U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Energy Efficiency in Correctional Facilities & Opportunities for State Energy Office Engagement

January 23rd, 2014

Molly Lunn

DOE's State and Local Policy & Technical Assistance Team

DOE's State & Local Technical Assistance

Priority Areas: Programs/Policies & Technologies

- **Resources**
  - U.S. Dept. of Justice *The Greening of Corrections*
    http://static.nicic.gov/Library/024914.pdf
  - DOE Solution Center *Energy Data Management portal*
    www.eere.energy.gov/wip/solutioncenter/data_management.html
  - DOE Solution Center *ESPC resource page*
    www.eere.energy.gov/wip/solutioncenter/performance_contracting.html
  - DOE Building Technologies Office *Commercial Buildings resources*
    www.eere.energy.gov/buildings/commercial/save_energy.html
  - Updated Solution Center resource portals for Programs/Policies and Technology Deployment live later this year
- **Trainings & Peer Exchange**
  - Upcoming Webinar – *Tapping New Markets for Efficiency: State Initiatives for Multifamily Housing,* next Thursday, January 30th
    www.eere.energy.gov/wip/solutioncenter/wip_events.html

How to Tap into These and Other TAP Offerings

- Visit the ***Solution Center***
  www.eere.energy.gov/wip/solutioncenter/

- Submit an ***application*** for assistance
  www.eere.energy.gov/wip/solutioncenter/technical_assistance.html

- Sign up for ***TAP Alerts***, the TAP mailing list, for updates on our latest and greatest
  TechnicalAssistanceProgram@ee.doe.gov

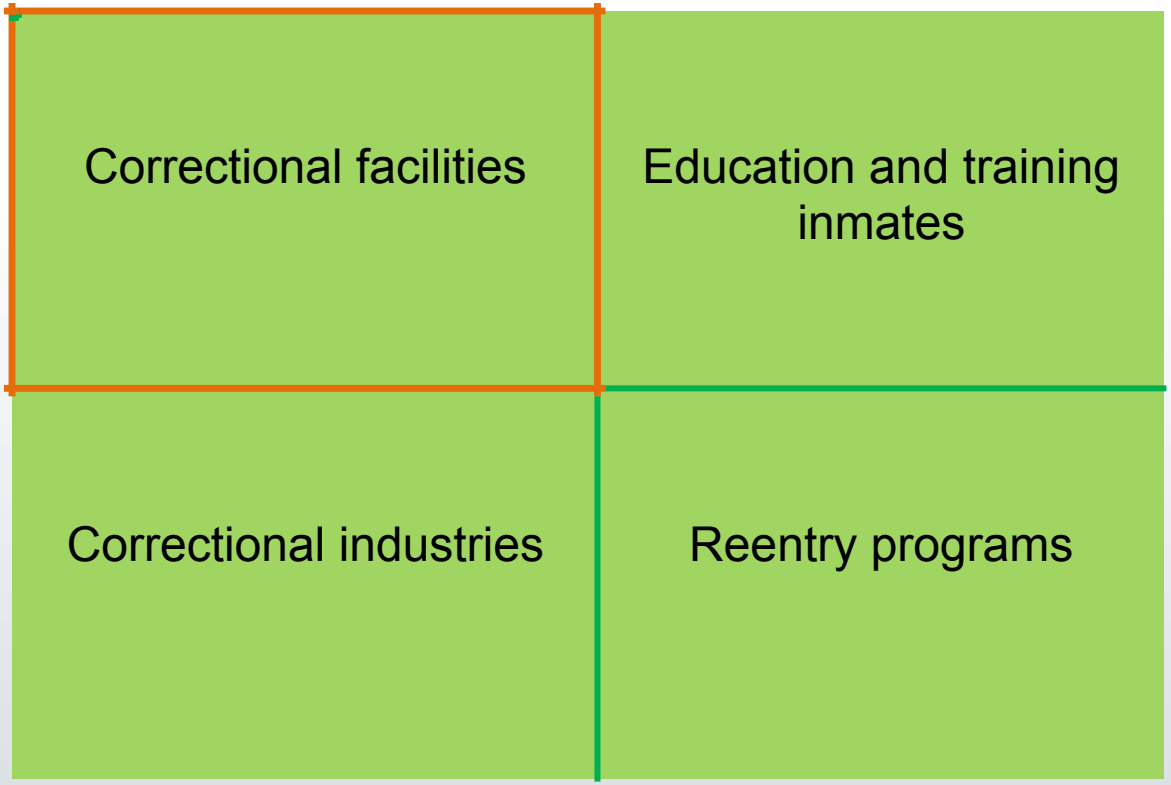
fhi360 THE SCIENCE OF IMPROVING LIVES

Correcting Energy Systems in Correctional Facilities

Stephanie Davison

January 23, 2014

The Greening of Corrections: Creating a Sustainable



National Institute of Corrections

Energy use
Correctional facilities VS Other facilities

Facility characteristics	Corrections	Hospital	Office
Population density	High density	High density	Varies
Population type	Limits on individual energy use; captive and controlled	High levels of individual energy consumption	Varies
Sanitation and health	High concern	High concern	Low to moderate concern
Security and safety	High concern (security level impacts energy use)	Moderate concern	Varies
Ability to measure energy use	Varies	Varies	Varies

U.S. Energy Use Intensity by Property Type. July 2013.

https://portfoliomanager.energystar.gov/pdf/reference/US%20National%20Median%20Table.pdf

ENERGY STAR® Portfolio Manager® Technical Reference

Broad Category	Primary Function	Source EUI (Kbtu/ ft2)	Site EUI (kBtu/ft2)
Lodging/ Residential	Hotel	162.1	73.4
Lodging/ Residential	Senior Care Community	243.2	125.7
Lodging/ Residential and Public Services	***Prison/Incarceration***	***169.9***	***93.2***
Public Services	Social/Meeting Hall	69.8	45.3
Public Services	Other – Public Services	123.1	78.8

What prompts correctional systems to start energy projects?

- Federal and state regulations
  - Governor's goals toward energy reduction
  - EPA review of facilities
- Shrinking budgets
- Major capital projects

Why state energy offices & correctional systems should partner

- Potential for major impact (energy and $$)
- Unique energy challenges / Need for expertise
- Wide range of potential projects
- Offender benefits

Common barriers to partnership

- Funding
- Security
- Staff and offender buy-in

Funding energy-saving projects

- Energy performance contracts
- Annual or multi-year capital budgeting
- Federal grants
- State legislative process

Characteristics of renewable projects

- Often require capital expenditures
- Monetizing benefits
- Multi-year initiatives
- May have ample space for large projects (i.e. solar)
- May generate funds

Characteristics of efficiency projects

- May be built in annual operating budget
- Benefits can only be measured/calculated if accurate baseline data is available
- May be completed in a shorter time frame
- May be implemented in multiple phases

Common energy efficiency projects in correctional facilities

- Heating / HVAC
  - Replacing boilers
  - General upgrades
- Lighting
  - Re-lamping
- Water
  - Replacing water heaters
  - Replacing appliances (i.e. laundry and dishwashers)

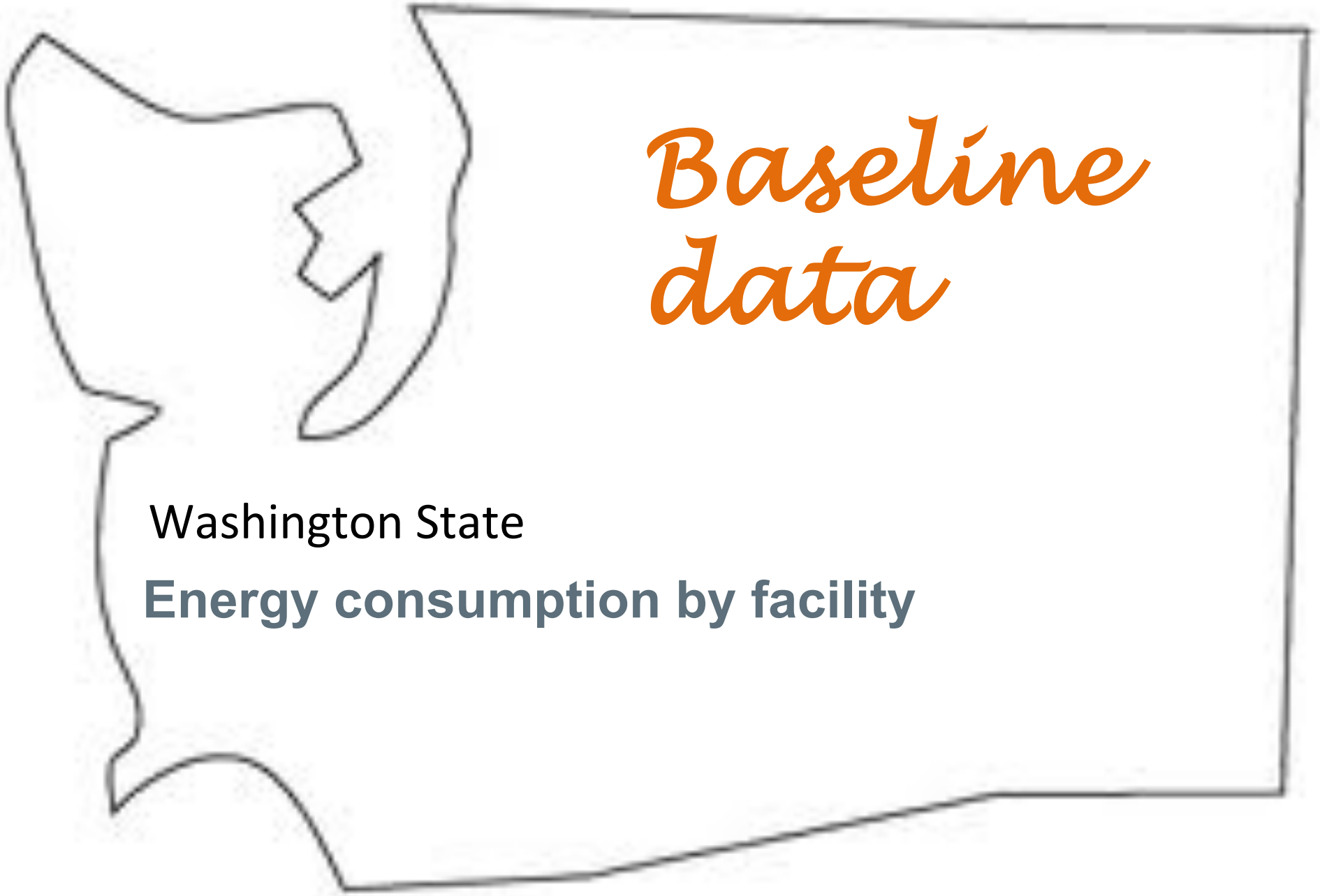
Sample: State Energy Saving Projects

California Department of Corrections and Rehabilitation

Facility	Energy Savings (kWh)	Utility Bill Savings ($/Yr)	Project Description
California Correctional Institution	430,116	$317,476	Boiler replacement projects (remove IV A/B from Central Steam Loop)
Corcoran State Prison	3,865,294	$261,574	HID lighting (2nd split), Phase 2 Energy Management System
North Kern State Prison	75,778	$6,062	Bulk lighting purchase
Correctional Training Facility & Salinas Valley State Prison	1,034,517	$361,780	Water heaters, boiler & lighting

Important elements of energy projects

Baseline data



Baseline data

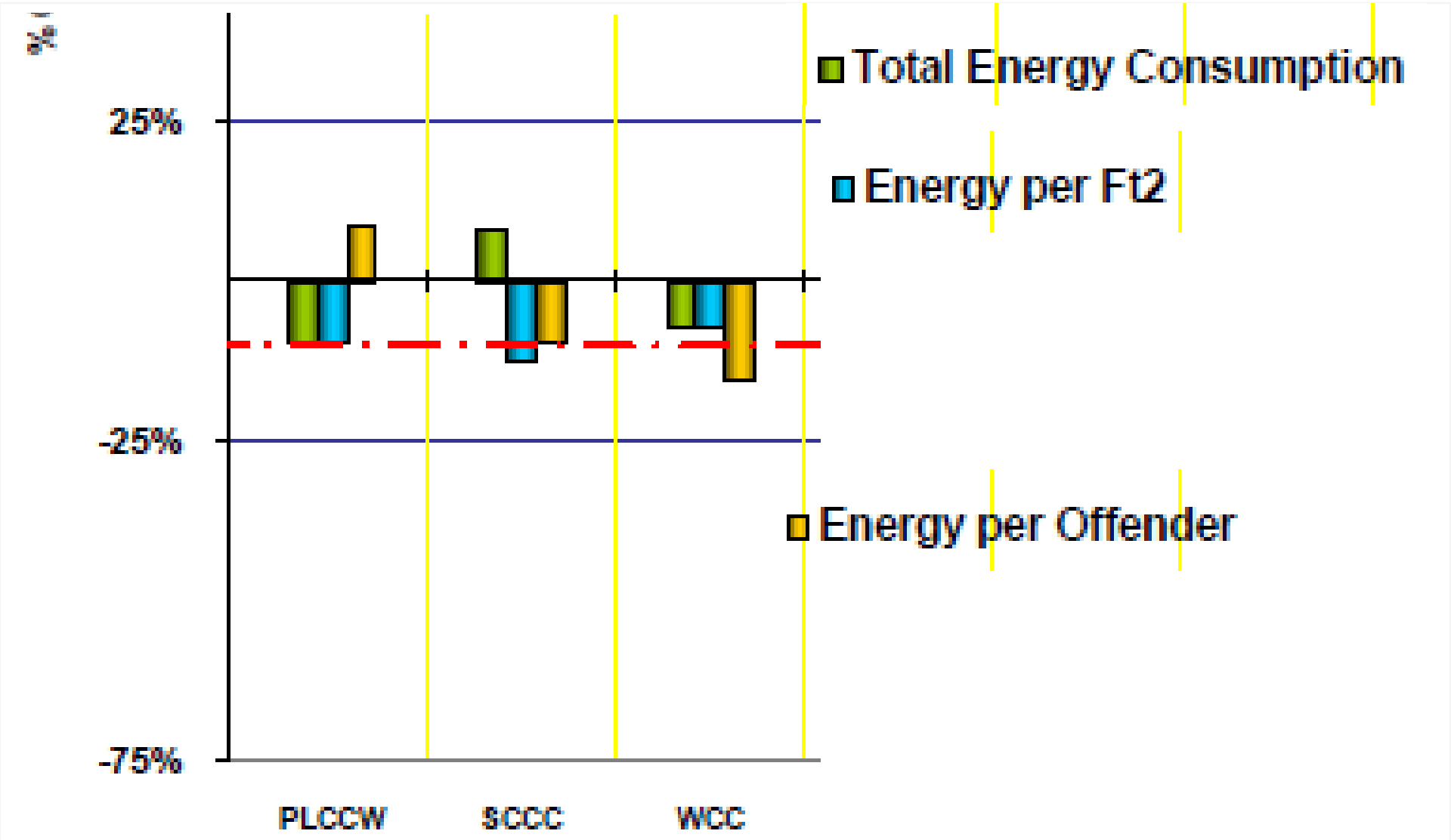
Washington State

Energy consumption by facility

Baseline data comes in many forms

- By facility
- Per square foot
- Per offender
- Other

Illustrates Progress for the Three Energy Measures Side-by-Side



Reasons for misleading data
(unexpected relationship between measures)

- Changes in offender population
- Changes in facility size
- Changes in activities (examples include trash-sorting/recycling; greenhouses; training programs)
- Energy tracking procedures

Important elements of energy projects

Offender and staff buy-in

Offender buy-in

- Use of facilities
  - Toilets, showers, etc
  - Windows
  - Cafeteria

Offender and staff buy-in

Maryland

Energy Consumption by Region and source; use of utility bills

Staff buy-in

- Operations
  - HVAC system
  - Recycling and water systems
- Analysis of data

Sustainable Green Corrections: Reducing Waste and Lowering Recidivism

Green Corrections Challenge
documenting best practices through a video contact

Green Corrections Symposium
sharing best practices and announcing Challenge winners

Green Corrections Innovation Webinars
featuring Challenge winners

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When Dollars and Sense Matter: The Alabama Department of Corrections' (ADOC) Project

Jennifer Young, ADECA Energy Division

Steve Brown, Alabama Department of Corrections

ADECA
Alabama Department of Economic and Community Affairs
Energy Division

DEPARTMENT OF CORRECTIONS

Background

- 2007 Correctional Needs Assessment
- Executive Order No. 25
- Energy Performance RFP
- American Recovery & Reinvestment Act of 2009 (ARRA)

The Odd Couple: A Relationship is Formed

- Evolution of the Relationship
- Two Diverse Visions
  - Mission-Driven (ADOC)
  - Green Solutions (ADECA Energy Division)
- Common Goals

Scope of Work

- Investment Grade Audit
  - Baseline energy costs
  - Condition of prisons
  - Energy reduction goals

- Upgrades and Retrofits Accomplished

Greening of ADOC

- The Energy-Efficient Retrofits included:
  - Lighting
  - Kitchen Equipment/Systems
  - Domestic Water Systems/Controls
  - Laundry Equipment/Systems
  - Plug Load Control
  - HVAC System Upgrades
  - Central Plant Measures/Boilers
  - Building Envelop
  - Solar Array
  - Computer Management Solutions

Financing Energy Upgrades

- Performance Contracting
  - Master Lease
  - ESCO Financing
  - Private Funding
    - ITB—Bond Index plus basis points
    - Private Placement
    - Certificates of Participation (COP)

Challenges

- ARRA Requirements
- Alabama Building Commission
- Security
- Guaranteed Savings
- Measurement & Verification
- Equipment Maintenance

Benefits

- Energy Savings
  - Projected at $7.4M annually
  - First year savings = $6.2M
  - Energy cost dropped 31.5% in first year

- Project Funding
  - Limited General Fund money
  - Only viable approach for large scale projects

- Decrease in Maintenance Expenses

- Increase in Comfort
  - Staff
  - Prisoners

- Replaced “Band-Aid” Fixes with Repairs that provide Long-Term Solutions

Conclusion

- Summary of ADOC Project
- Lessons Learned
  - Project scope is critical…know what you're buying
  - Timing issues…funding first
  - Guarantees…understand your responsibilities
- Comments & Questions

Thank you!

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DEPARTMENT OF CORRECTIONS

Creating A Cleaner Energy Future For the Commonwealth

DOER
Massachusetts Department of Energy Resources

Massachusetts Leading by Example

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Agenda

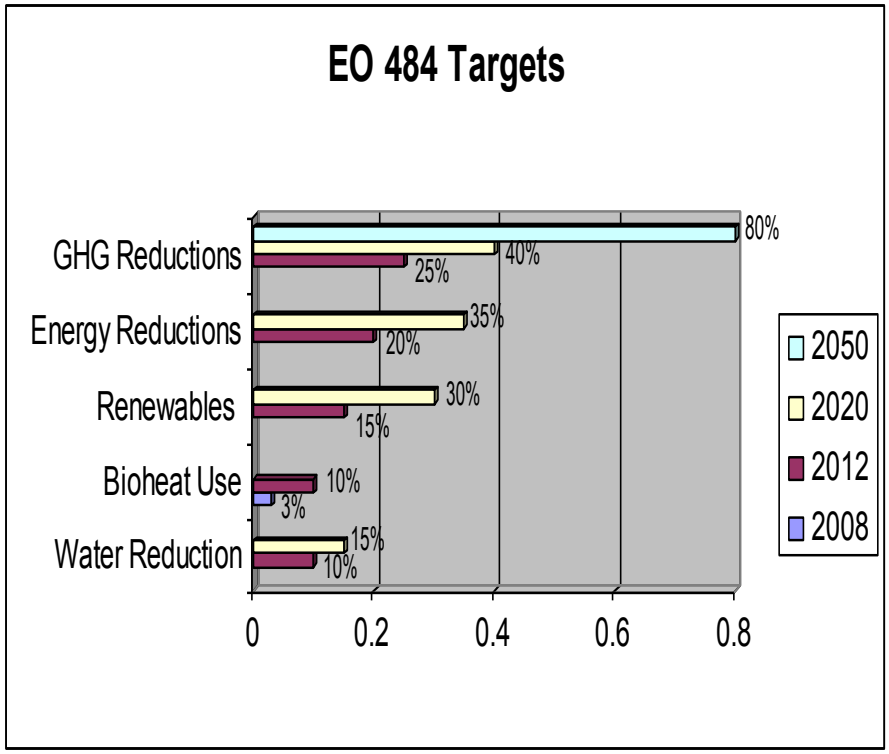
- **Leading by Example Program Overview**
- **Collaboration with DOC**
- **Massachusetts Dept of Correction (DOC) data in context**

Executive Order No. 484

Leading by Example—Clean Energy and Efficient Buildings

Issued April 2007 by Governor Deval Patrick

- Sets short, medium, and long-term goals for state agencies:
  - GHG emission reductions
  - Energy reductions
  - Renewable energy
  - Water conservation
- Requires all new construction to meet Mass. LEED Plus Standard
- Includes executive agencies, community colleges and university campuses, Trial Court



Leading by Example
Massachusetts State Government

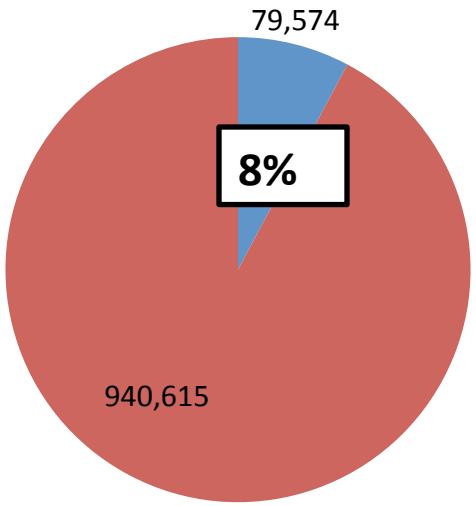
- 29 College and University Campuses
- Large office complexes,18 prisons, hospitals and health facilities, hundreds of small parks and highway depots, dozens of courts
- 80 million square feet of buildings
- 3,000 light duty vehicles
- 50,000 computers
- Thousands of electric and gas accounts
- 50,000 employees
- Consume over 1 billion kWh
- Emit over 1 million tonnes of carbon

LBE Program and Collaboration with DOC

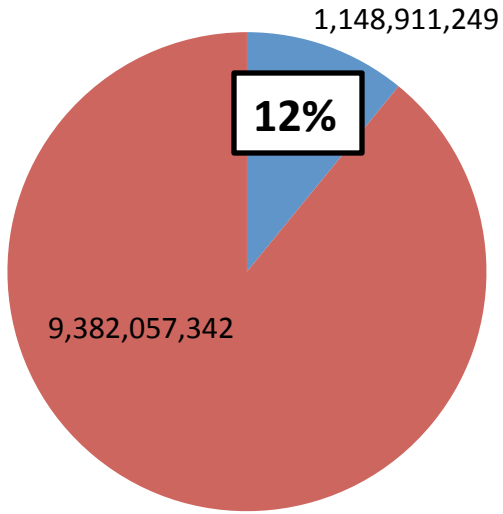
- Financing:
  - Clean Energy Investment Program
  - Project Grants
  - Utility vendor projects <$100,000
- Accelerated Energy Program
- Real-time Metering
- Other LBE efforts
  - Coordinating council
  - Data tracking and standardization
  - Guidance documents
  - Recognition/awards, Event coord, Legislative outreach

LBE: Data Tracking

FY2012 GHG Emissions (tonnes)



FY2012 TOTAL ENERGY USE (KBTU)



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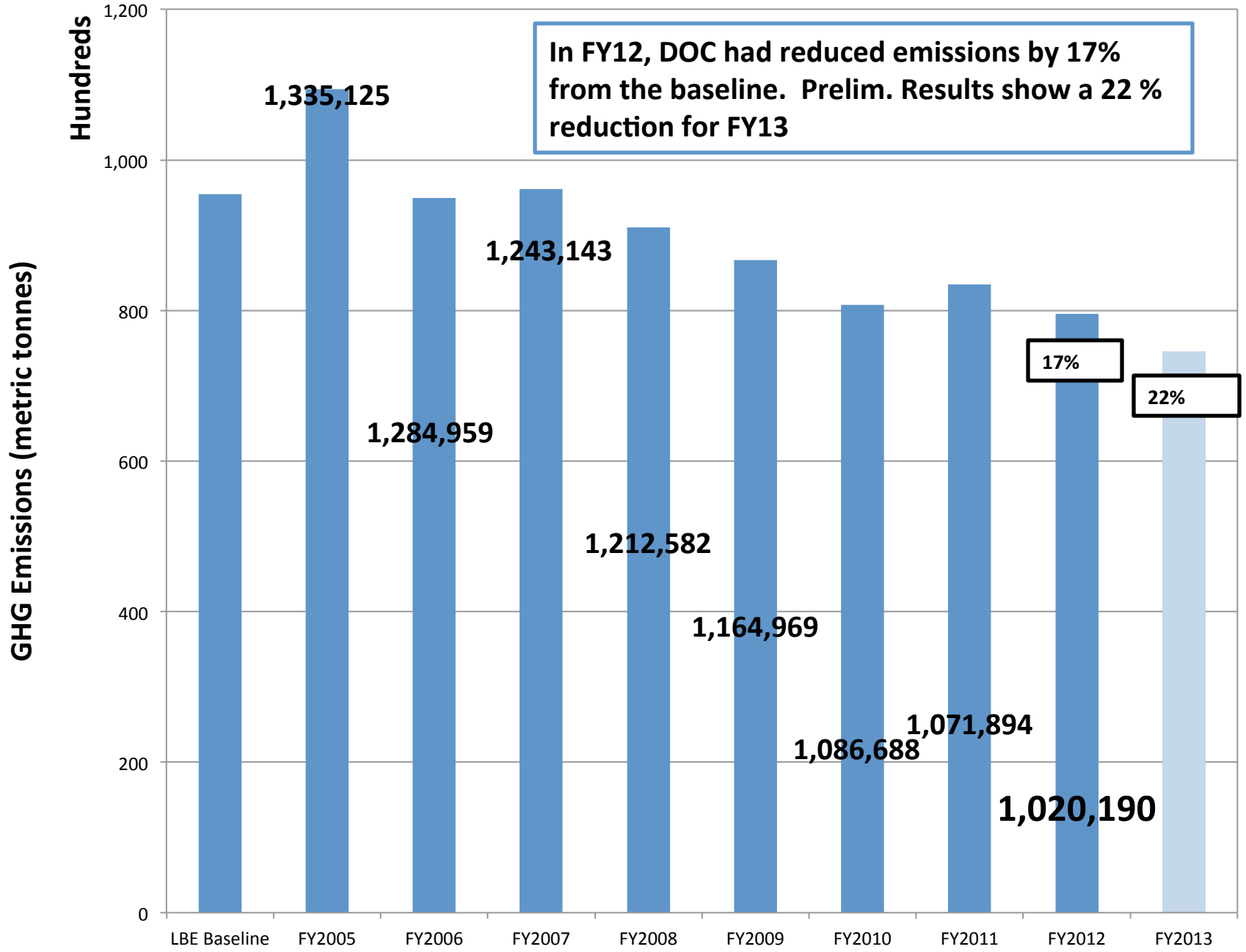
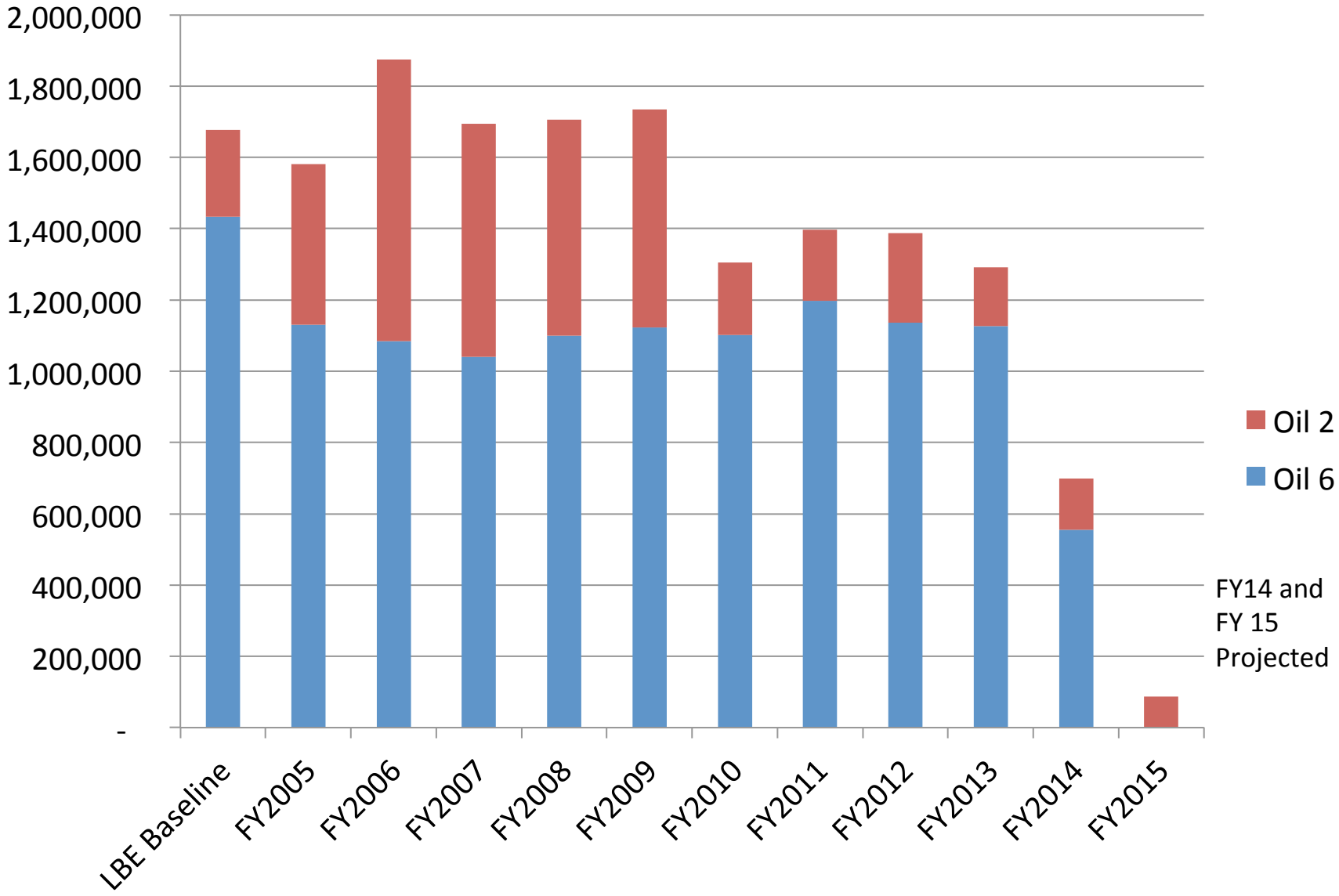
Massachusetts Department of Energy Resources

DOC GHG Emissions from LBE Baseline to FY2013



DOC Results – Oil Consumption (Gallons)



DOC Renewable Energy Data

- With over 1 MW, DOC has the most solar PV capacity of any executive branch agency, the second-most of all LBE partners
- In FY 12, DOC alone generated over 22% of the total solar PV electricity at LBE partner sites.
- In FY 12, DOC generated over 11.3 million kWh in clean on-site electricity through Combined Heat and Power and Solar PV.
- Numbers expected to increase this year with 3.3 MW wind turbine installation

Thank you.

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Creating A Cleaner Energy Future For the Commonwealth

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Massachusetts Department of Energy Resources

Commonwealth of Massachusetts
Department of Correction
Green Initiatives

- Energy Conservation Projects
- Lighting Retrofits
- Recycling
- Renewable Projects
  - Wind
  - Photovoltaics
- Four Projects Completed
  - One in progress
  - Two planned for future

The Beginning - 2000

- Trash/ Solid Waste Removal Review
- “Energy Police” – Internal Process
- LBE funding programs for Energy Savings
- Small Grants Application
- Exploring Large Scale Energy Efficiency

Recycling

- Department wide average about 50% (2012).
- Creative Funding Source Article 97 Legislation to Support Recycling/ Equipment.
- Areas of Improvement are Paper, Cardboard and Food Waste.
- Over the past 10 years, reduced annual waste generation by over 2,000 tons annually.

Energy Portfolio Review

- Fuel Conversion –Fuel Oil to Natural Gas
- Large Scale ESCO Work
- Cogeneration
- Photovoltaics
- Wind

Lighting Retrofits

- T12 to T8 Lighting
- Other Lighting worked tied into ESCO work
- LBE - LED bulb replacement
- Exterior and Perimeter Lighting –Utility Rebates
  - Sodium/HID to High Output LED
  - Security Issues

Benefits -Lighting Retrofits

- Estimated at DOC $300,000 annually
- Savings in labor – no changing lamps.
- Less bulb replacement – less inventory required.

Large Scale Solar Installations

- Two Phases
- 427 kW and then 608 kW
- Phase I Ground mounted and roof mounted
- Phase II Ground mounted tracking system and expanded existing roof mounted system.

Bay State Correctional 80kW

Output and Savings

- Total systems is approximately 1,035 kiloWatts
- Annual production over 2,480,000 kiloWatts hours
- Savings calculated at $280,000 per year
- Four systems track the sun increasing output by 20% annually

NCCI Wind Turbine Construction

- Two Turbines
- 3.3 Megawatts
- Vestas V82
- .65 mW each

Wind Turbines
Projected Annual Costs and Savings

- Annual North Central Correctional Institute (NCCI) electrical usage 3.898 mWh
- Annual Output from two turbines 9.467 mWh
- Projected Annual Savings – Electrical offset approximately $1,088K.
- Annual repayment of bond - $731K over 20 years
- Maintenance – after year 5- $130K to $200K per year
- Excess power value approximately $157K to $225K.
- Excess power to be credited to MCI-Shirley (Schedule Z)

ESCO Projects

- Energy Management Systems
- Lighting Upgrades
- Boiler Upgrades
- Installation of Cogeneration
- Better Control of systems

Low Pressure Boilers

Low Pressure Boilers

Norfolk & Cedar Junction Boilers

Combined Heat & Power (CHP)

Norfolk & Cedar Junction
Cogeneration units w/
heat recovery

Water Conservation

- Water System Failure in Norfolk, MA
- Installed backflow preventers, water conserving devices, water system upgrades.
- Savings of nearly 100,000 gallons of water use per day.
- Transfer of information to other facilities

Current Energy Conservation Projects

- Boiler replacement at NCCI, window replacement, other new equipment.
- Gas Turbine project at Bridgewater – installing an air chiller to improve electrical production and steam production – rebates cover about 30% of cost.

The Bottom Line

- Over 12 years electrical use reduction of nearly 65,000,000 kWh.
- Fuel Oil –replaced by natural gas - green house gas reduction.
- Water Savings – nearly 37,000,000 gallons per year.
- Costs savings – Recycling and Waste Diversion of nearly $1,000,000 since 2000.
- Continue to evaluate labor savings.

Comments and Questions

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