILADELPHIA REDUCES ITS VULNERABILITY TO RISING ENERGY PRICES

Environment — PHILADELPHIA REDUCES ITS ENVIRONMENTAL FOOTPRINT

Equity — PHILADELPHIA DELIVERS MORE EQUITABLE ACCESS TO HEALTHY NEIGHBORHOODS

Economy — PHILADELPHIA CREATES A COMPETITIVE ADVANTAGE FROM SUSTAINABILITY

Engagement — PHILADELPHIANS UNITE TO BUILD A SUSTAINABLE FUTURE

5 goals, 15 targets, over 150 initiatives

DEPARTMENT OF PUBLIC PROPERTY

PHILADELPHIA INTERNATIONAL AIRPORT

PHILADELPHIA CITY PLANNING COMMISSION

DEPARTMENT OF PUBLIC HEALTH

PROCUREMENT DEPARTMENT

PHILADELPHIA CITY COUNCIL

LICENSES & INSPECTIONS

STREETS DEPARTMENT

PHILADELPHIA WATER DEPARTMENT

HUMAN RESOURCES

REDEVELOPMENT AUTHORITY

OFFICE OF CITY BUDGET

RECORDS DEPARTMENT

COMMERCE DEPARTMENT

THE CITY OF PHILADELPHIA

MAYOR'S OFFICE OF SUSTAINABILITY

SEPTA

FLEET MANAGEMENT

ZONING CODE COMMISSION

OFFICE OF HOUSING & COMMUNITY DEVELOPMENT

CITY LAW DEPARTMENT

DIVISION OF TECHNOLOGY

DEPARTMENT OF PARKS AND RECREATION

MAYOR'S OFFICE OF TRANSPORTATION AND UTILITIES

AIR MANAGEMENT SERVICES

PHILADELPHIA HOUSING DEVELOPMENT CORPORATION

PHILADELPHIA GAS WORKS

PHILADELPHIA SCHOOL DISTRICT

PHILADELPHIA HOUSING AUTHORITY

City Government Energy Consumption: By the numbers

ENERGY

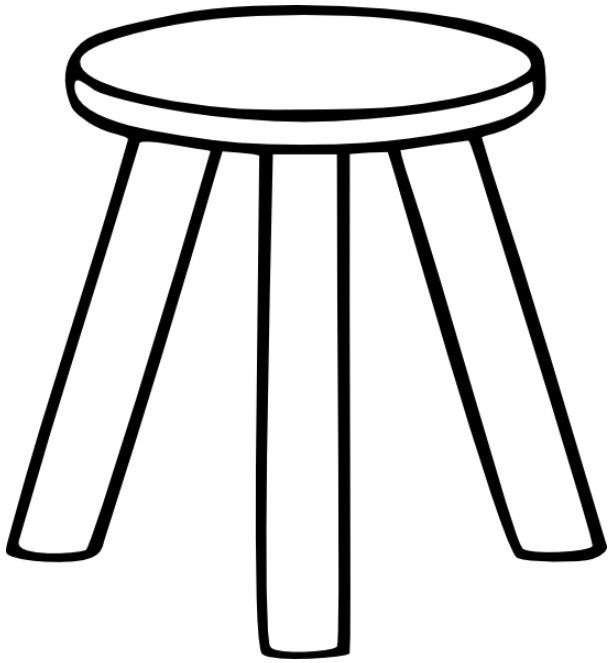
- 3.58 Trillion BTUs of energy
  - Equivalent of approximately 33,000 Pennsylvania homes [1]
- Approximately $100 million spent in energy annually between General, Water and Aviation Funds
- 524,000 metric tons of Greenhouse Gas emitted annually.
  - Roughly 2.3% of total Citywide emissions
- Energy Management Practices in City Government positively impacts 7 of the City's 15 Greenworks Goals

[1] Based on EIA Annual Energy Review Data: http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb0204

Reducing City Government Energy - Approach

ENERGY

- Organization and Analysis
  - How do we find (and sell) the opportunities?
  - How do we monitor the results of our work?
- Technology
  - What are the best technology opportunities to leverage?
  - How does the technology overlay with other City initiatives?
- People
  - Who is maintaining the project and how do they interface with the technology?
  - **Why should people prioritize energy conservation?**



Data Organization: The need for an Energy Management Database

ENERGY

2010

- Over 1800 utility accounts
- Single person has access to historical records of energy bills. No one else knows how to use the system.
- Building level reports are built manually on a case by case basis and available based on the schedule of the database manager.
- Data on a hard drive
- Multiple accounts for one building are treated separately

2014

- Over 3000 utility accounts (increase driven by deregulation)
- Over 85 users with access to energy bills through web-based software. Strategic partners can have access.
- Building level reports are built by the system to meet users specific requests. They are available 24/7 from any internet connection.
- Data in the cloud with regular backup
- Multiple accounts for one building are aggregated automatically

Energy Management Database

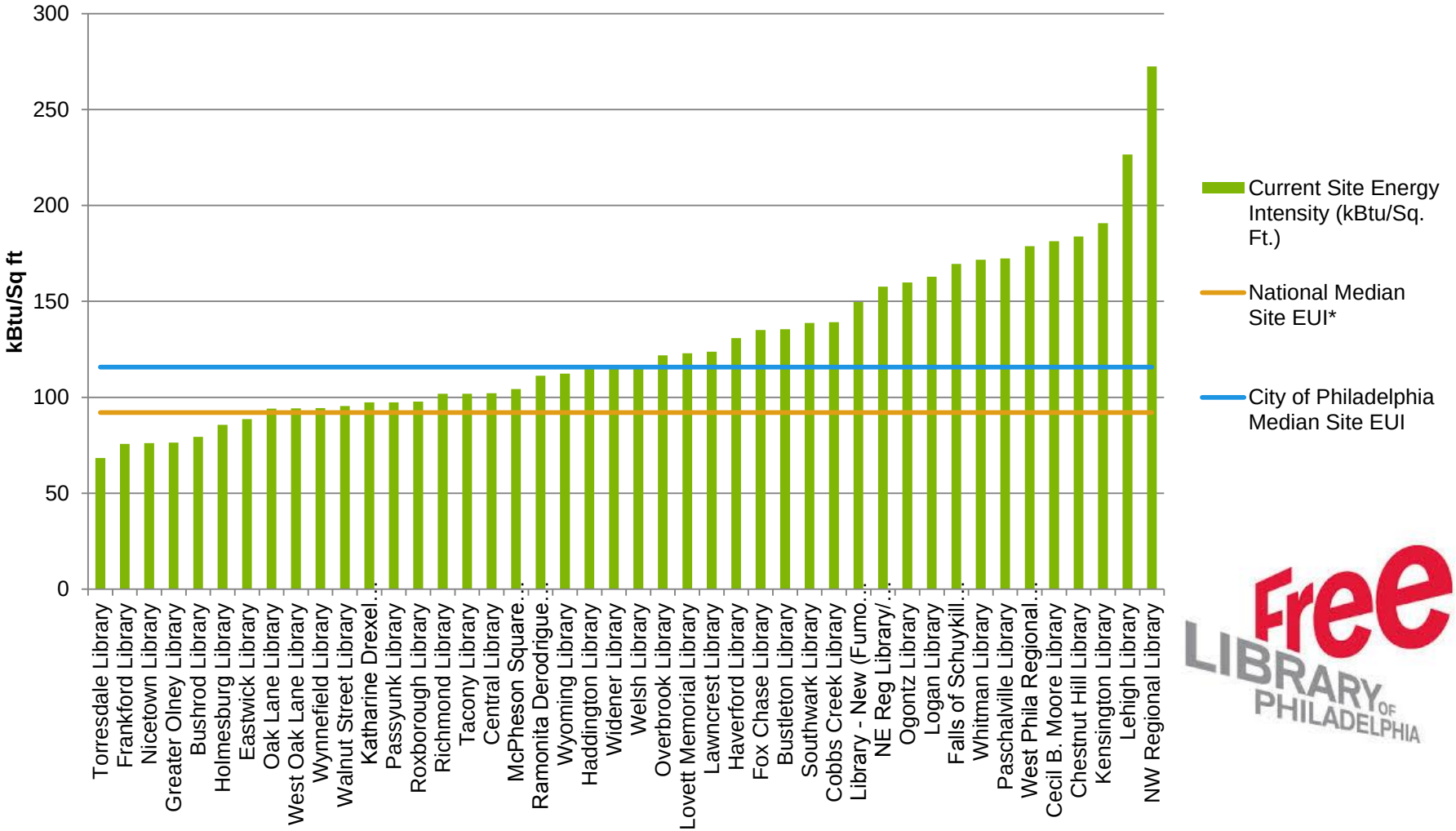
Over 600 facilities! – Where are our opportunities?

- Top 10 energy users make up 44% of General Fund's energy cost.

- Top 50 energy users make up 77% of General Fund's energy cost.

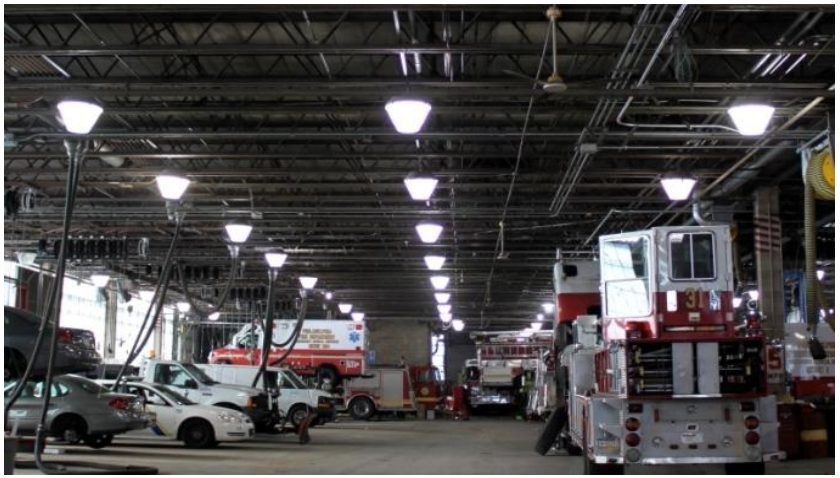
Over 600 facilities!
Where are our opportunities?

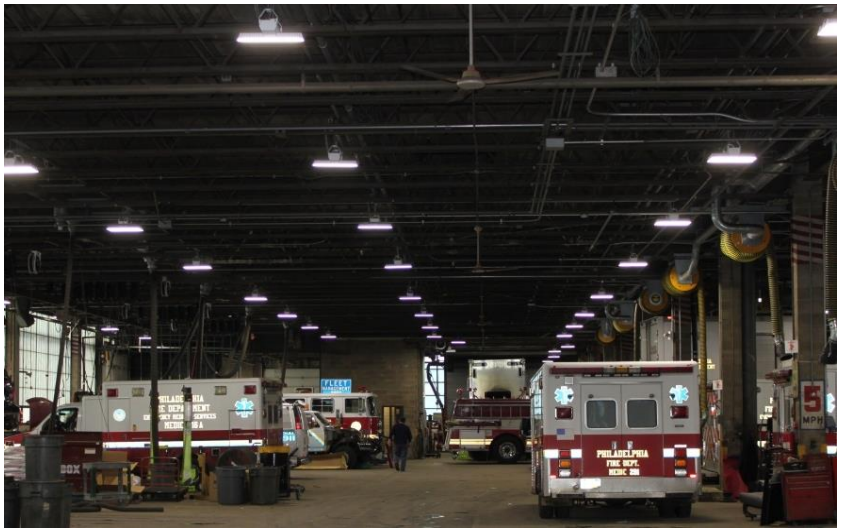
ENERGY



Free LIBRARY OF PHILADELPHIA

Fleet Shop 134- Lighting Renovation





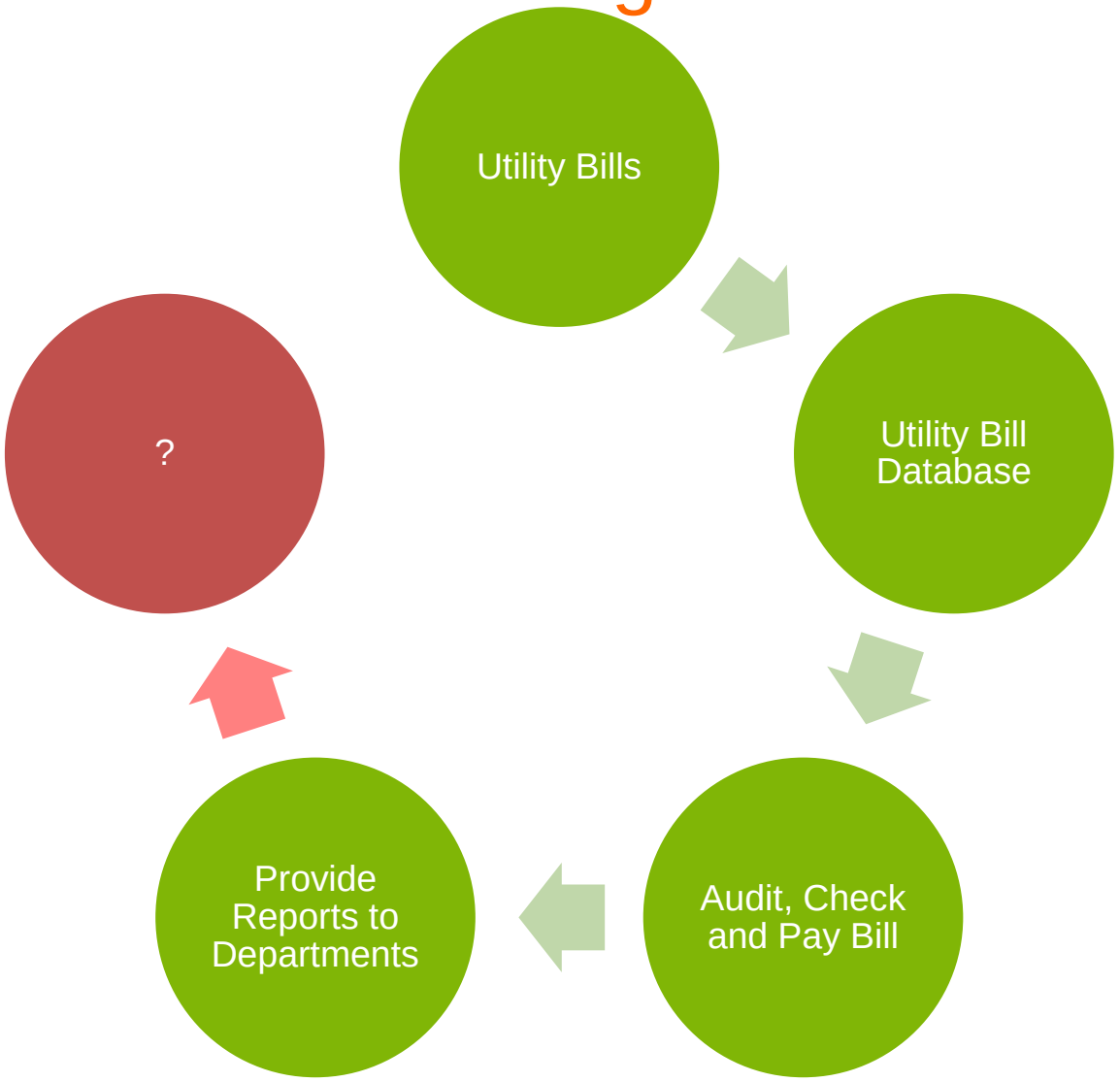
- Project Cost: $245,000
- Anticipated Annual Savings: $40,000+
- Rebate: $38,000

Scope of Work:

Replace existing Metal Halide and T12 lighting with new High bay LED lighting in a 24 hour fleet repair shop

Energy Incentive Pilot Program
Shared Savings Justification

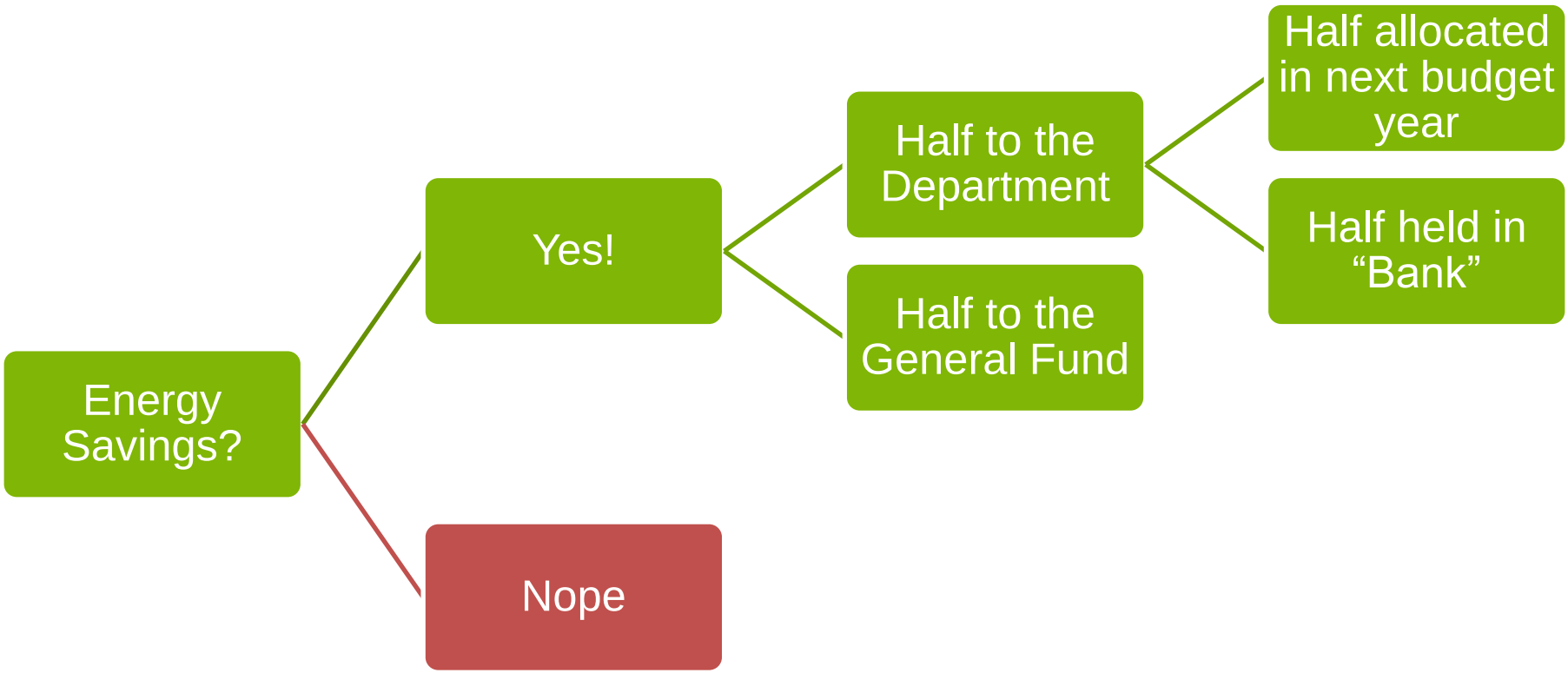
ENERGY



- Centralized Bill Payment
- No accountability to Departments

Energy Incentive Pilot Program Process

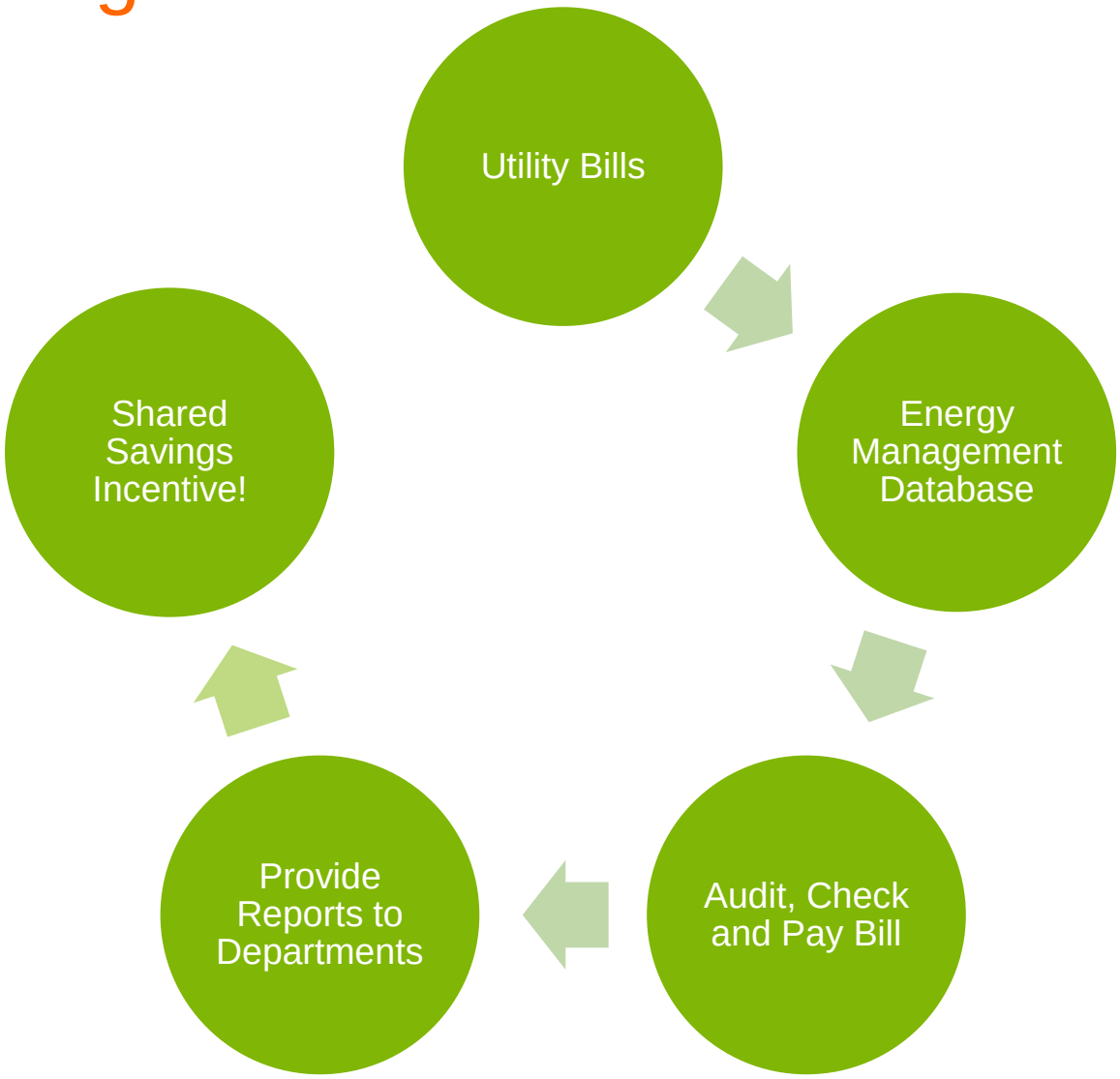
ENERGY



Energy Incentive Pilot Program Challenges!

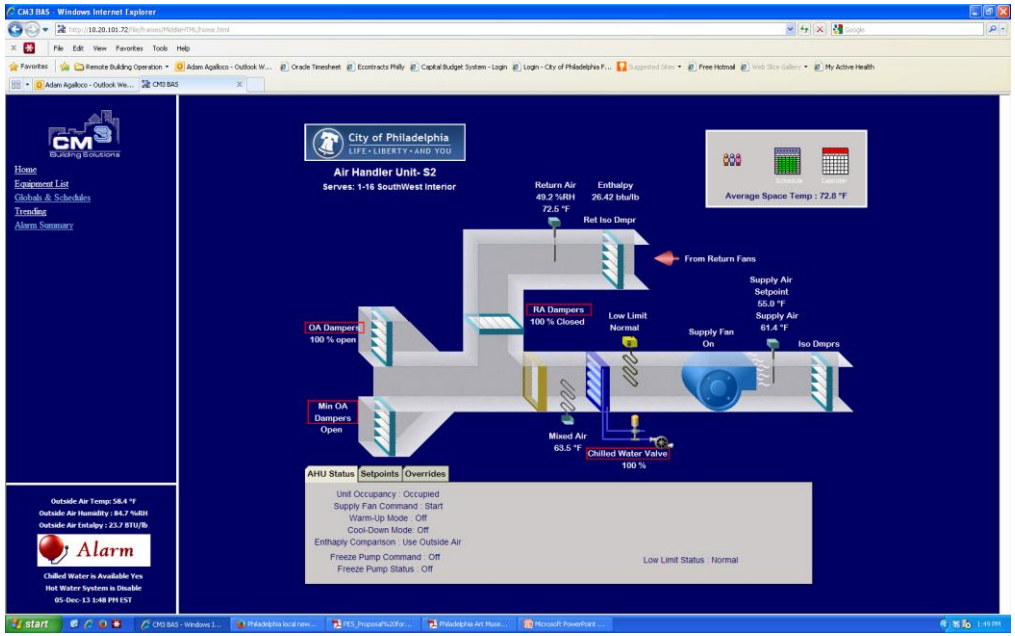
ENERGY

- New Buildings
- Operational Changes
- Weather Normalization
- External Funding of projects
- Unit Cost fluctuation, many many more…



Remote Building Operations (RBOp)

ENERGY



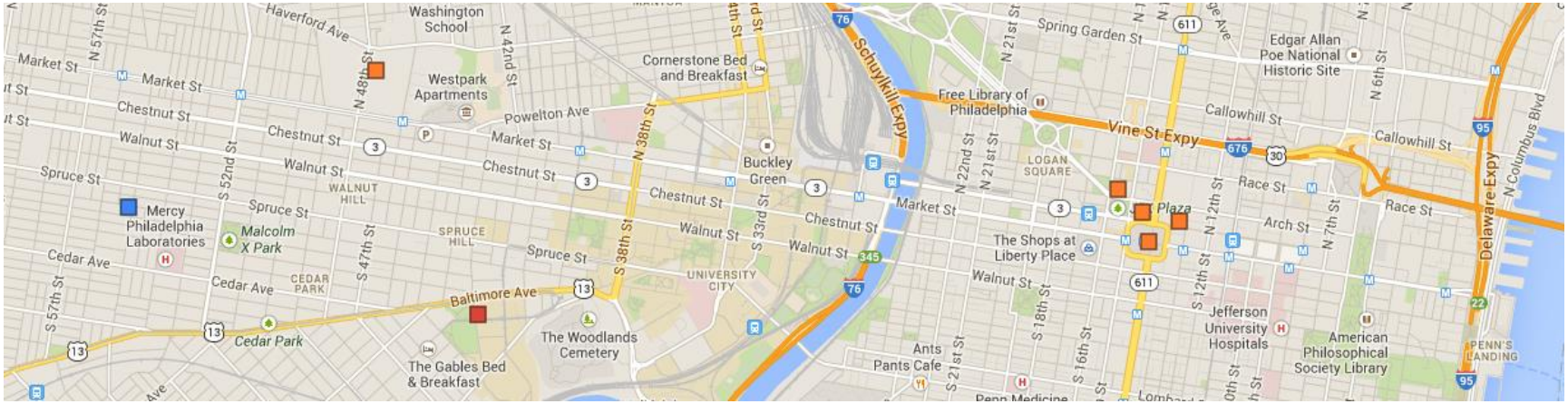
Remote Building Operations (RBOp)

ENERGY

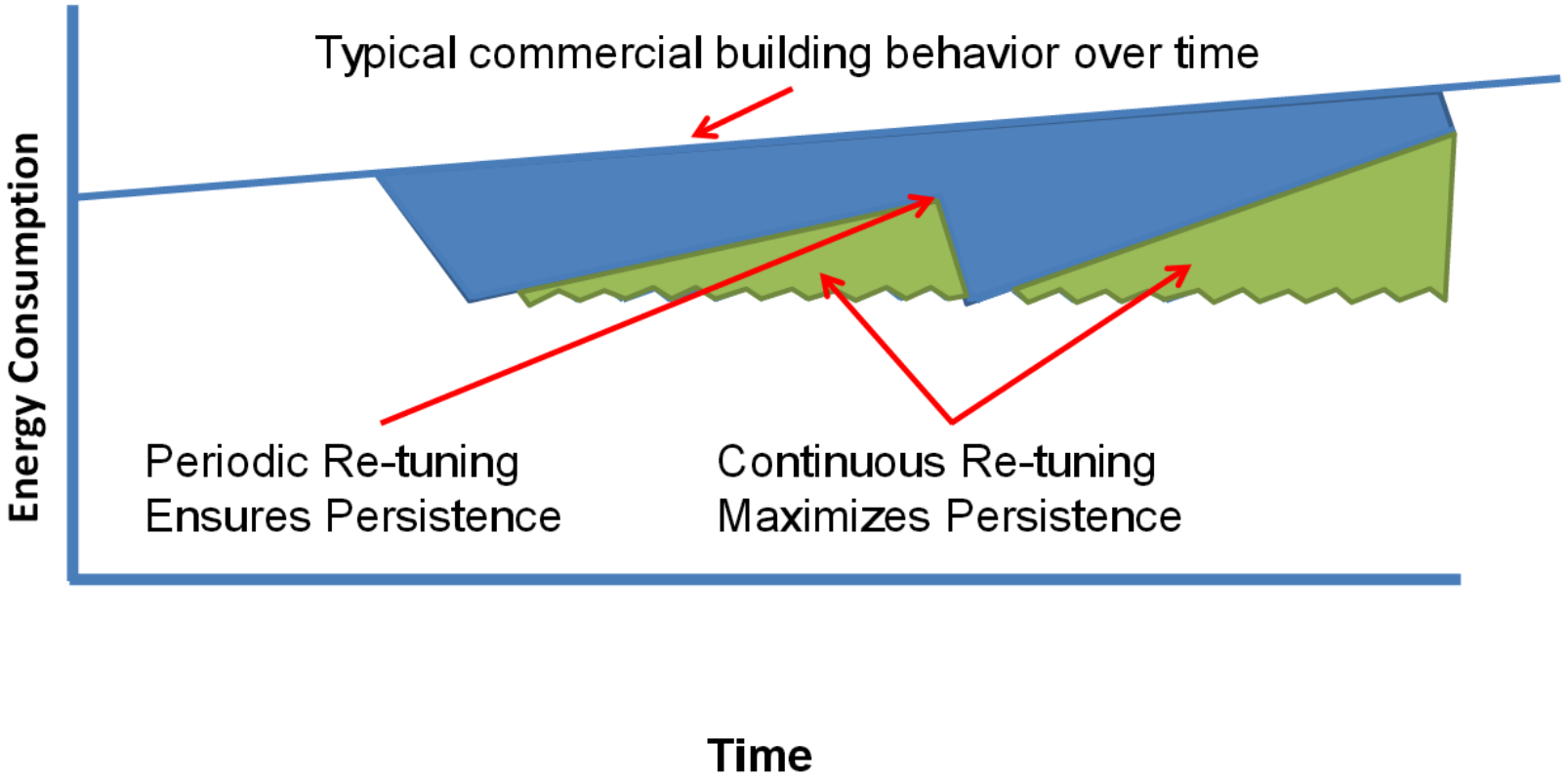
- Remote accessibility to building automation systems (BAS) for HVAC and building operations.

- Reduces visits to the site, automates messages and emergencies to building operators. Trends and stores data.

- Allows to remote check-ins by supervisors and controls contractors on functionality and performance (particularly with energy)



Energy Conservation through RBOp



What's Next?

Near Future

- New vendor for energy management database
- Expansion of Energy Incentive Pilot Program
- Expansion of RBOp to new buildings
- Leverage PECO's smart meter technology

Longer Term

- Increased energy reporting
- Remote building operation aggregation system
- Expanded project tracking for M&V

THE CITY OF PHILADELPHIA

MAYOR'S OFFICE OF SUSTAINABILITY

GREENWORKS

PHILADELPHIA

EMAIL **adam.agalloco@phila.gov** | VISIT **www.phila.gov/green**

facebook.com/greenworksphila twitter.com/greenworksphila

Best Practices in Public Housing Energy Data Management

Debra Hall

MA Dept. of Housing & Community Development

May 9, 2014

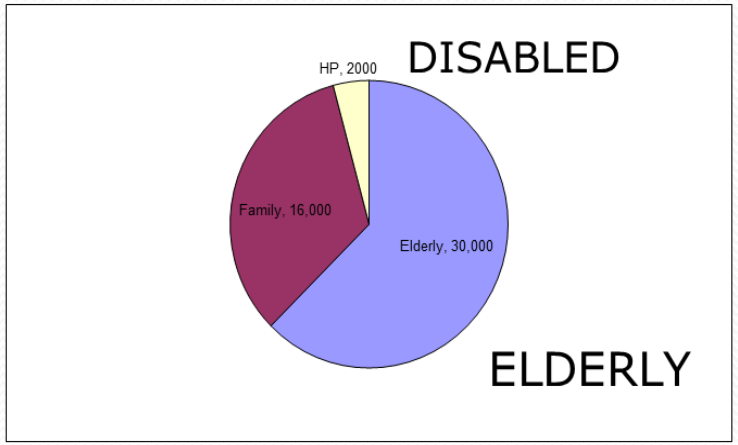
Massachusetts State-aided Public Housing Profile

~ 240 local housing authorities

~ 45,000 state supported apartments in 7000 buildings

~ 2/3 are elderly units, with 15,000+ electric heat elderly units

~ 75 of these HAs also manage 35,000 federal units



Patrick Administration Green Goals

- **Executive Order 484 –** public agencies lead by example – energy/water savings targets
- **Green Communities Act of 2008 (& 2012)**– energy efficiency as "first fuel" – less need to build new power plants - $ 2 billion, 3-year energy efficiency plan
- **Global warming /Climate change plan** – 25% by 2020
- **Sustainable Development Principles** - Grow the Innovation Economy & Clean Energy businesses

MA goals for Sustainable Public Housing

- Reduce the "footprint", especially energy & water use, GHG emissions (25% by 2020)
- Implement innovative sustainable measures as model for broader community and citizen action
- ***How to target the right investments and confirm the savings?***

Initial Performance Metrics Available as part of Fiscal Data Base

Operating

- Utility Costs ~ $90+ M
  - $40 M electric
  - $22 M gas
  - $25 M water
- Maintenance ~ $34 M

Other Metrics:

- 250 M Kilowatt hours electricity
- 12 M therms natural gas
- 250K gallons heating oil

- ~537 M Lbs. CO_2

Brown to Green:

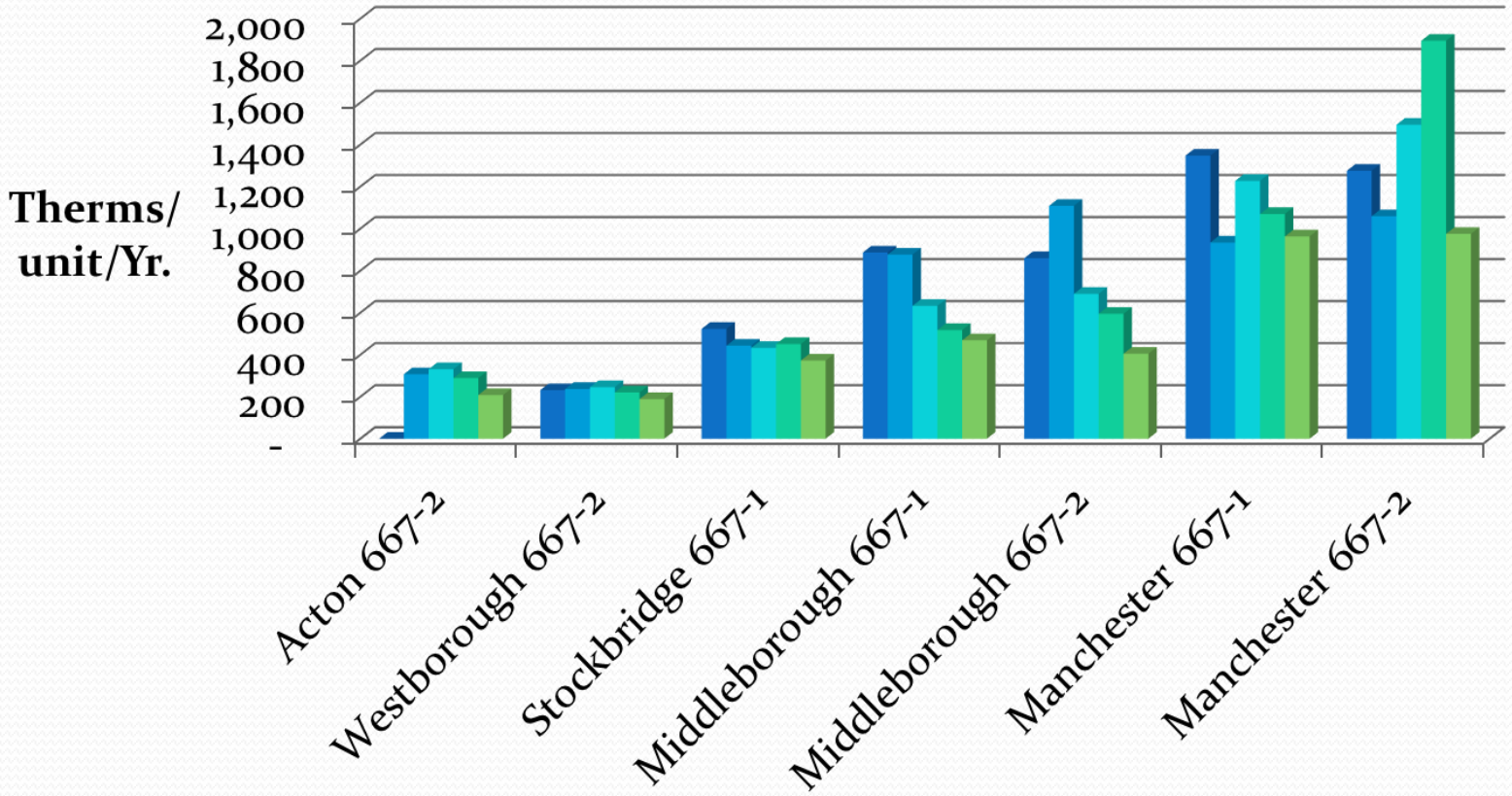
Driven by Capital Planning Inventory & $500 M Housing Bond

Policy shift from competitive to formulaic capital planning:

- $40 M in heating systems
- $ 28 M in roofs
- $5 M low flow toilets
- $ 10 M Energy Performance Contracts at large authorities
- + Millions to other building shell work – siding, windows, doors
- PLUS $ 10+ M Utility Energy Efficiency Programs (lighting, refrigerators, insulation)

New boilers - *What you save depends on where you start*

Devs with heating replaced between 2008 and 2012



Green Communities Act of 2008 boosted resources for MF housing

- Utilities obligated to use energy efficiency as "first fuel"
- Three year energy efficiency plan - $2 billion budget
- 10% of budget to Low Income households
- Utilities held Stakeholder charrette that led to new Multifamily programs for Low Income and Market Rate
- Low Income Multifamily Program designed to pilot-test a new benchmarking software called WegoWise
  - W=Water, E=Electricity, G=Gas and O=Oil

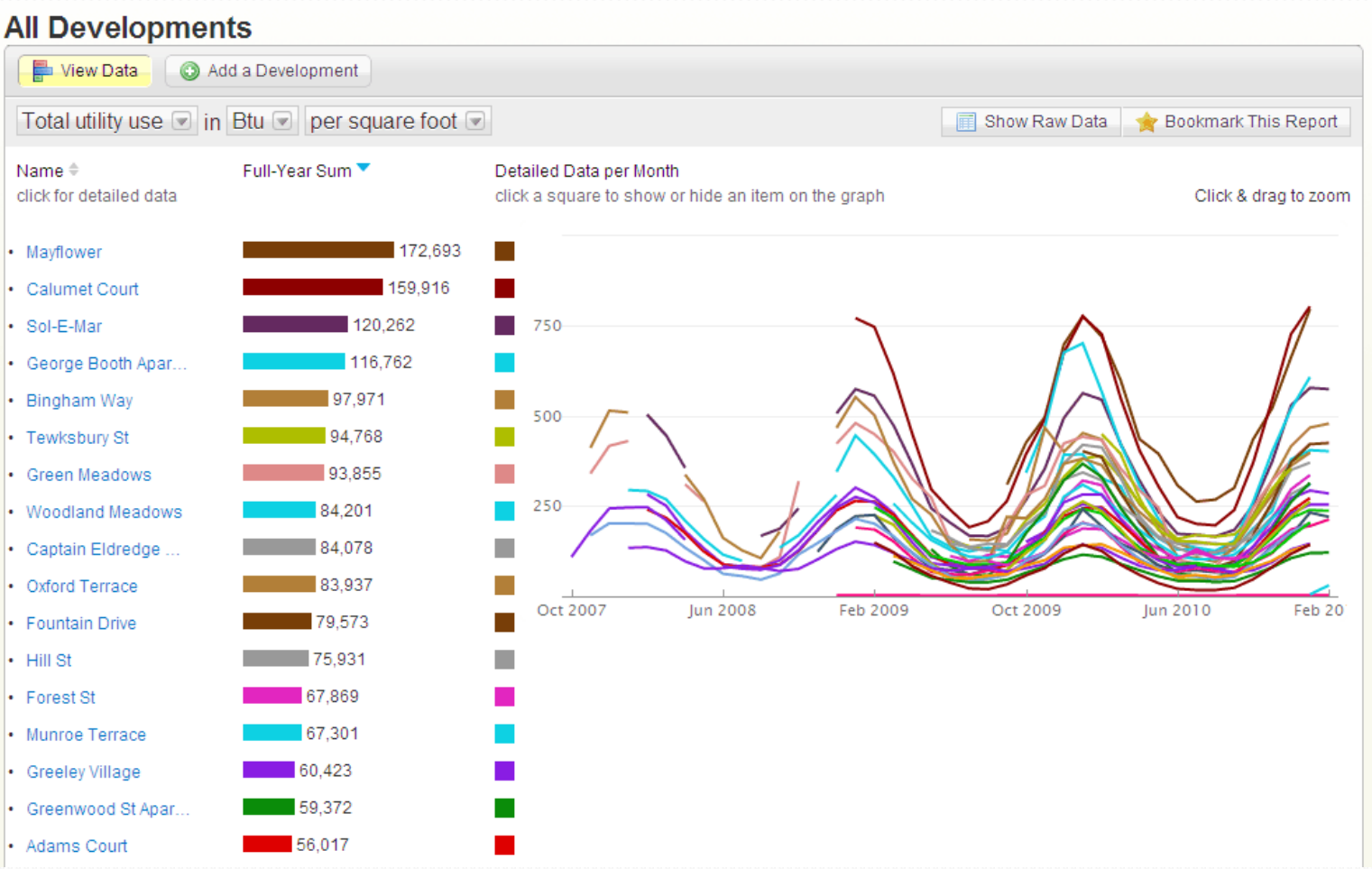
Attributes of WegoWise Software

- Electronically pulls utility data, saving time and eliminating manual entry errors
- Benchmarks against similar buildings - largest U.S. database of utility use in multifamily properties
- Utility EE program funded 1st year subscription, enabling participation by 180 housing authorities
- "Score" of BTU/SF provides quick affirmation of high intensity usage
- Provides graphic snap-shot of impact of renovations
- Sophisticated M&V analysis provides consumption and $ savings

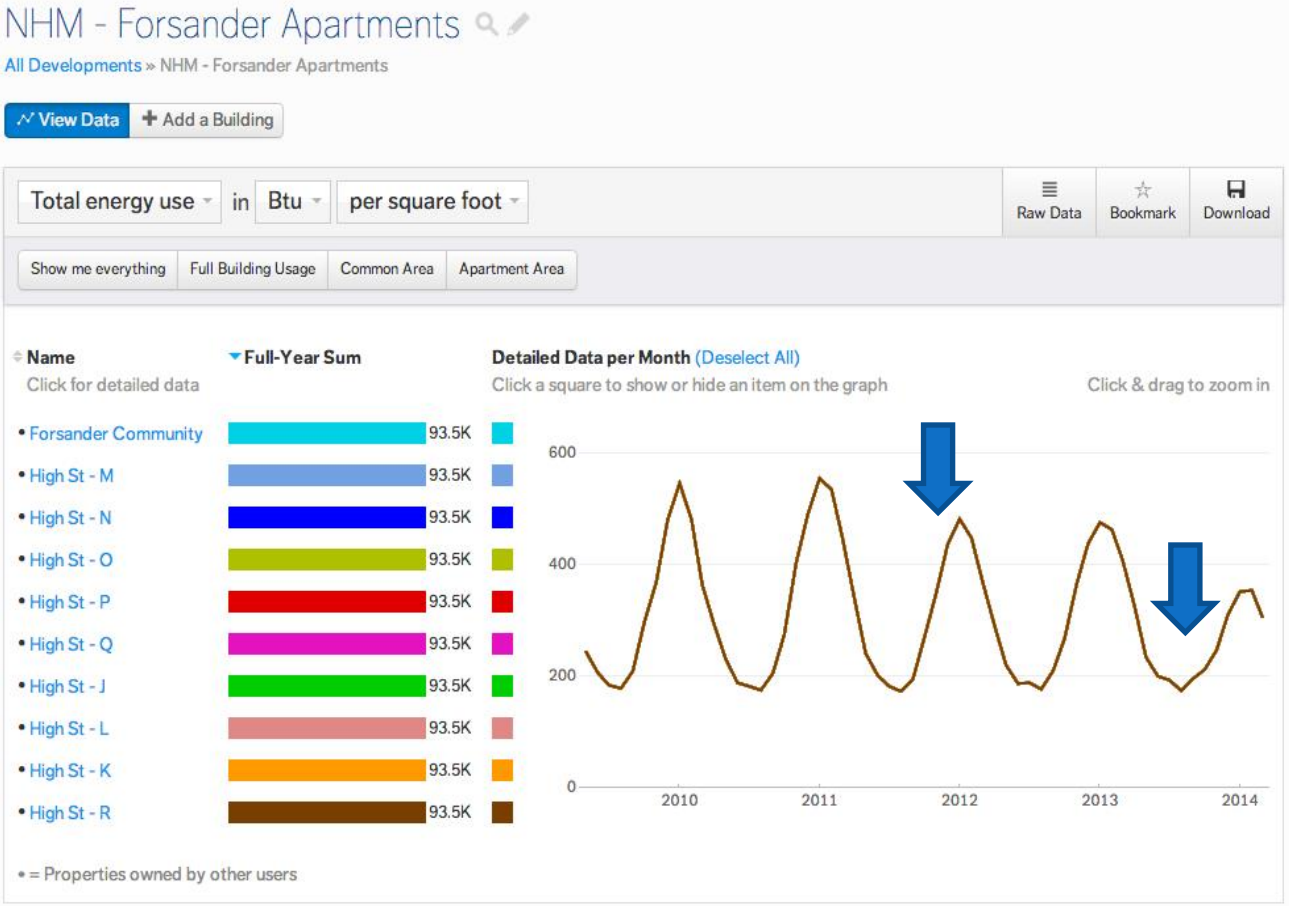
Major benefits to DHCD

- Enabled DHCD to identify top energy hogs within each fuel type (electric & gas)
- Vastly improves accuracy & timeliness of data
- Raw data can be downloaded into Excel and extracted for multiple uses
- Sophisticated analytics can separate heating-only energy – especially helpful for electric heat, which is indistinguishable on electric bill

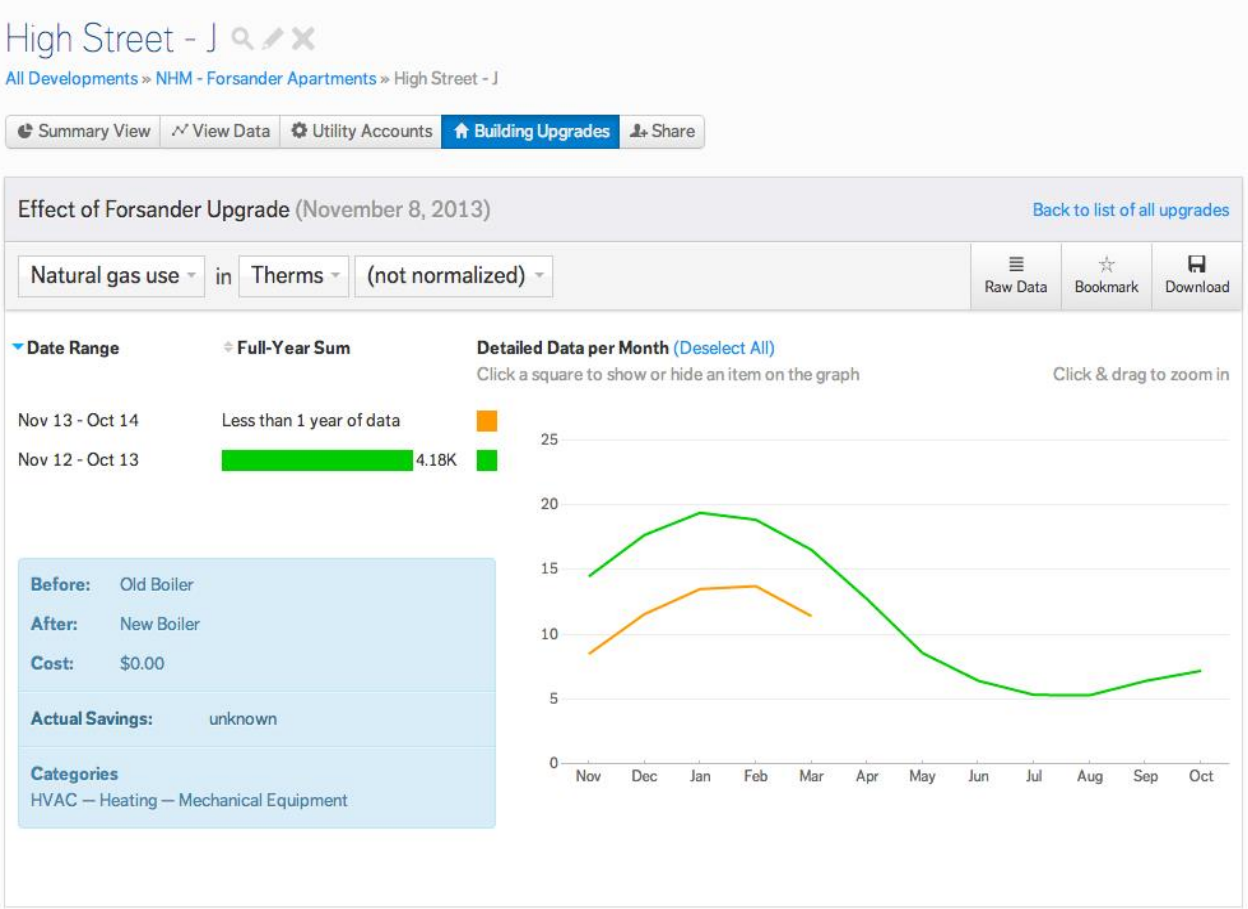
DHCD view of multiple developments



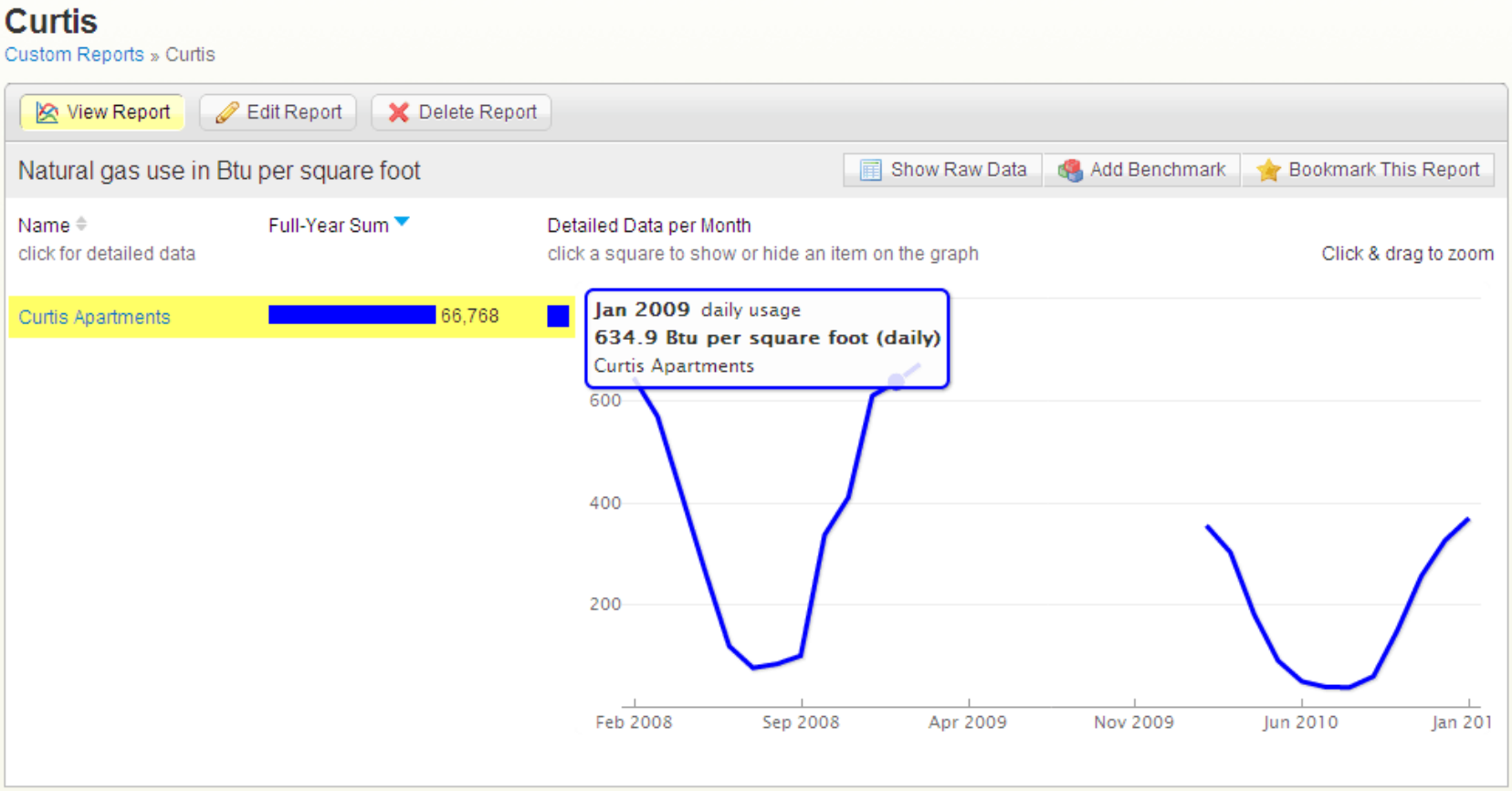
Sample: EE upgrades (lights & weatherization), then New Boilers



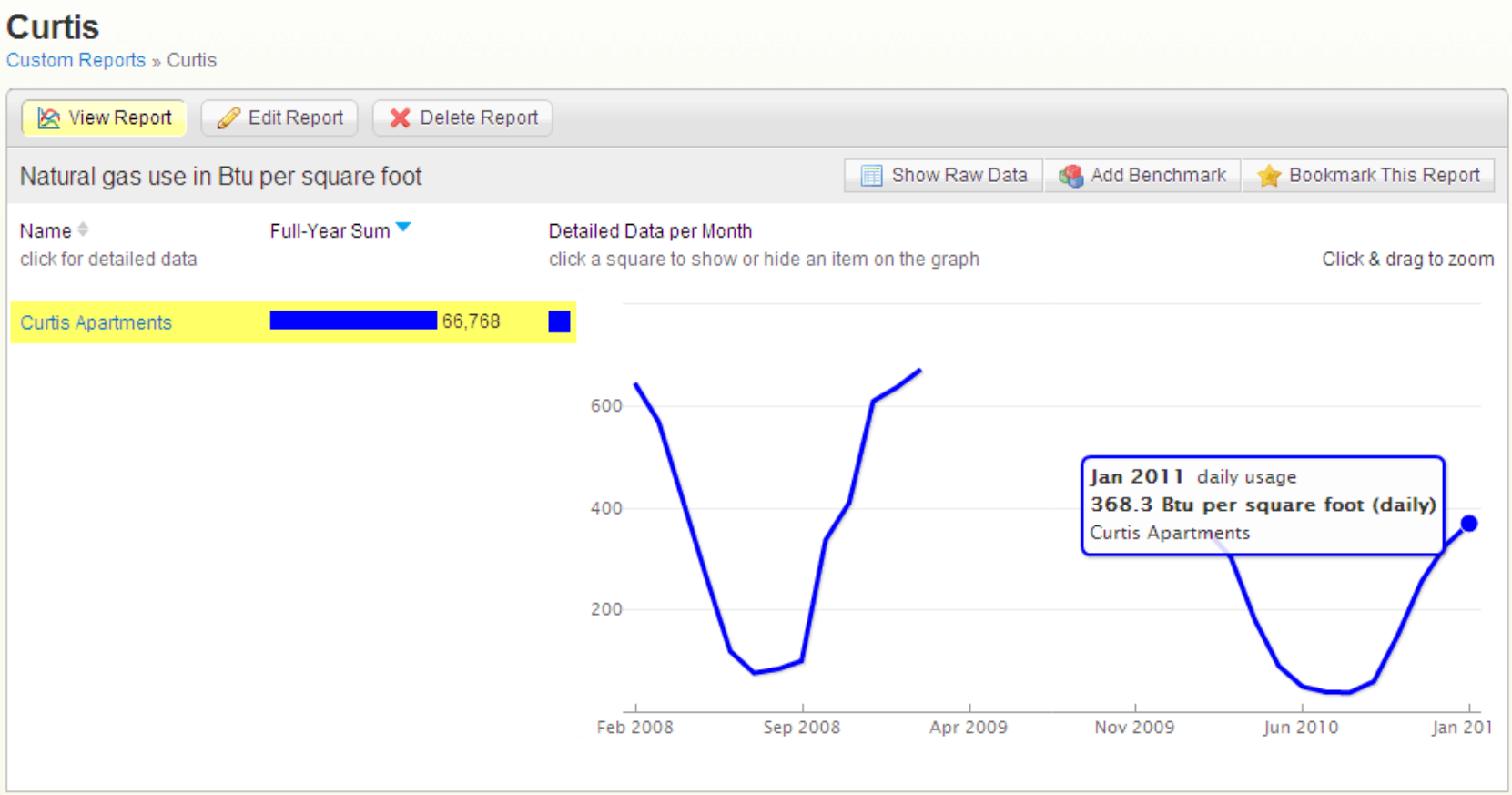
Project reports – year on year



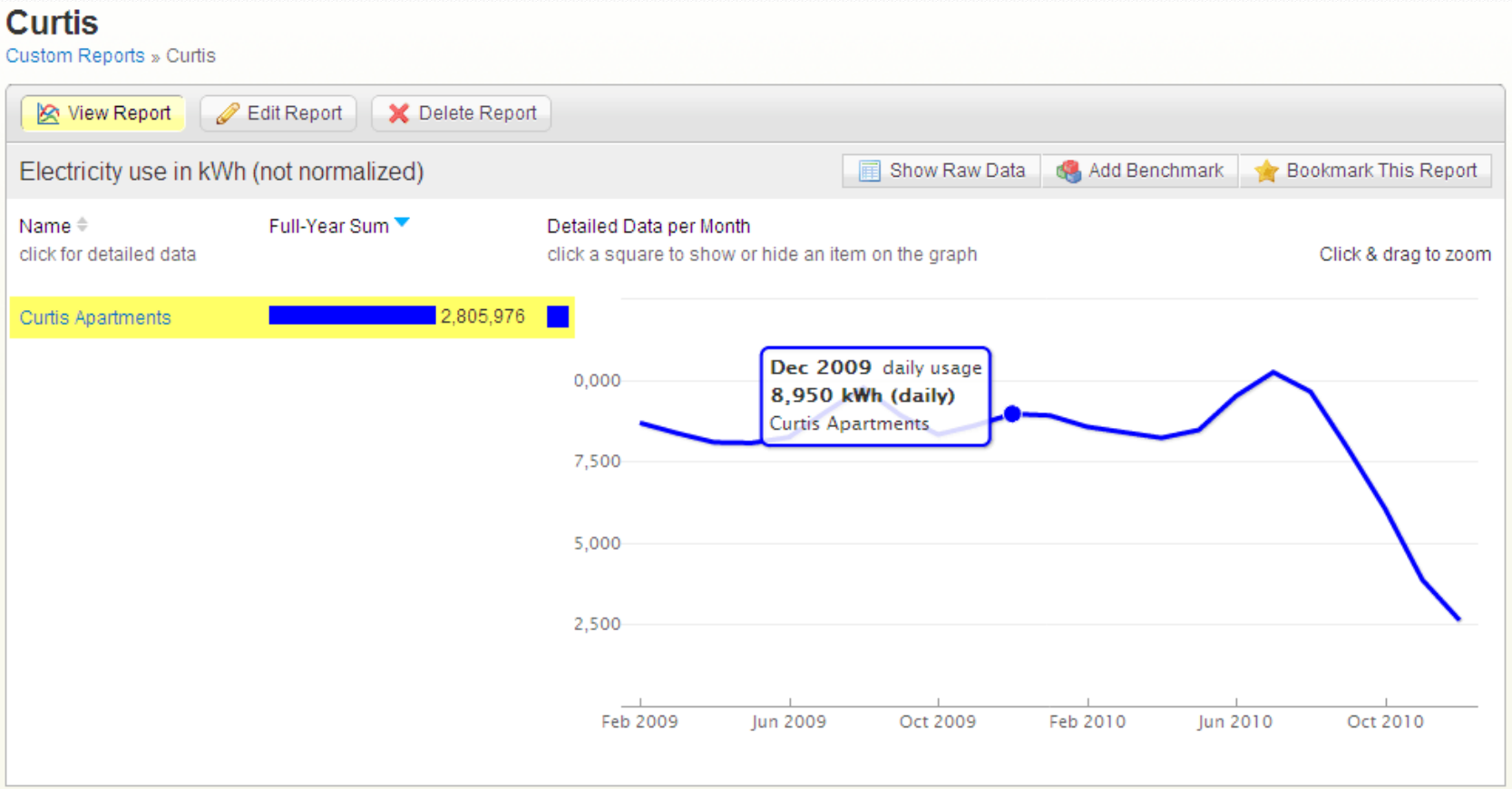
Cogeneration – Natural Gas



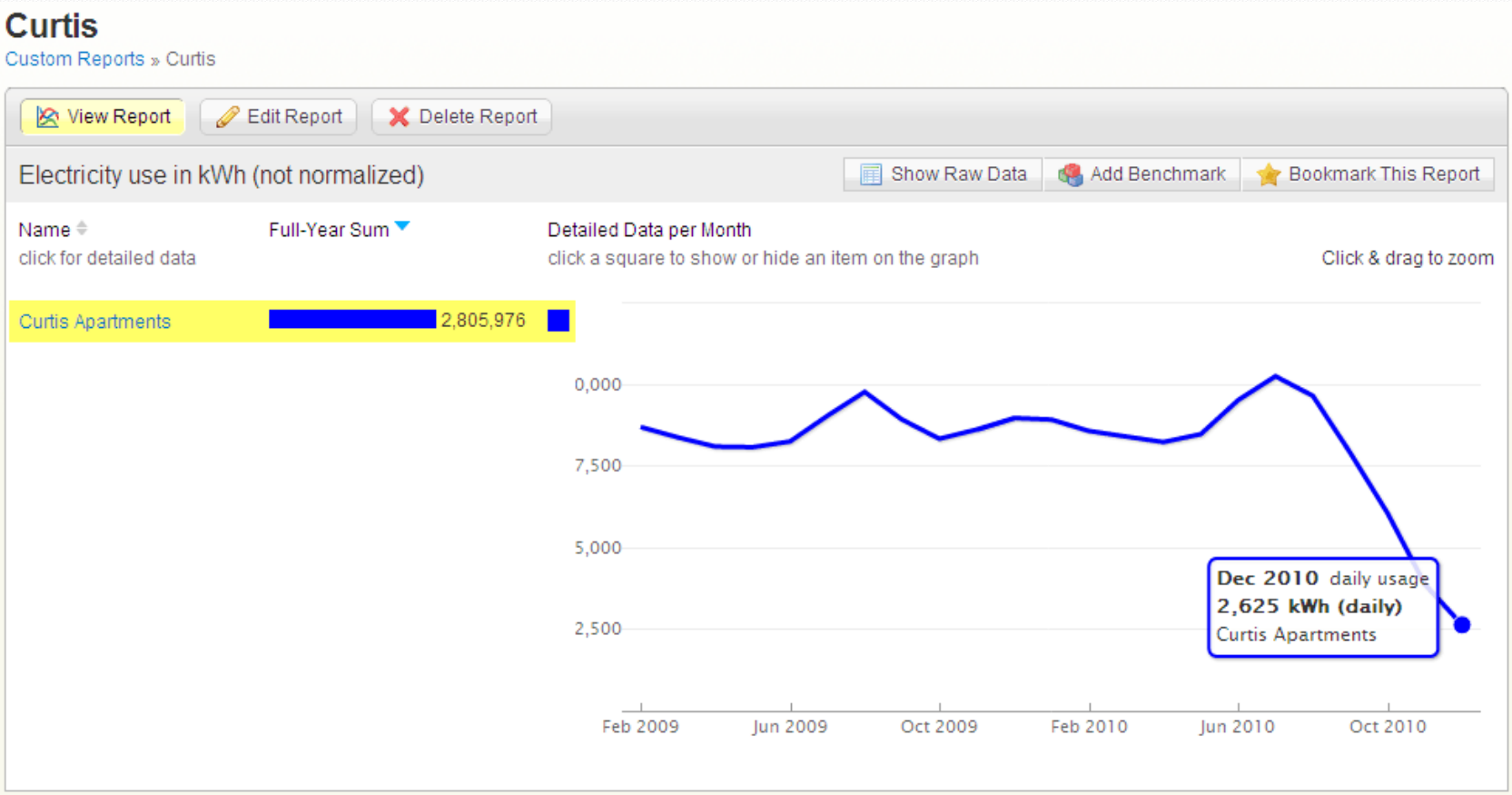
Cogeneration - Natural Gas



Cogeneration - Electricity



Cogeneration - Electricity



Next Application: SAPHIRE Renewables Demonstration Projects

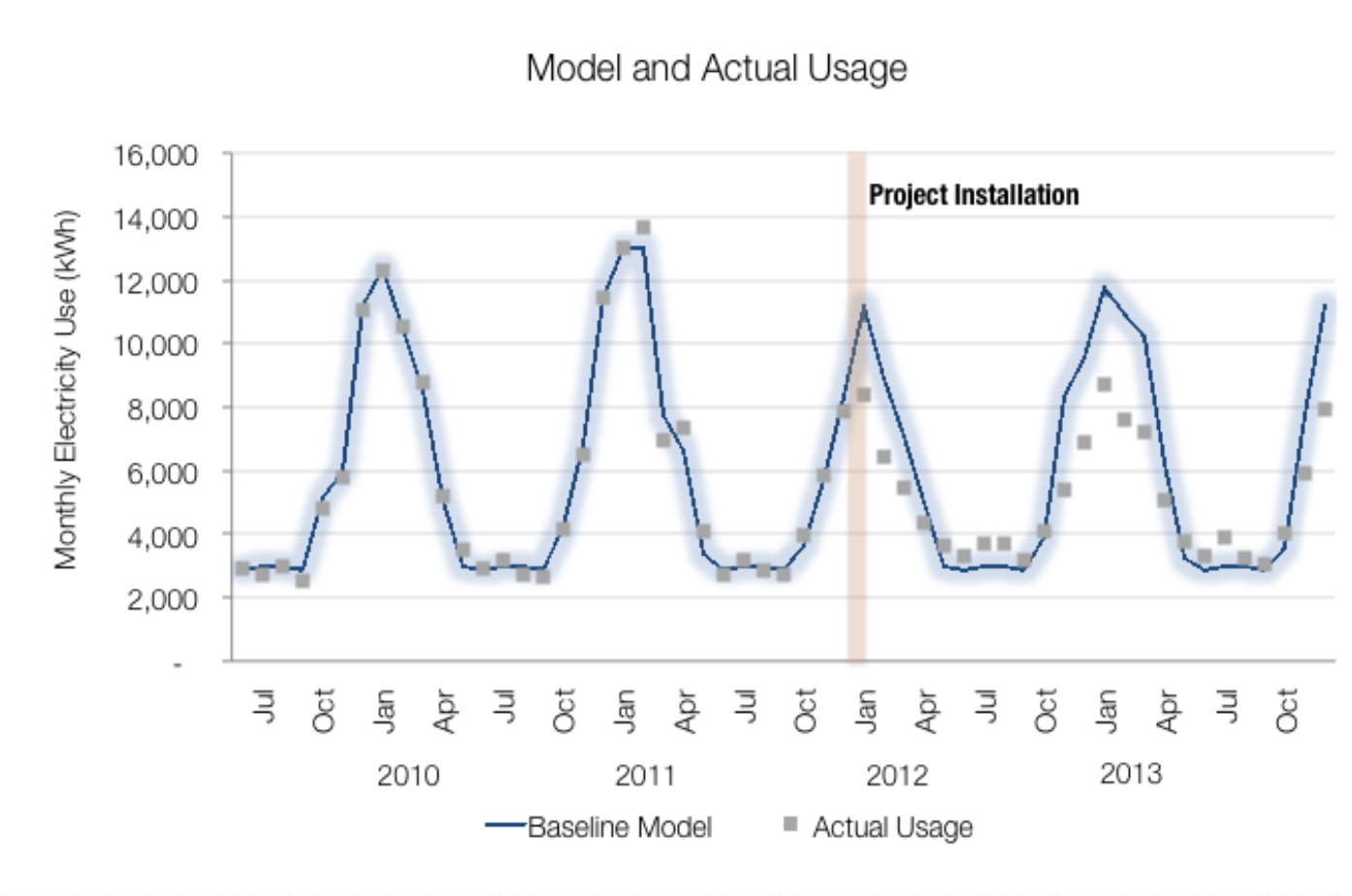
- SAPHIRE = *Schools and Public Housing Investing in Renewable Energy & Efficiency*
- Partnership with MA Dept of Energy Resources (DOER) led to $750,000 US DoE grant
- $2M capital grant from DOER for renewable thermal technologies
- $5M Qualified Energy Conservation Bond authorization hard to spend when utility funds so robust!
- DoE grant funding staff & technical analysis: software (WegoWise) & hardware (PowerWise)

Renewable thermal projects

- Air Source Heat Pumps
- Geothermal
- Solar Thermal/ Hot Water Panels
- Solar thermal /Hot Air – Replacing 30 yr. old. solar trombe wall with 21st century solar hot air panels
- Passive Solar new construction
- Biomass /Wood Pellets

WegoWise Measurement & Verification

Winthrop Air Source Heat Pumps



Ongoing Challenges in Energy Data Management

- WegoWise expensive for cash-strapped housing authorities at $200 - $600 per development; exploring batch download into state fiscal data base
- "Score" of BTU/SF can be misleading in prioritizing retrofits; some buildings have limited retrofit options
- Maintenance costs & $ savings matter more to HA managers than BTU and CO_2
- Still need to refine how to track non-regulated fuels (oil, bio-mass) and renewables

Thank you!

Debra Hall

Sustainability Programs Developer

MA Department of Housing and Community Development

100 Cambridge Street, 4th Floor, Boston, MA 02114

617.573.1185

Debra.hall@state.ma.us