

Your Guide To Writing Your Agency Energy Management Plan

Use this document to guide you through the writing of your Agency's AEP. Ultimately, this document must be useful to you and your Agency, so modify it as needed to make sure that it works for you.

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I. Why Write An Agency Energy Plan (AEP)?

Requirement: Maryland’s law SB267 requires all state agencies to reduce their energy consumption 10% by Fiscal Year FY2010 based on a 2005 baseline.

- State agencies have complied with SB267 by engaging in large Energy Performance Contracts (EPC), and have reduced their overall energy consumption by 11.0 % in FY2013 from a FY2008 energy baseline.
- Maryland wants to continue leading by example, by moving beyond past savings to achieve a 10% energy reduction goal over a 2010 baseline by FY2020.
- State agencies can achieve this goal by targeting the thousands of energy consuming entities (ECE) such as non-LED lighting (interior and exterior), pumps/motors, fish hatcheries, etc. that were not included in past energy reduction projects.

A detailed Energy Plan is a necessity when trying to save energy in the many small buildings and stand-alone energy consuming devices not included in previous EPC¹. All of your agency’s buildings will have to be identified, described and categorized as to their type(s) and amount(s) of energy consumed and their potential for becoming more efficient. Once this list is complete, budget and procurement strategies will have to be identified. An annual consistent effort outlined in a well written plan is a necessity for your agency to be successful in achieving any energy reduction goal.

II. Introduction to Writing Your AEP

Over the past several years the Department of General Services (DGS) and the Maryland Energy Administration (MEA) have worked with many state agencies to help them create their Agency Energy Plans. Although these efforts have resulted in Energy Plans with varying levels of completeness and usefulness, the state as a whole has been able to reduce its energy use by 11%. We were able to accomplish this laudable mark because agencies embraced the EPC model. The State did two things to make EPCs available to agencies:

- DGS established an Indefinite Delivery Contract (IDC), which made pre-approved Energy Service Companies (ESCO) available to agencies, and
- The State Treasurer created a financing mechanism for agencies undertaking an EPC. These EPCs have made it relatively easy for an agency to move forward with energy saving goals despite lacking a comprehensive Energy Plan.

Agencies have undertaken many EPCs since the early 1990’s which have touched hundreds of state-owned buildings, outdoor lighting, pumps, etc. But the state owns many more buildings, **thousands of buildings**, that were never touched by an EPC. Previous successful efforts with EPCs suggest that we are wasting energy in these untouched buildings. Moving beyond EPCs to work on these many, smaller

¹ If your Agency has participated in an EPC, then this AEP becomes a continuous improvement mechanism to maximize your Agency’s energy efficiency through social behavioral changes and the continuous “retuning” of your energy consuming equipment.

projects will require agencies to manage the process through completed Energy Plans that have a renewed focus on these “leftover” opportunities. Agencies will need to be more “hands-on” with these smaller projects and will need to have a clearly defined set of goals.

We cannot manage what we cannot measure, one of the first things you as an Agency Energy Coordinator (AEC) will be asked to do is to create an inventory of buildings and other stand-alone energy consuming entities (ECE) owned by your agency². **As the Agency Energy Coordinators (AEC) you have been given the responsibility by the head of your agency to produce an Agency Energy Plan. As a result of the new administrations initiative to have plans completed by all agencies in the State of Maryland.** DGS will provide you with a template for creating the inventory otherwise known as the ECE Table (See page 9). The inventory will include such things as building size, location, year built, etc. You will then use either your agency’s internal documents or the State Energy Database hosted at DGS’ website to assign past energy data to that building. DGS will take your inventory data and develop an Energy Use Index (EUI) for each building. An EUI is simply a measure of how much energy a building uses annually per square footage of the building. The EUI can be used to compare it to other similar buildings. Once that comparison is made, buildings can be prioritized for energy retrofits and energy projects.

III. Who Should Write an AEP

Agencies that own and control buildings and other ECEs should use this template for creating their AEP. Agencies that lease space and do not pay utilities in their Agency name will be addressed through a different State mechanism. This template focuses on planning for and implementing actual energy efficiency projects for your buildings and ECEs. This template should include your policy on education, training and behavioral changes that can be implemented by your Agency. Behavior modification examples are located in green highlights in Appendices A-B.

If agencies need assistance with completing their AEP, please contact Randolph Wilson, the current DGS Energy Administrator.

² An ECE is any stand-alone energy consuming device that uses energy inside or outside of a building. Examples include parking lot lighting, ball field lighting, wastewater pumps, etc.

IV. Target Dates

May 13, 2016 Cover Sheet and Agency Team Table Completion by Interns and All AECs are initiated.

May 16, 2016 Start ECE Table (**Only Inventory of Buildings and ECE Sites Due**).

June 6, 2016 All Utility Accounts, Meters and Locations are added to the Corresponding Building and ECE Sites (**Input into the ECE Table**)

June 13, 2016 Energy Conservation Measures are contributed to the plan by Engineering/Maintenance Staff

June 20, 2016 Develop Utility Graphs utilizing BL-26 ECAP

June 27, 2016 Maintenance stakeholders contribute Impact of Maintenance on the Energy Program

July 14, 2016 Develop Executive Summary

July 18, 2016 Agency Energy Plan Completed & Due

V. Template for Your Agency's Energy Plan (AEP)

This template was created by the Maryland Department of General Service's Office of Energy Performance and Conservation (DGS) and the Maryland Energy Administration (MEA) to assist you in developing your own AEP. The AEP is expected to be written in stages as information (such as energy audit results) becomes available. Based upon your State Agency's need, DGS can offer you technical assistance utilizing engineering consultants or "contractors" to identify cost effective, energy saving strategies unique to your Agency. An Indefinite Delivery Contract (IDC) established by DGS is available for agencies to procure short listed ESCOs to perform small EPCs (< \$2M) and large EPCs (>\$2M). Additional financing for projects are available through MEA's zero-interest State Agency Loan Program (SALP). Your AEP should be thought of as your Agency's long-term plan to achieve your agency's energy savings goals.

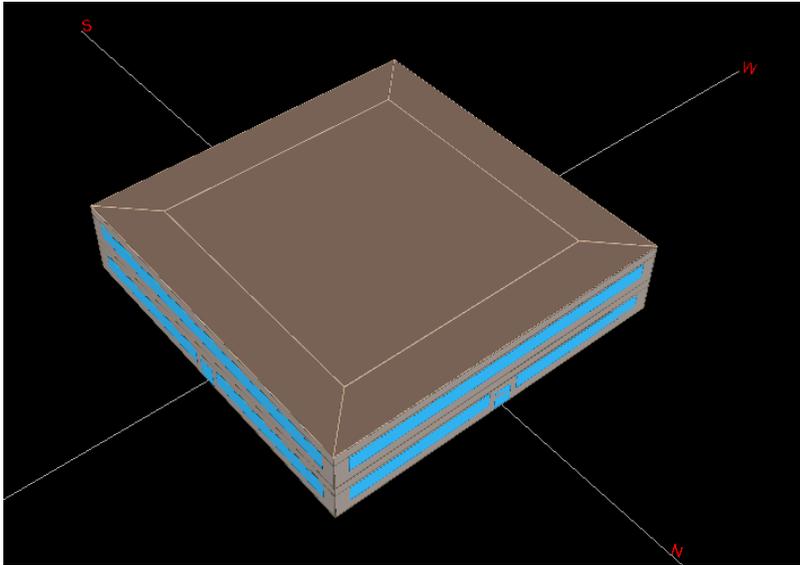
My name is Randolph Wilson and I am your state energy coordinator. I will be one of your state resources and my information can be found below:

Randolph Wilson
Energy Administrator
Department of General Services
301 W. Preston St., Suite 1405
Baltimore, Maryland 21201
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[410-767-4439](tel:410-767-4439) (office)

Let us continue to be guided by the principle of "Changing Maryland for the **Better**" for the citizens of Maryland.

[Insert Agency Name Here] Energy Plan and Instructional Outline

[Insert Agency Logo/Graphic Here]



[Place Agency Headquarters Name and Building Address Here]

A. EXECUTIVE SUMMARY

The executive summary should include how your agency uses energy and what types of energy are used. You should lay out in broad detail how your agency plans to achieve a 10% energy savings goal by 2020. Include the following sections in your write-up. This section should be written after all other sections are completed.

B. AGENCY MANAGEMENT TEAM

Individuals from your agency who will be involved with the Agency Energy Plan will be categorized as your “Agency’s Management Team”. Aside from your Agency Energy Coordinator your management team will most likely consist of individuals from fiscal/accounts, maintenance, and the facility operations department. Anyone in the agency who works in a department that will provide pertinent information in assisting the development of the project will be an influential part of your Agency Management Team. Each individual involved with the plan should list in a table their Name, Role (position) , Phone Number, Email address and Role or Function on the team. Right click on the hyperlink below to utilize the Agency Management Team template and click on the “Open Hyperlink tab” to utilize the table.

<http://dgs.maryland.gov/Documents/energy/AgencyManagementTeamTable.xls>

C. AGENCY ENERGY CONSUMING ENTITIES ARE ENERGY USERS.

Energy Users: An Energy Consuming Entity (ECE) is a State building or any system that consumes energy. An ECE can be anything from a building/parking lot to a traffic light or leased space. In this plan, your ECEs are summarized in a tabular form called an ECE Table. You will find an example with instructions on how to build your ECE table by utilizing the hyperlink below. Your ECE table is an inventory of all Agency buildings and sites that consume energy for your Agency. Once you have completed the table, Section D will require you to identify the most significant energy conservation measures (ECM)³ that your Agency can pursue. DGS will help you establish a list of ECM for each site. An Agency’s ECEs may include recently completed, ongoing, and future projects. Right click on the hyperlink below to utilize the Energy Consuming Entity Table template and click on the “Open Hyperlink tab” to utilize the table.

http://dgs.maryland.gov/Documents/energy/ECE_Table_Instructions.pdf

http://dgs.maryland.gov/Documents/energy/ECE_Blank_Table.xls

DGS can assist each Agency in establishing energy reduction goals.

D. EVALUATION OF ECE FOR POTENTIAL RETROFITS

Create a narrative for each ECE detailing its current state and its energy saving potential. Results from energy audits can be used to fill in these plans. Initial evaluations focus on low cost, high payback initiatives. Include budget and procurement strategies and a timeline for each project if it is available. Each mini-plan should be limited to a few paragraphs and can be

³ An energy conservation measure (ECM) is any type of project conducted, or technology implemented, to reduce the consumption of energy in a building.

inserted into this section. Tables can also be used to express ECMs. Use the following resources and tools to assist you:

1. Use ECE table results you compiled.
2. Use Appendices A through C of this template so you can begin to develop individual plans for retrofitting identified energy conservation measures.

Indicate no cost/low cost ECMs for immediate action your Agency can undertake with policy changes to include behavior modifications and establish medium to long range ECMs.

If agencies recognize bundled ECMs during self auditing, then request Energy Performance Contracting⁴ support from DGS for medium and long range or bundled ECMs.

Discuss leased space that may not be metered since each State Agency, acting as the tenant, is usually responsible for any estimated utility cost for space use. The state is renegotiating leases as they come up for renewal to require utility meter placement into the states name. Agency's energy database will require an update to reflect this change. This could impact your Agency energy usage with an increase in energy usage or energy decrease from the elimination of the space.

E. EXAMPLE OF AN ECM FOR AN INDIVIDUAL ECE

Existing Conditions: (Data from a free energy audit provided through MEA). The Visitor Center at Falls State Park is a 4,800 square foot building built in 1978 that consumes 42,000 kWh of electricity and 1000 therms of natural gas annually. The HVAC system is a 6 ton Trane air source heat pump and there are 2-50,000 BTU natural gas suspended space heaters in the display hall. Water heating is provided by an 80 gallon natural gas storage tank. There are 20-four foot two bulb T-12 fluorescent light fixtures, six exterior 150W incandescent floods, six 250W high pressure sodium parking lot lights, 23 halogen pendant lights, and various incandescent desk lamps.

Proposed Retrofits: An energy audit has identified several energy conservation measures that are estimated to save 12,000 kWh and 600 therms of natural gas annually.

1. Replace existing 17 year old heat pump with two multi-split ductless heat pumps
2. Remove existing natural gas space heaters
3. Turn off all lighting in appropriate spaces during unoccupied hours (immediate action)
4. Replace existing 12 year old natural gas water heating tank with natural gas tank-less model
5. Have IT place all computers in automatic shut-down mode (immediate action)
6. Replace all T-12 fixtures with T-8 fixtures or LED lamps
7. Replace all halogen lighting with LED lighting
8. Replace bulbs in incandescent desk lamps with CFL bulbs
9. Replace parking lot lighting with LED lighting
10. Replace exterior floods with CFL bulbs
11. Install motion detectors for interior lighting
12. Install dusk to dawn switch on exterior lighting systems
13. Increase insulation in attic and air seal as appropriate.

⁴ Energy Performance Contracting is an innovative financing technique that uses cost savings from reduced energy consumption to repay the cost of installing energy conservation measures.

Timeline: Gun Falls Park is third on the list of buildings needing retrofits and the park expects to perform retrofits in FY2016.

A second example was used by a creative Agency to simplify the above process. Please see below:

EXAMPLE OF AN ECM FOR AN ECE			
ECE (Building or Leased space)	Address, City/County and Zip Code	Leased or Owned	Size (Square Footage)
	1790 Westwood Drive, Salisbury, MD 21804	Owned	20,000
Quantity	Energy Users	Quantity	Energy Users
174	4 Tube 32W t8 4100k Light Fixture	2	Desk Lamps
84	2 Tube 32W t8 4100k Light Fixture	2	Water Cooler / Heaters
3	2 Tube 21/26DTT Light Fixture	2	Vending Machines
120	Desk Lamps Tube F21T5 4100	1	Coffee Pot
10	26 Watt compact fluorescnet Bulbs	1	Laminator
17	400 m Metal halide outside parking lights	1	Overhead Projector
15	100 m metal halide outside wall lights	1	Desktop Projector
2	26/42TRT outside wall lights	16	Portable Fans
4	70MH outside main entrance FWC3210	10	Radios
3	250 MH outside main entrance ceiling	3	Fax Machines
153	Monitors	3	Fax & Scanner Machines
89	CPU'S	1	Auto Ctr/2 Flat TV's and Smart Board
68	Laserjet Printers	1	TV
13	Scanner,Fax, Printers	2	VCR's
2	Copiers	1	Mailing Machine
2	Laber Top Standion	1	Mail Opener
5	Refrigerators	2	Shredders
4	Microwaves	1	Electri Hole Punch Machine
2	Weil Mclein Boilers 500Btu @20 years	2	Reciprocating Chiller 300T @ 20years
1	2Cell Cooling Tower 700T @ 9 years		

Note: Unlike the first example, this Agency was focused on identifying energy consuming entities across their entire portfolio of buildings. This table represents an ECE location with all of its potential ECMs listed in the table. This comprehensive method can be very time consuming to accomplish so larger agencies may want to list only the most significant energy conservation measures at each location.

F. ENERGY DATA & AGENCY WIDE ANALYSIS

- 1. Energy Data:** All Agencies must report their total energy use to a statewide energy database hosted by EnergyCap (web.energyCap.com). All utility bills, invoices and third party supplier invoices for metered ECE should be sent to the State’s Energy database subcontractor, Bith Energy Group.⁵ Access EnergyCap, by requesting a username and password from DGS Energy Database Program Administrator, Emily Soontornsaratool (emily.soontornsaratool@maryland.gov). The login box for the website is featured below:

©2013 EnergyCAP, Inc. Version:3.1.5.15994.73

- a. Utility Bills:** Bith Energy automatically sends out a quarterly missing bill report to your Agency. Utility data should include, but not be limited to the following commodities; electricity, natural gas, propane, fuel oil, water, steam, chilled water, and hot water usage and cost. Include diesel fuel data from your backup generator(s) but do not include fleet vehicle fuel.
- b. Quality Control:** Perform a line by line comparison between the EnergyCap database and your ECE (including real property, leased space, sites, etc.) to ensure all ECE sites match up with corresponding meters and locations. Each time a meter is changed in your Agency, please notify Bith/DGS. Devise a quality control plan to verify correct data and details of meter locations and changes⁶.

Complete utility bill information and quality control of your “metered energy” will make it easy for DGS/MEA to help you establish your FY2010 energy baseline (period from July 2009 to June 2010) and compare energy usage below.

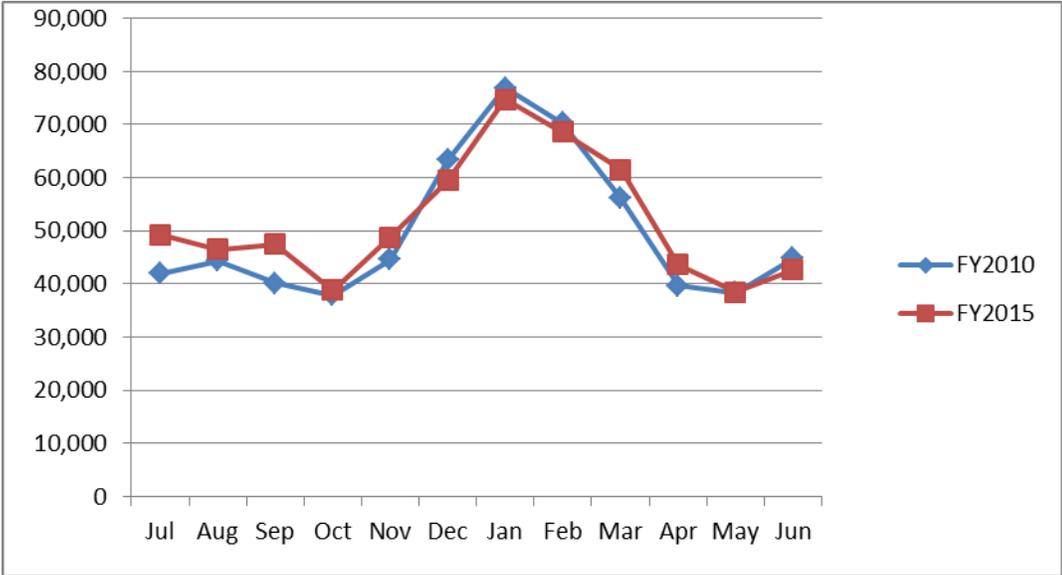
- 2. Energy Use Summary:** Use EnergyCap to graph energy usage for all owned and leased Agency ECE by commodity. The AEP is meant to be a “living document” that is updated annually. Graph and use utility data by following the steps outlined in Appendix D. The AEC must find resolutions and explanations for unsubstantiated wasteful energy usage by their Agency. Examples below create energy questions depicted by energy data and graphs.

⁵Bith Energy Group, 113 West Monument Street, Baltimore, Maryland 21201, Telephone: (410) 962-1188 x35, Fax: (410) 962-6535, Email: info@bithenergy.com

⁶ Once notified, a record of the change and date each change was verified will be recorded into the EnergyCap database by Bith Energy Group and DGS.

- a. **[Total Energy Analysis Example]** Each agency should briefly describe why the total annual energy commodity (utility) increased or decreased.
 Example: The graph below indicates energy usage decreased in FY2015 compared to FY2010 baseline year. Heating requirements impact this Agency more than cooling needs. The total energy graph indicates much higher energy use during the heating season. AEC should focus on improving energy efficiency with respect to heating equipment and their operating procedures.

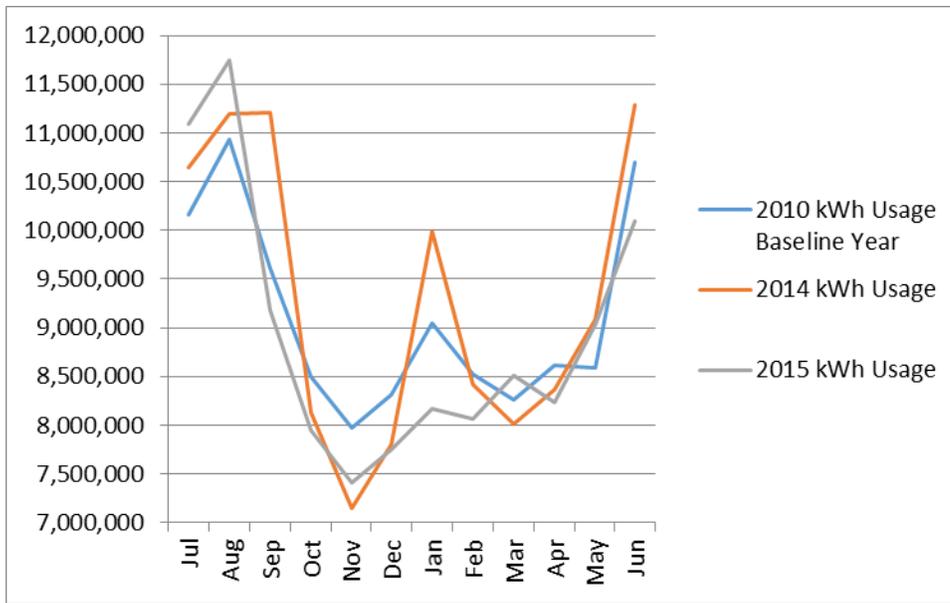
Figure 1: Energy Usage per Year (MMBtus)



Data Source: web.EnergyCap.com

- b. **[Total Electricity Analysis Example]** In the electricity graph below, FY2015 electric usage is compared to FY2010 electric baseline and previous year FY2014. The FY2015 electric usage is slightly better than the FY2010 electric baseline. There is heavy usage during the summer months. In FY2012, Agency shows high electric usage from December to February. With some effort, Agency reduced winter demand by focusing on electric consumption during the same period in FY2015.

Figure 2: Electricity Usage per Year



Data Source: web.EnergyCap.com

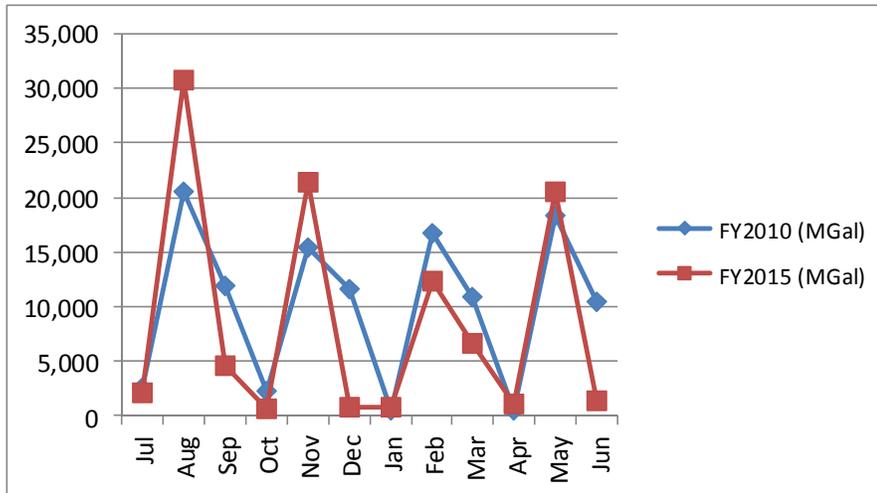
- c. [Total Natural Gas Analysis Example]The graph below indicates that the natural gas usage in FY2015 far exceeds the usage in baseline year FY2010. The Agency may have converted over to gas or new buildings may have been added to the portfolio. These are the answers that the AEC must verify in the AEP to describe natural gas usage. The data below is a good example of supporting an Agency

Figure 3: Natural Gas Usage for FY2010 and FY2015

Data Source: web.EnergyCap.com

- d. [Total Water Analysis Example]Water bills come in every three months. The Agency breaks water usage down to days so monthly reporting can be observed. It is easier to track water monthly. There appears to be data problems associated with this bill based upon instances when water usage is zero (for two consecutive months). The AEP should investigate data for errors. FY2015 usage has increased over the baseline year FY2010 so the AEP must investigate reasons for increased water use. Agency must renew water conservation policy to combat increased water usage.

Figure 4: Water Usage Per Year



Data Source: web.EnergyCap.com

For further assistance with developing your agency’s commodity graphs please refer to the hyperlink below. Please right click on hyperlink below and select “Open Hyperlink” in order to access the document provided.

http://dgs.maryland.gov/Documents/energy/WorkingwithBL26_EnergyCAP.pdf

G. ENERGY SAVINGS THROUGH PREVENTIVE MAINTENANCE

1. **Maintenance:** Preventative Maintenance (PM) is the foundation of all energy management programs. Discuss how PM is handled by your organization.
 - a. Analyze what you need to improve Agency PM program,
 - b. Explain how your Agency PM impacts your ability to achieve energy reduction,
 - c. List your challenges and accomplishments in maintenance,
 - d. Improve Agency focus on PM by utilizing equipment schedules, and
 - e. Explain how traditional maintenance protocols (log books and work orders) or computer-based maintenance management system (CMMS) works for your Agency.

2. **Retro-commissioning (Retro-Cx)⁷:** Retro-Cx is an effective means to extend the life of ECE site by delaying the cost of installation of new equipment. Over a period of time, sensors and calibrations drift out of original building design criteria. Retro-Cx returns ECE, building and leased space equipment and controls back to their original operating design. If Retro-Cx could apply to any of your ECE, add a Y/N tab to your table in Appendix A.

Once you have submitted your AEP to MEA/DGS and have obtained approval, MEA will create a Memorandum of Understanding (MOU) with Agencies that qualify for an energy audit. The MOU will

⁷ The Building Commissioning Association recommends conducting re-commissioning for new buildings either on a regular schedule (3 to 5 years is a frequently cited time frame), or if ECE performance degrades, or if the building occupancy or usage changes significantly.

provide the qualified Agency with a list of approved auditors. DGS will also assist your Agency in determining EPC eligibility and challenges with pursuing other ECM.

Appendix A: Immediate Energy Conservation Measures

Please note that the GREEN text conveys Behavior Modifications in Appendices A-C.

Lighting

- De-lamp” common use (offices) and corridor (hallways) spaces by 30 /40%, respectively, wherever possible.
- Recommended Lighting Standards should not be exceeded, wherever possible. Classroom and general workspace lighting levels shall be 30-50 foot candles. Corridors shall be between 5-10 foot-candles. As recommended by Illuminating Engineering Society of North America.
- **Turn off lights in unused common areas such as copy rooms, break rooms, conference rooms and rest rooms. The effect on lamp life and energy use when turning the lamp back on is negligible.**
- Make sure photocells (light sensors that turn on electric lights after dark) are clean.
- Add **“When not in use, turn off the juice” or similar stickers where they are needed.**
- Have vending machine operator(s) turn off the advertising lighting in the machine or utilize power management software.
- Eliminate interior and exterior incandescent bulbs and replace with fluorescent or LED bulbs, where possible. Update fire alarm systems with LED exit signage.
- Begin fluorescent bulb and ballast recycling program.
- Replace exterior sodium / mercury vapor bulbs & ballasts with LED bulbs.

Electricity

- Reduce hot water heaters from 130 to 123 degrees, wherever practical (i.e., Not food service)
- Reduce the size of hot water heaters or install tank-less heaters during scheduled replacement, if possible.
- **Print double-sided per page to conserve resources. Use default settings.**
- **Use the automatic setting on thermostats so the fans turn on only when you need heating or cooling. On the manual setting, the fan operates continuously and can increase your energy usage.**
- **Turn off your computer monitor when you are away from your desk for more than 15 minutes and at the end of the day. Most monitors now come with power management, standby and shut down features which the Information Technology Department can activate. Note: Screen savers don't save energy; complex screen savers actually increase energy use**
- Lower heating settings to **69** degrees F. (76 degrees for seniors) with a set back at night, weekends, holidays or when unoccupied to 60- 65 degrees.
- Raise cooling settings no lower than **74-76** degrees F. (76 degrees for seniors). All thermostat settings should comply with building energy management system and energy performance contract program specifications if applicable.
- Set the temperature of un-occupied spaces to 85 degrees, where possible.
- Heating and cooling should start no sooner than 1-2 hours before you begin the day. Currently starts at 4 AM (Monday) and 5 AM (Tuesday-Friday).
- Heating and cooling may be set back 2 hours before the end of the day. Setback temperatures are to be set at 80 degrees in the summer and 65 degrees in the

Immediate Energy Conservation Measures (Cont'd)

winter (not being performed where after-hour use is anticipated / programmed).

- Do not reset breakers – call Building Services. This may be an indicator of a more serious problem.
- **Eliminate unnecessary hot plates, foot / cup warmers, coffee pots, microwaves and other small appliances in your area and turn off all tools, office machines and portable appliances when not in use. Turn off the photocopiers and other office equipment, and use one coffee pot to cover the whole office.**
- Avoid outlet and extension cord overload. Underwriters Laboratory (UL) compliance is required.
- Reduce boiler settings from **180 to 150** degrees, whenever possible. Alternatively, consider setting boiler temperatures to match the ambient air temperature for individual buildings. Note: Depending on the outside temperature less heat may be needed.
- Order laptops instead of desktop computers to cut electrical use by **50%**. Estimated savings per year is \$25-\$40 per unit.
- **Less frequently used equipment with remote controls such as televisions and VCRs should be unplugged when not in use because they still use some power even when turned off. Identify where occupancy controlled power strips will be useful.**
- Install dual technology occupancy sensors, timers on light switches and/or use photocells to automatically switch lights on and off in little used areas (i.e., emergency stairwells).

Building Envelope

- **In the winter, close blinds / window coverings at the end of the day to cut down on heat loss. In the summer, close window coverings during the day to avoid the heat gain of direct sunlight. Utilize direct sunlight during winter for heat gain by raising blinds. Do not change thermostat or equipment settings established by Building Services.**
- Continue to clean or replace filters regularly. Keep outside units free of leaves or debris that may clog vents.
- Replacing old windows with non-operable commercial grade double pane insulated Low E glass windows can help reduce electricity and oil costs. Loss from older windows is estimated to be **10-25%** of heating and cooling costs.
- **Make sure all windows and doors are closed during the heating and cooling seasons.**
- Restructure janitorial and custodial services to implement Team Cleaning approach so lights are not on in the entire building during night cleaning.

Heating, Cooling, Ventilation

- **Do not use space heaters if your building has centralized heating.**
- Verify that the manual / computerized outside air (OSA) dampers are closed during un-occupied hours, including during morning warm-up periods. Fresh air is critical while the building is occupied, but heating OSA when it is not needed increases energy costs.
- Be sure motor-operated dampers are operating properly.

Immediate Energy Conservation Measures (Cont'd.)

- Confirm that your variable speed drives (VSDs) are running properly. If they are operated constantly at 100% (“high”) speed, they use more energy than the directly connected motor. Most VSDs have an output monitor to report percentage of operation. A motor running at 50% (“medium / low”) speed uses 1/8 the energy of a motor running at 100% speed.
- **Close off unoccupied areas and shut their heat or air conditioning vents; or turn down / off room air conditioners where possible. This does not apply if you have a heat pump or central air conditioning system.**
- **Close off spaces designed to be segregated for heating and cooling where possible**
- Purchase Energy Star energy efficient office equipment and computer electronics to reduce heat output⁸.
- Repair faulty insulation - furnaces, boilers and hot water heaters.
- Stabilize libraries and archival material sites at temperatures no higher than **70° F** and **≤60%** humidity
- Verify the amount of outside air introduced into facilities through ventilation systems is not excessive. Amounts vary depending on ambient temperature and use of facility.
- Inspect control schedules and zones so that you heat and cool only the occupied sections of the building.
- Make sure that air vent grills are not blocked by plants, books or furnishings.
- **Keep drafts away from thermostats to prevent inaccurate readings and do not place heat generating office equipment under thermostats.**
- Dust or vacuum radiator surfaces frequently to insure a free flow of heat.
- Don't set a higher temperature to "warm up faster," or a lower temperature to cool quickly. It only wastes energy.
- Check to make sure that garage exhaust fans operate only during occupied periods unless required to operate continuously.
- If you only have electric space or baseboard heating as the primary source of heat supply, stagger the start times to help reduce demand, especially during peak demand times.

Water Conservation

- Watering your landscape wastes electricity along with water. Make sure you follow local watering guidelines for proper landscape care.
- Use only the amount of water necessary to perform a task.
- Replace older, larger (3 gallon) flush valves with smaller capacity (1.5 gallon) valves in restroom facilities during scheduled replacement, except high capacity needs.
- **Use cold water when possible except where hot water is required by state codes.**
- Develop landscaping plans that do not require additional water consumption or sprinkler systems.
- Consider budgeting and a pilot program for installing instant (on-demand) water heaters under sinks.
- Initiate a waterless urinal pilot project(s).

Try New Approaches

⁸ See <http://dgs.maryland.gov/Pages/GreenOperations/GreenPurchasing/index.aspx> for state green purchasing guidelines

- Hire a Certified Electrician to perform in-house maintenance.
- Include energy conservation improvements in your Agency's capital improvement program.
- **Provide safety and energy conservation awareness to employees and include on web site.**
- **Try to schedule group activities where possible in the area with the least energy use, and schedule evening meetings in areas that can be heated and cooled individually.**
- **Celebrate Energy Conservation Week annually (EarthDay in April)**
- Restructure janitorial and custodial services to implement Team Cleaning approach (i.e., only work on one floor at a time to save energy, so total building lighting will not be on at the same time).
- Wearing closely woven fabrics adds at least a half-degree in warmth. For women, slacks are at least a degree warmer than skirts. For men and women, a light long-sleeved sweater equals 2 degrees in added warmth. A heavy long-sleeved sweater adds about 4 degrees, and 2 light weight sweaters add about 5 degrees of warmth because the air between insulates and keeps in more body heat.

Appendix B: Medium Range Energy Conservation Measures

- Use photocells to automatically switch lights on at night or use motion sensors to increase safety. Photocells are controls that make lights "smart". They sense whether available surrounding light is present to determine whether a light should be lit or not. The light turns on and off automatically.
- Use lower wattage bulbs in both critical and non-critical areas.
- Avoid using incandescent task light (desk lamps). Use a compact fluorescent lamp or light emitting diode (LED) to replace the incandescent lamp in your task light.
- Use one large bulb instead of several small bulbs that add up to higher wattage.
- Replace exterior sodium / mercury vapor bulbs & ballasts with LED bulbs (Wall packs, field and parking lot lighting).
- Many areas have more lighting than is required for current tasks. Measure current lighting levels and reduce excess lighting by using power reducers, multi-level switching, or simple removal of lamps and ballasts. Note that some ballast continue to use some energy even when lamps are not operating.
- A 50-watt reflector floodlight provides the same amount of light as a standard 100- watt bulb.
- For every degree below 78 you set your thermostat during the summer, your cooling costs could increase by up to 9 percent.
- Require janitorial services to only light one area of the building at a time rather than having the entire building brightly lit until midnight.
- Install additional motion sensitive lighting. Note: Restrooms in most facilities have already been affixed with timed sensor devices.
- Ask janitorial services to take advantage of partial switching (such as turning on only one lamp of a three-lamp fixture that is wired to allow this) to further reduce energy use during building cleaning.
- Purchase energy efficient office equipment and computer electronics to reduce heat output that needs to be vented or cooled.
- Turn off circulation pumps during unoccupied times if no freeze conditions exist.
- Replace all electric hot water heaters with boiler/coil combination to take advantage of heated exhaust and avoid additional electric costs.
- Install plug load controllers in cubicles to control multiple loads like monitors, task lights and fans. These devices use a motion sensor that is incorporated with a plug load surge suppressor. Inactive equipment can be shut down when the cubicle is unoccupied.
- Reduce perimeter lighting, shut off unnecessary exterior, decorative lighting and on-premises signage lighting.

Building Envelope

- Confirm that OSA (Outside Air) economizers are functioning properly to take advantage of free cooling. Most office buildings are in cooling mode when the outside air temperature is above 55 degrees F. The core of buildings over 20,000 square feet are almost always in cooling, even during the winter months.

Medium Range Energy Conservation Opportunities (Cont'd.)

- Confirm that the amount of outside air matches the occupant load. One improvement to consider is adding carbon dioxide monitors or controls that will automatically bring in as much OSA as necessary for the current occupant load.
- **Curtains and blinds block sunlight which reduces heat gain in the summer. Sunlight can increase the demand on the air conditioner by as much as 30 percent. For winter use, curtain and blinds should be left open to allow the sun to warm the rooms allow for daylighting.**
- Increase light reflectance of walls and ceilings. • Feel for air drafts around electrical outlets. Inexpensive pads are available, as are plugs for unused sockets.

Heating, Cooling, Ventilation

- Make sure simultaneous heating and cooling does not occur. Verify proper operation of valves, dampers and controls. Keep your systems well-tuned with periodic maintenance.
- At least once a month have a service technician measure the carbon dioxide in your gas burner / chimney. The higher the carbon dioxide / monoxide the greater the efficiency of the unit. 9 percent is a good level.
- For commercial and industrial applications, monitor stack temperatures on fossil fuel boilers. If the stack temperature is more than 400 degrees above the boiler room temperature, schedule the boiler for a tune-up, unless stack temperatures are designed for alternative operating levels.
- Check the duct work for air leaks about once a year if you have a forced-air heating system. To do this, feel around the duct joints for escaping air when the fan is on. Small leaks can be repaired with metal duct tape. Larger leaks may require duct sealant.
- Make sure that air handling unit filters are changed every 2 - 3 months, and that coils on the outdoor condensing unit and indoor heating and cooling units are kept clean. Switch to filters with lower airflow resistance.
- Clean air conditioning refrigerant condensers to reduce compressor horsepower.
- Check control sequencing for multiple chillers and boilers. For light load operation, use the smallest and most efficient chiller or boiler available and avoid frequent equipment cycling.
- Implement training for mechanical system operations that includes required air quality, boiler and pressure vessel certification(s).
- Avoid introducing high moisture exhaust air into air conditioning system. Periodically calibrate the sensors that control louvers and dampers.
- Establish and utilize Occupant Comfort Zones and Recommended Lighting Standards for use in facilities or ECE.
- Verify that the building control system is going into the night setback mode during unoccupied hours. Time clocks may require adjustments after daylight savings switch-over or after power outages. Even computer control systems may need updating after equipment modifications.
- Install locking devices on thermostats to maintain desired temperature settings.
- Install programmable thermostats and automatic settings, when possible.

Medium Range Energy Conservation Opportunities (Cont'd.)

Water Conservation

- Consider auto-flush technologies. Implement a pilot program for the use and evaluation of waterless urinals.
- Install water flow meters in facilities to monitor gallons per minute usage or balancing valves to set a standard flow (non-domestic).
- Recycle water and/or install rainwater storage tanks.
- Begin installing water saving devices and ultra- water efficient plumbing fixtures (i.e., water efficient faucets, low-flow shower heads, etc.).

Appendix C: Long Range Energy Conservation Measures

Lighting

- We can eliminate bulbs in fixtures as an initial conservation measure, but the long- term fix is to replace the T-12 bulbs with T-8 bulbs with electronic ballasts or LED lighting. In doing this, lighting would also be re-evaluated to avoid over-lighting with the new bulbs since they are more energy efficient & produce more light.
- Investigate advancements in solar technology for exterior and parking light lighting.

Electricity

- Purchase only "Energy Star" qualified products or high energy efficient systems and equipment⁹.
- Re-evaluate occupancy comfort zones.
- Continue to purchase high efficiency motors on electrical equipment.
- Explore use of landfill gas for electric power generation
- Install a photovoltaic system to help generate some of the maintenance yard electricity.
- Expand training programs for alternative energy and reduced energy consumption.

Building Envelope

- Perform energy audits or thermal imaging on all buildings.
- Incorporate energy efficiency guidelines for all building retrofits and new construction.
- Increase light reflectance of walls and ceilings.
- In climate controlled facilities, install replacement windows with non-operable commercial grade double pane insulated windows which can help reduce electricity and oil costs. Note: Loss from older windows is estimated to be 10-25 percent of heating and cooling costs.

Heating, Cooling, Ventilation

- Continue to install variable speed drives and variable air volume (VAV) systems in lieu of constant volume HVAC systems as we replace, re-order or build new facilities.
- A central heating and cooling system will use less energy than individual heat-cool units for most work environments.
- Make use of technology and modernize facilities with direct digital HVAC controls by replacing pneumatic & time clock controls.
- Install smart climate control technology and consider centralized energy management systems.

Water Conservation

- Water conservation needs to be addressed. Low-flow faucets, low-flow toilets and an evaluation of hand drying methods should be evaluated.
- Reduce the size of hot water heaters during scheduled replacement, if possible, based on historical use.
- Develop landscaping plans that do not require additional water consumption or sprinkler systems.
- Evaluate the use of grey-water and reclaimed wastewater for irrigation purposes

⁹ <http://energy.gov/eere/femp/find-product-categories-covered-efficiency-programs>

Long Range Energy Conservation Opportunities (Cont'd.)

General

- Utilize performance contracting to limit economic impact on building retrofits.
- Retrofit most energy inefficient buildings first.
- Expand support / maintenance division in conjunction with the added square footage due to continued construction.
- Implement ownership accountability by providing each mechanic with an area(s) of responsibility.
- Develop recognition programs for buildings that demonstrate the best environmental stewardship.
- Continue updating and replacing of aging equipment with more efficient systems.
- Use technology to ensure consistent and accurate utility consumption reporting through auditing, control and monitoring of energy consuming processes.
- In cold weather, dress warmly and in layers that can be adjusted for optimal comfort. Loosen clothing and dress casually during the warmest hours.
- Evaluate state processes to eliminate or reduce energy resources needed for the process such as eliminating or reducing the forms needed to get permission for an activity, simplify approval chains or modify reporting requirements, etc.

Appendix D: Accessing EnergyCap Utility Data for Analysis

1. Click on Home at the top left of EnergyCap Menu
2. Click on "Reports" from left menu
3. Select "Billing Reports"
4. Scroll down on the right and select BL26-Executive Energy Profile
5. Click on "**Green Continue**" at top right

BL26 - Executive Energy Profile Fiscal Year

Current Filters		
Bill is Void	Equals	No
Billing Period	Between	Jul 2007 And Jun 2013
First Month (01 -12)	Equals	7
Topmost Place Code	Equals	DGS

6. Click on "Topmost Place Code" and select your Agency. Choose your commodity, save your selection, and click on "**Run Report**".

Filter Settings:

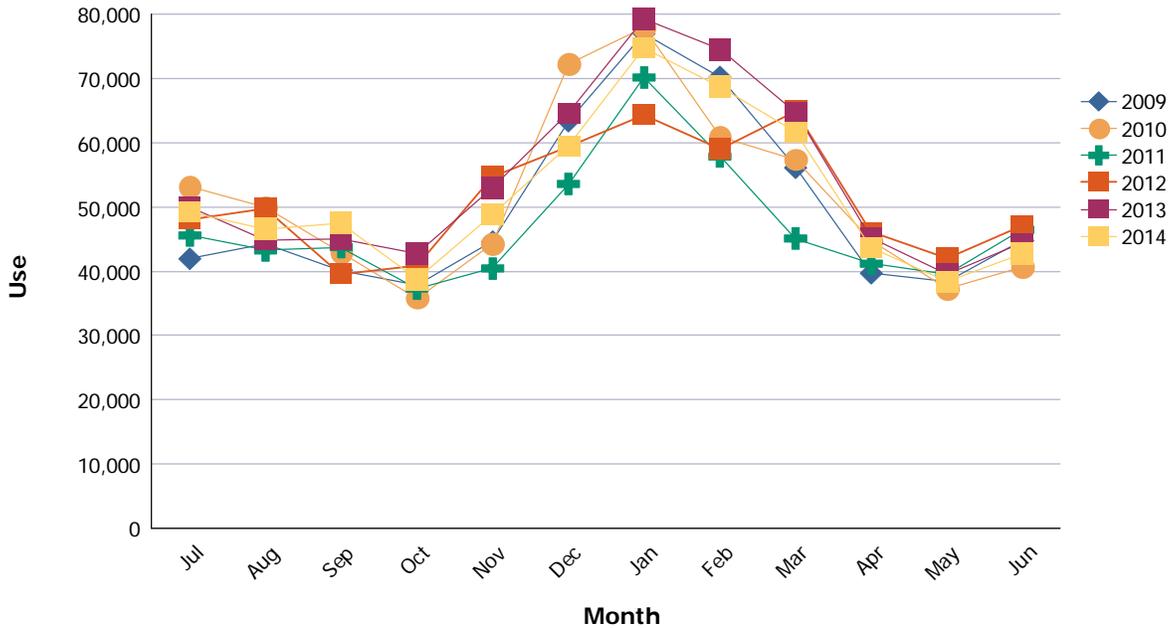
Filter: Topmost Place Code

Operator: ▼

Value:

This report may take a few seconds but you will eventually receive an energy usage graph.

Executive Energy Profile



Now you have an energy use graph. The fiscal year (FY) 2009 actually represents your FY2010 energy use baseline and your FY2014 year actually represents your FY2015 current energy usage. You can compare all of the years, or you can look at the most recent year by removing all data between FY2010 and FY2015

7. Click on the export symbol beside the printer symbol at the top left of your screen. A little box will appear in the middle of your graph.
8. Click on downward arrow beside “Crystal Reports (RPT)”
9. Select “Microsoft Excel Workbook Data-only”
10. Click on Export. You should now see your spreadsheet of data. You may have to enable editing to produce the type of graph that you would like.

Example: Highlight FY2010 – FY2013 data and place in an unused location on the spreadsheet. Do the same with all total values. Cut and paste the FY2014 data beside the FY2009 data. You will need to Re-label FY2009 and FY2014 label with FY2010 and FY2015, respectively. You have to do this because each year’s energy usage begins in June of the previous year (FY2010 equals July 2009 through June 2010). You will now see something that looks like this below:

Electricity Usage Data for FY2010 and FY2015 (kWh)

	2010	2015
Jul	10,148,158	11,070,972
Aug	10,919,886	11,732,453
Sep	9,594,521	9,155,033
Oct	8,486,268	7,934,057
Nov	7,973,594	7,400,168
Dec	8,286,753	7,741,156
Jan	9,031,408	8,159,935
Feb	8,520,517	8,051,415
Mar	8,258,137	8,491,225
Apr	8,605,490	8,219,852
May	8,579,535	9,021,120
Jun	10,684,025	10,061,012

Use your knowledge of Microsoft Excel to produce a commodity graph. Compare utility use of Baseline year FY20010 to this year or year of your choice¹⁰.

¹⁰ Graph and Data analysis procedures are in the process of being updated for easier use and review.