T&E COMMITTEE #4
June 29, 2009

Briefing

MEMORANDUM

June 25, 2009

TO: Transportation, Infrastructure, Energy and Environment Committee

FROM: Keith Levchenko, Senior Legislative Analyst

SUBJECT: **Briefing:** County Facilities Energy Analysis

On June 29, the T&E Committee will receive a briefing from the Department of General Services (DGS) on an energy analysis of County facilities that was completed during FY09. David Dise, Director of DGS, and Harold Adams, also of DGS, are expected to lead the briefing.

Energy Analysis Consultant Report and Follow-up Work

Consistent with Council Bill 30-07, Buildings – Energy Efficiency (approved last year) and Montgomery County's Climate Protection Plan (transmitted to the Council in January 2009), DGS hired a consultant (EMG) to do an energy analysis of Montgomery County facilities. The report is attached on ©1-32. The report identifies what the consultant believes are reasonable targets for potential cost savings (60%), energy savings (45%), and greenhouse gas reductions (58,000 metric tons) by 2015. These annual cost savings would result in a payback period on the upfront capital costs ($57 to $67 million) of 8 to 10 years.

The T&E Committee briefly discussed the report at its 2010 utilities budget worksession on April 16. The Committee asked for a more detailed briefing from DGS after the budget.

The Department of General Services is currently reviewing the analysis and scoping out work for various County facilities based on the energy efficiency opportunities identified in the report. However, major energy efficiency savings are not expected to be obtained from this work until FY11 or FY12.

Funding for this work is expected to come from multiple sources, including: the Energy Conservation: MCG project ($225,000 per year in current revenue funding) and American Recovery and Reinvestment Act of 2009 (Energy Independence and Security Act (EISA) Federal grant dollars. Under the funding allocation formula in EISA, Montgomery County is eligible for

$7,633,900 in EECBG Program funding. Of that amount, DEP is requesting $3.2 million for County facility projects to be shared across Montgomery County Government, Montgomery County Public Schools, Montgomery College, and the Maryland-National Capital Park and Planning Commission. However, given the scale of capital costs identified in the energy analysis, the County will need to be both creative in its approach (seeking out options which avoid high up-front capital costs) and selective (choosing those facilities that have the greatest potential for energy savings and/or the quickest return on investment).

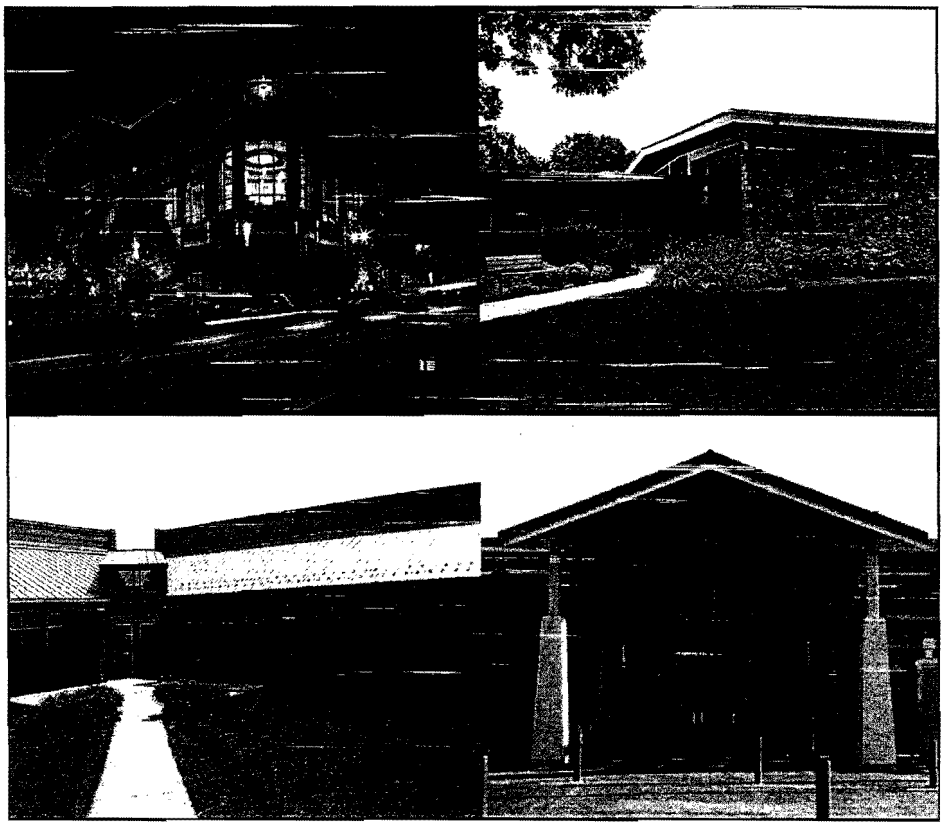
FY10 Utilities NDA Budget Savings

As part of the Council's budget approval for the Utilities Non-Departmental Account (NDA), the Council reduced the Executive's Recommendation by 4 percent ($1.12 million) with the expectation that DGS would pursue energy conservation efforts during FY10 to achieve these savings. Council Staff has asked DGS to update the Committee on these efforts.

Attachments
KML:f:\levchenko\dep\energy issues\utilities budgets review fy10\t&e follow-up 6 29 09.doc

ENERGY ANALYSIS

MONTGOMERY COUNTY, MARYLAND
DIVISION OF OPERATIONS, DPWT
101 Orchard Ridge Drive
Gaithersburg, Maryland 20878



ENERGY ANALYSIS
of
MONTGOMERY COUNTY FACILITIES

Prepared By:

EMG
222 Schilling Circle, Suite 275
Hunt Valley, Maryland 21031

1.800.733.0660
FAX: 410.785.6220
www.emgcorp.com

EMG (A)

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A. EXECUTIVE SUMMARY

1. PROJECT SCOPE

EMG has been commissioned by Montgomery County Maryland, Department of General Services, Division of Real Estate and Management Services to focus on elements of the requirements of County Council Bill 30-07. The intent of adopted Bill 30-07 is for Montgomery County to lead by example by implementing enhanced energy management programs that reduce the energy consumption and Greenhouse gas footprint of county facilities. The Bill specifies that energy consumption of County facilities must be reduced by 25% by 2020. EMG is to focus on the following key elements of the adopted Bill:

- Provide energy consulting services to the Montgomery County Sustainability Workgroup.
- Energy Benchmark and develop an energy baseline for all facilities listed in the County portfolio.
- Develop a utility unit savings plan and a cost savings plan.
- Assist in assembling the initial report for County Council submission and approval.
- Create a database with energy usage data by building that will become the platform for tracking future usage and comparing targets and benchmarks.
- Support the Sustainability Workgroup at public hearings.
- Prepared Energy Analysis

2. ENERGY ANALYSIS METHODOLOGY

EMG has designed this program to be consistent with the mission and goals of the County Council for Montgomery County, Maryland. We understand the needs of the program and have performed similar services in the past. The following chart depicts the overall flow from Data gathering, thru benchmarking and prioritization, and energy plan implementation.

The goal of this Energy Analysis is to support a summarized condition plan for:

1.) Reducing the total energy consumption of all building owned and operated by Montgomery County.
2.) Reducing the cost of the consumption through procurement strategies.
3.) Replace energy consumed with clean or renewable energy sources where applicable.

The Project Approach to collect, document and analyze the County facilities energy data has been designed to achieve the following:

- Gather utility data for each building and benchmark against models by square footage, facility use, and type of structure.
- Create a prioritized list of buildings in comparison to the benchmarks with respect to buildings where significant savings can be expected.
- Provide an energy consumption target for each county facility.
- Provide an energy cost reduction target for each facility.
- Provide back up information and calculations to the County.
- Provide recommendations for follow up and implementation.

Of the 124 facilities considered, the following facilities were not included in the overall energy analysis:

Facilities:	Reason:
4 Facilities	Aquatic Centers
10 Facilities	Insufficient Utility Data
5 Facilities	Outside Variance Tolerance

A Variance Analysis should be instituted prior to Energy Audit engagement to validate input information of certain facilities including the 19 facilities not included in this analysis report.

The following facility types are included in the energy analysis:

Facility Type	# of Facilities
Courthouse	5
Educational	7
Entertainment and Culture Centers	4
Fire and Police Stations	11
Healthcare	8
Libraries	20
Lodging	3
Offices	9
Public Order and Safety Centers	7
Recreation	23
Service Facilities	7
Warehouses	1
Total:	**105**

Benchmarking of each of Montgomery County's facilities has been undertaken to establish a baseline, compare against the national average, and to prioritize the efforts of this Energy Analysis.

Based on the results of then benchmarking, the facilities have been prioritized based on their total anticipated annual energy cost reductions and reasonable targets have been set for reducing energy consumption, cost, and green house gas emissions.

The following chart shows the anticipated annual cost, energy consumption and green house gas emission savings and a gross representation of the corresponding capital investment anticipated for the implementation of measures required to reach the goal.

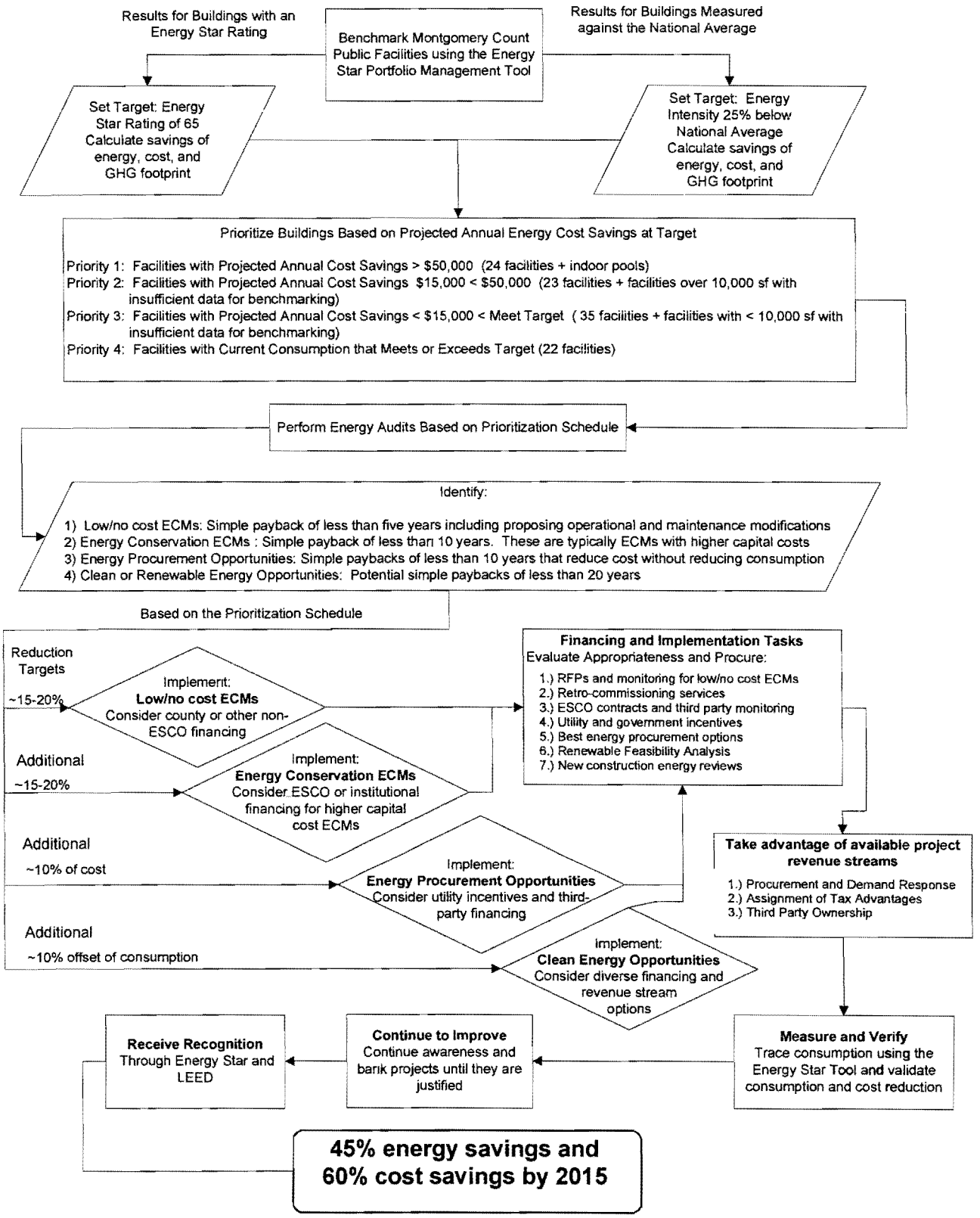
Phase	Target Completion Date	Gross Capital Cost	Annual Energy Savings @ Target (MMBTU)	Annual Energy Savings @ Target (%)	Annual Cost Savings @ Target ($)	Annual Cost Savings @ Target (%)	GHG Reduction (MtCO2e)
I	2013	$33 – 36 M	136,000	51%	$4.2 – 4.8 M	51%	24,000
II	2014	$5.8 – 6.3M	25,000	39%	$760,000	39%	2,500
III	2015	$1.9 -2.2M	9,000	24%	$240,000	24%	1,500
IV (if needed)	2016	If Needed	If Needed	If Needed	If Needed	If Needed	If Needed
Procurement	2013	$9.0-11M	0	0%	$1,100,000	100.0%	0
Renewables	2013	$ 8.0 -10M	0	0%	$ 980,000	100.0%	30,000
Totals	2015	$57-67M	170,000	45%	$7,200,000	60%	58,000*

*This is the equivalent of removing over 10,000 cars off of Montgomery County's Roads.

Phase Four is optional, based on Progress and Realizations of Savings of first three Phases. Phase IV includes the potential of facilities that already meet our target to become even more energy efficient.

It should be noted that capital costs could potentially be offset with an array of incentive programs and financing options detailed later.

Montgomery County Public Facility Management Plan



To achieve the stated goals, the EMG team first gathered and populated the benchmarking tool developed by the EPA. Once the benchmarking performance ranking or comparison rating was established, the EMG team prioritized the facilities into four energy study categories or phases.

3. BENCHMARKING

The U.S. Environmental Protection Agency has developed an Energy Management Program to assist public and private sector building owners and managers o benchmark and track energy performance in their buildings. The program is the Energy Star Portfolio Manager. The Portfolio Manager tool allows the input of historical utility data of a facility to be compared to normalized data of a large database of buildings of its peers. This Energy Performance Rating System is based on a simple 1-100 "score" where 50 is an average building. The rating normalizes factors such as weather, occupancy, operating hours, and other building-specific characteristics. The rating is based on actual billed energy data and captures the interactions of building systems not individual equipment efficiency. Energy Star Portfolio Manager can establish a rating in 11 building categories. There are not enough facilities entered into the database for other building types outside of the 11 building categories for Energy Star Portfolio Manager to establish a rating. The database is sufficient enough for these other building types to establish energy use comparisons. Montgomery County has 15 facilities that are in categories that can achieve a rating. There are 100 facilities that have energy use comparisons. There are 4 pool facilities that do not have either a rating or energy use comparison. The pool facilities have high energy consumption and will also be evaluated for energy consumption and cost reduction.

The energy consumption data that has been initially analyzed are electricity, natural gas, fuel oil, and propane. Water usage and water consumption data will be analyzed during the individual facility energy audit process. The following energy unit cost have been established for the benchmarking analysis; $0.128 per Kwh of electricity, $1.55 per therm of natural gas, and $2.60 per gallon of fuel oil and propane.

Actual Building Information received from Montgomery County includes:

- Facility name
- Address
- Ownership entity
- Square footage
- Age (some facilities)
- Operating Hours (some facilities)
- 12 months of Energy Consumption data

Assumed Building Information includes:

- Age (some facilities)
- Number of computers
- Number of workers on Main Shift
- Operating Hours (some facilities)
- Energy Cost (standard blended rate used for all facilities)

B. ENERGY ANALYSIS RESULTS

1. RESULTS

Variance Analysis

A variance analysis of the data produced by the benchmarking process was conducted to look for anomalies in the data.

Once the facility information and utility data is entered for each facility, it becomes possible to measure the difference between the national average and actual energy intensity for each facility. This difference can be studied to determine if there are anomalies in the input data that could allow us to suspect error.

From the raw data resulting from the analysis of each facility's energy consumption analysis through Energy Star's Portfolio Manager Tool, it was determined that an energy intensity factors greater than four correlated to data that was outside a three sigma (~95%) confidence level. The energy intensity factor is calculated as a ratio of the national average intensity of a facility against the actual energy intensity. For example, an energy intensity factor of four would correlate to a facility that had a calculated energy intensity of either one fourth (.25 = -4) or four times (400% = 4) that of the national average energy intensity level for that particular facility.

Facilities with an energy intensity factor greater than two are included in the following chart. Five facilities with energy intensity factors greater than four were excluded from the rest of the study as it is assumed that there are errors in our known assumptions concerning each of these facilities.

Facility Name	National Average Site EUI (kBtu/Sq. Ft.)	Baseline Site Energy Intensity (kBtu/Sq. Ft.)	Energy Intensity Factor	Building Type
AFI Mobile Production Unit	65	16.4	2.96	Recreation
B.C.C. Seniors Center	65	288.6	(3.44)	Recreation
Center on Domestic Violence*	124	857.2	(5.91)	Health Care: Long Term Care (Nursing Home, Assisted Living)
CSAAC	77	15.8	3.87	Office
DFR – Aspen Hill Shelter*	87	3.1	27.06	Lodging
Gaithersburg Maintenance Depot	77	24.8	2.10	Service (Vehicle Repair/Service, Postal Service)
Germantown Police*	78	1,358.00	(16.41)	Fire Station/Police Station
Mental Health House*	124	11.3	9.97	Health Care: Long Term Care (Nursing Home, Assisted Living)
Piccard Drive Health Center*	124	657.1	(4.30)	Health Care: Long Term Care (Nursing Home, Assisted Living)
Police at Ardennes	78	340.9	(3.37)	Fire Station/Police Station
Police Special Operations	77	322.6	(3.19)	Office
S.S. Maint. Depot Building A	77	305.5	(2.97)	Service (Vehicle Repair/Service, Postal Service)

*Facilities with an Energy Intensity Factor greater than 4 were removed from the study pending confirmation of facility input data

The output energy intensity factor of eight additional facilities was between two and four. These facilities were left in the study.

It is recommended that all of the assumptions regarding all of these facilities be confirmed either at the onset of the energy audit phase or before. All assumptions can be found in the checklist included in the "Statement of Energy Performance" that has been generated from each facility's data.

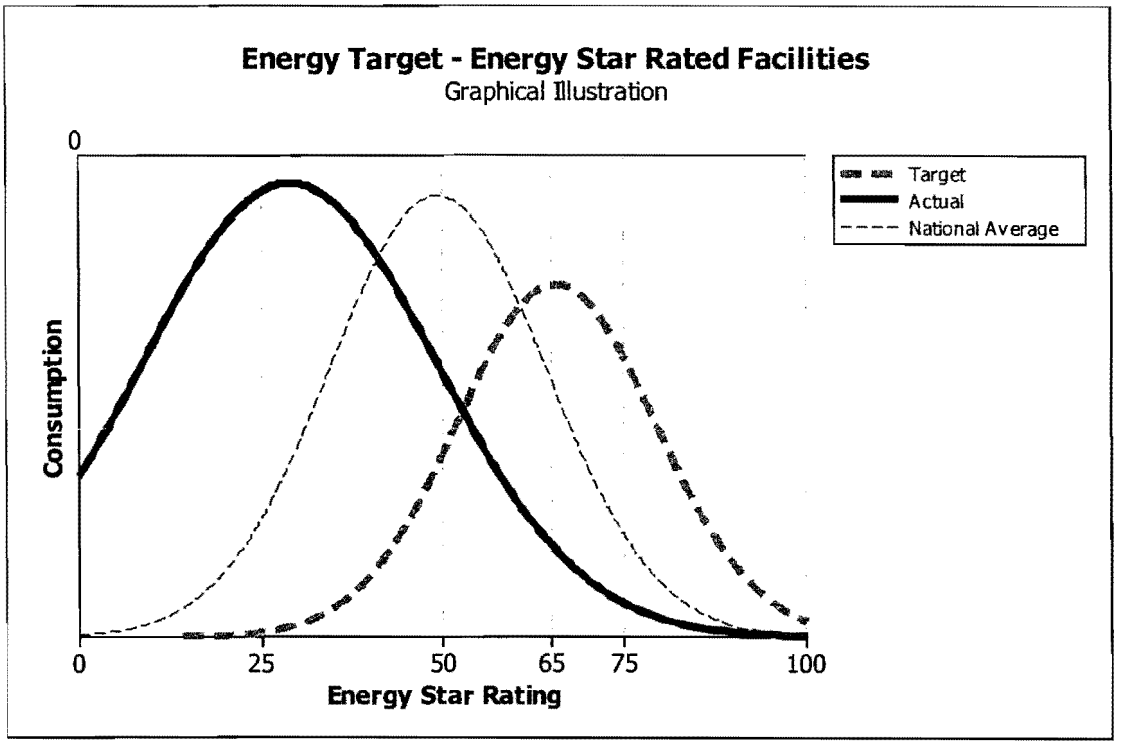
Results

Energy Star's Portfolio Manager tool has the capability of comparing some building types energy use against data in its database related to buildings of the same type and giving the facility a 1-100 ranking. This is due to the fact that they have a significantly large data set to which to compare the facility and can compare the facility to the distribution of similar facilities in its database.

Of the 105 remaining facilities, fifteen are categorized as Courthouses, Warehouses, and Office Buildings and were able to receive an Energy Star Rating. The Energy Star Ratings of these buildings varied between 4 and 66. The fifteen Energy Star rated facilities represent nearly an annual consumption of 150,000 MMBTU at a cost of just over $5.1 million.

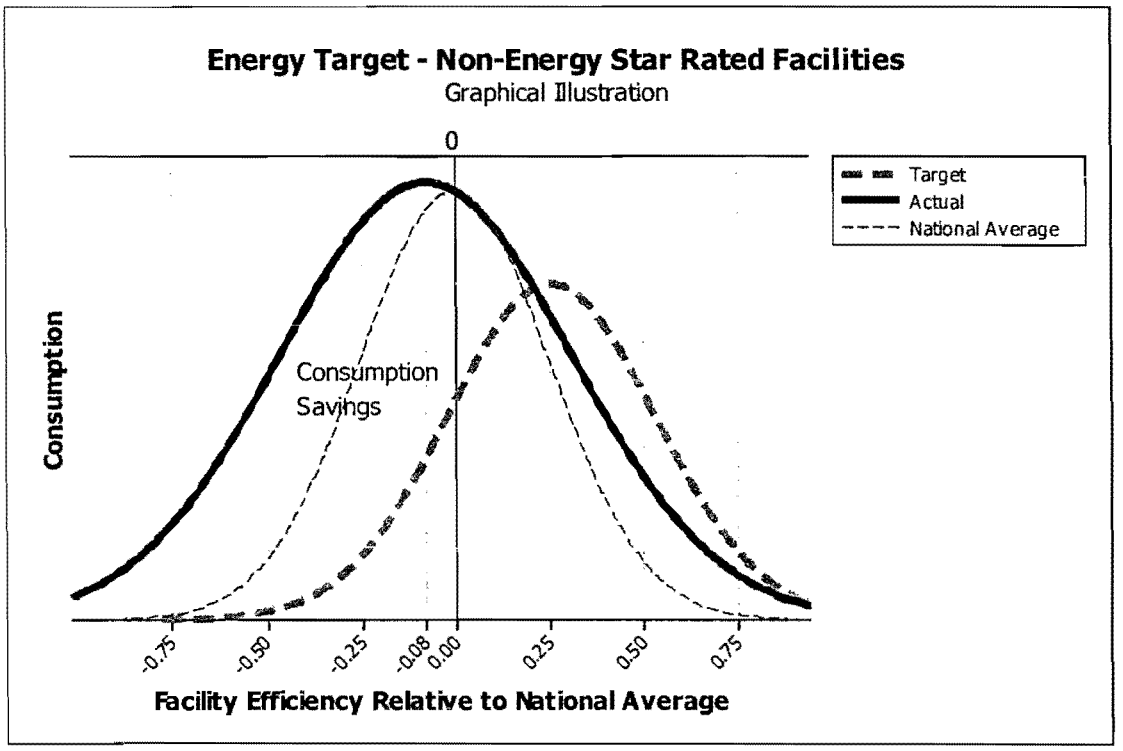
Based on an average Energy Star Rating of 65, we calculated the energy and cost savings of each building type and found that the county would save approximately $2.1 million. As a rating of 65 is required for consideration in the LEED existing building program, this level of energy consumption was chosen as the target for these facilities.

The following graph illustrates consumption of the current, national average, and target consumption for building types rated by Energy Star. The savings of cost, consumption and GHG emissions is represented by the difference in area of the current and target histograms.



The remaining 90 buildings are of types that the Portfolio Manager does not give a rating. Instead, it measures these facilities against the national average of buildings of similar type in its database.

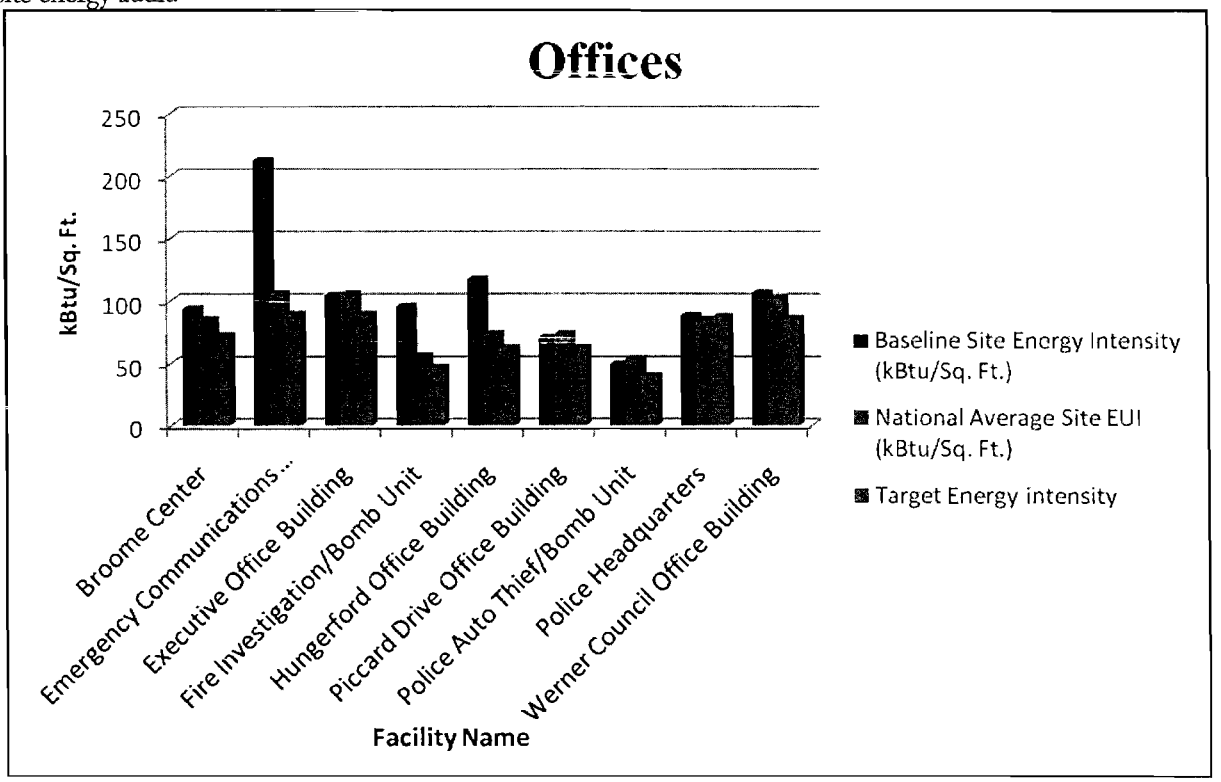
A histogram (shown below) displays the results in a distribution of the facilities relative to the national average. This data shows that the facilities average eight percent above the national average. Based on the energy consumption of these facilities and the goals of Montgomery County, we have chosen a target of 25% above the national average. Meeting this goal will result in an annual savings of approximately $3.1 million. Graphically, cost and energy consumption savings is represented by the difference between the in the Actual and Target consumption histograms.



2. FACILITY ANALYSIS

Each building type was analyzed based on energy intensity. Energy intensity is typically expressed in kbtu/sf/yr. This allows for a normalized comparison of building type of different sizes as well as converting both electrical and heat energy units to the same base energy unit. The following graphs compare the Actual energy intensity with that of the national average and that of our target. The energy intensities of some facilities are notable from the graphs located in Appendix A. The graph illustrating the results of the Office Buildings is included below.

The facilities that were identified in the variance analysis can be identified in these bar chart as well. Again, the reasons for some of the large differences between the national average of consumption and the actual consumption may be that utility data is missing, square footage data is incorrect, or the building shares a meter with a non-typical load among other things. A checklist confirming the data entered will be compared to observed conditions during an on-site energy audit.



Offices

It also should be noted that non-anticipated loads have a higher proportional effect on the energy intensity of smaller buildings and energy audits should reveal these loads.

3. PRIORITIZATION

Based on the results of our benchmarking, we developed a prioritization plan based on four phases designed to capture the facilities with the largest potential energy consumption and cost savings.

3.1 PRIORITIZATION PHASES

Based upon the results established by Portfolio Manager, the facilities were categorized into 4 priorities or further study and implementation phases.

Priority Phase	Description
1	Facilities that have a potential to achieve $50,000 or greater annual energy cost savings if target is met. 24 facilities and 4 indoor pools in Phase 1.
2	Facilities that have a potential to achieve $15,000 to $50,000 annual energy cost savings if target is met. 23 facilities in Phase 2.
3	Facilities that have a potential to achieve $0.00 to $15,000 annual energy cost savings if target is met. 35 facilities in Phase 3.
4 (optional)	Facilities that are currently at target. 22 facilities in Phase 4. Phase Four is optional, based on Progress and Realizations of Savings of first three Phases. If savings targets are not met, Phase IV will be implemented. Cost and Savings will be later determined.

C. ENERGY PLAN IMPLEMENTATION

1. RECOMMENDED SERVICES

Based on the list of facilities in each of the four Priority Phases and in order to achieve the established goals, the following list of services is recommended:

- Countywide Operations and Maintenance Program
- Full Energy Audit for each facility
- Identify and Implement No/Low Cost Energy Conservation Measures
- Identify and Implement High Cost Energy Conservation Measures
- Identify Clean or Renewable Opportunities
- Identify Energy Procurement Opportunities
- Identify Financing Options
- Measure and Verify Results

1.1 COUNTYWIDE OPERATIONS AND MAINTENANCE PROGRAM

The Countywide Operations and Maintenance Program is designed to establish facility operation and maintenance procedures for each category. The procedures will be instituted by the maintenance personnel associated with each building. The intent is to provide an ongoing, routine inspection of equipment and systems. The Program will be reevaluated and modified and updated after the initial On Site Energy Audit.

1.2 ENERGY AUDIT AND ENERGY CONSERVATION MEASURES

The energy audit will include an analysis of all utility consumption data, included will be electrical, natural gas, fuel oil and propane consumption. The energy audit consists of an on-site assessment to determine current conditions, itemize the energy consuming equipment (i.e. air conditioning, fans and blowers); review lighting systems both exterior and interior; and review efficiency of all such equipment. In addition, The Auditors will also consider structural elements, such as the building envelope, for energy efficiency. Recommendations will be made on implementing cost-saving energy conservation materials and methods. The Auditors will estimate the projected payback period on each energy-saving recommendation and prioritize accordingly.

1.2.1 Energy and Water Usage

The Auditors will survey 100% of the facility, common areas, office areas, maintenance facilities and mechanical rooms to document utility related equipment, including heating systems, cooling systems, air-handling systems and lighting systems.

1.2.2 Recommendations for Energy Savings Opportunities

Based on the information gathered during the energy audit, the utility rates and recent consumption data and engineering analysis, the Auditors will identify opportunities to save energy and provide probable construction costs, projected energy/utility savings and provide a simple payback analysis.

1.2.3 Analysis of Energy Consumption

Based on the information gathered during the on-site assessment and the utility billing history, the Auditors will conduct an analysis of the energy usage of all equipment, and identify which equipment is using the most energy and what equipment upgrades may be necessary. This information will be used to identify which equipment upgrades or replacements that may provide a reasonable return on the investment by Montgomery County. The analysis for any upgrades or replacements should include life cycle cost analysis for economic justifications.

1.2.4 Energy Audit Process

- Interview Montgomery County staff and review plans and past upgrades;
- Perform energy audit for each facility;
- Perform a preliminary evaluation of the utility system serving each facility;
- Analyze findings utilizing Energy Conservation Measure cost benefit worksheets.
- Determine if any energy efficiency measures are required;
- Make preliminary recommendations for system improvements, if needed.
- Determine what incentives are available for energy efficiency opportunities;
- Estimate initial cost and changes in operating and maintenance costs based on implementation of energy efficiency measures;
- Ranking of recommended cost measures based on largest payback; and
- Determine what cost-effective measures can be taken, including the projected payback timeframe.

1.3 Clean and Renewable Energy Opportunities

Clean energy is defined as energy that is generated and used in the highest feasible mode of environmental and social responsibility. Power from sources such as the sun (solar power) and wind are renewable and do not cause harmful emissions. Fuel cell generators are also considered renewable energy.

State and Federal government agencies are dedicated to promoting clean energy as an alternative to traditional sources of energy. As such, they have developed a number of programs to promote the use of clean energy sources by potentially providing technical assistance and/or financial incentives based on project feasibility

The following table summarizes some potential applications of Clean/ Renewable Energy Sources for the Montgomery County Facilities.

Clean/ Renewable Energy Sources	Technical Description
Solar Power	Use reflective materials that concentrate the sun's heat energy to drive a generator that produces electricity.
Photovoltaics (Solar Panels)	Use semiconductor materials to convert sunlight directly into DC electricity.
Geothermal	Geothermal energy uses the ground temperature as a thermal sink for heat rejection in the summer and heat gain in the winter which allow for more efficient HVAC systems
Solar Heating	Use solar collectors to absorb the sun's energy to provide low-temperature heat used directly for hot water or space heating. Used in applications with high hot water usage.
Wind Turbine	Uses motion of wind spinning a propeller to generate electricity from the mechanical rotation of a small generator.
Fuel Cell	Uses chemical reaction involving hydrogen and oxygen to create electric power. It continuously produces power as long as there is a supply of hydrogen gas and oxygen (from the air)
Combined Heat and Power (CHP) (co-generation)	Simultaneous production of electricity and heat from a single fuel source. It provides onsite generation of electrical and/or mechanical power and waste-heat recovery for heating, cooling, dehumidification, or process applications.

1.4 Low/No Cost ECMs

1.4.1 Low/No Cost ECMs

Low/No Cost ECMs are defined as being Energy Conservation Measures that require little or no capital relative to its associated energy cost savings. Some of these measures may be recommending changes to the programming of a facility's energy management system, changing light fixtures or bulbs, sealing the envelope of the building with weather-stripping or door seals, repairing steam traps or outside air dampers, etc. It is important that these measures are undertaken first to aid in determining the financial payback of more expensive ECMs.

For example; Assume an older facility with a water boiler that consumes $1M worth of heating fuel a year. A equipment vendor would suggest that this would justify the installation of a $1M condensing boiler that would result in a 10% improvement in efficiency and a annual savings of $100,000 with a simple payback of ten years. It may be found that by controlling air leakage through some doorways, retro-commissioning the energy management system and repairing some broken ventilation dampers could for an initial cost of $40,000 could cut the annual fuel bill to $700,000. The new water boiler now has a simple payback of over 14 years.

1.4.2 Commissioning

After a facility is constructed and before the general contractor turns over the keys to the new owner, the facility should be commissioned. This I the process of making sure that all of the building systems are operating s designed. From an energy perspective, the commissioning of the HVAC and other energy consuming systems is critical. By commissioning a facility, an HVAC contractor assures the new owner that the HVAC will consume the energy that it was designed to consume. Commissioning is always recommended and should be included in the scope of any significant renovation or new construction project.

1.4.2.1 Enhanced Commissioning

As a result of the energy efficiency ratings required to obtain LEED and Energy Star building certifications and to hold designers and system installers accountable for their system designs, some facility owners are asking for commissioning of building systems to be performed by a third party to the installation contractor of the designer. This is being called "enhanced commissioning" and gives the facility owner the benefit of an independent opinion as to the fitness and energy efficiency of newly installed equipment. This service is independent of the design and build contracts and should be weighed regarding cost/benefit as a buildings energy consumption will be known after a year of service and can then be compared against the design consumption. Buildings with expected annual energy costs greater than $100,000/yr. as well as buildings designed to meet strict energy efficiency target (for LEED points, for example) typically could justify enhanced commissioning. Done to meet LEED standards, enhanced commissioning is worth one LEED point.

1.4.2.2 Retro-commissioning

Retro-commissioning or re-commissioning is the process of performing the commissioning process on a facility in which the buildings functions or original design parameters have changed since the original commissioning. It is not uncommon for even young buildings to be utilized and operated in a manner different than was originally intended and retro-commissioning is almost always a justified low cost ECM for facilities that haven't been commissioned in the past three to five years. Retro-commissioning for a small facility may be as minor as checking set temperatures on water heating equipment and making sure that programmable thermostats are set and operating correctly. Sometimes, these items can be checked and/or recommended in an energy audit and implemented by on-site maintenance personnel. Retro-commissioning for a large, complex facility can be very involved and require a few days to weeks of on-site work by a qualified service provider. It is not uncommon for a simple retro-commissioning project to decrease a facilities energy consumption by 10% or more. In short, retro-commissioning is a service that typically pays for itself in a short period.

1.4.3 Financing for Low/No cost ECMs

Financing for low cost ECMs can come from many sources. Sometimes minimal capital costs can be met through an existing annual facility or maintenance budget. Utilities and state and federal programs often provide financial assistance for many simple projects. If self-financing is not an option, these ECMs can be carefully blended with higher capital cost ECMs in an energy performance contract.

Low/No cost ECMs should be identified and specified in an energy audit.

1.5 Typical Energy Conservation Measures

A typical Energy Conservation Measure (ECM) requires capital investment in order to implement. In many cases, significant investments in a building system can provide a return on investment through energy efficiency. HVAC and building envelope upgrades can often be justified by their resulting reduction in energy costs. Government-owned buildings often take advantage of an energy service companies to provide funding, development, and installation for these projects. ESCO financing will be discussed later.

An energy audit will identify potential higher capital ECMs that should be considered. A good energy audit will consider and explain the interactions of competing ECMs such as the boiler example in the previous section.

1.6 Energy Procurement Opportunities

1.6.1 Load Management and Smart Metering

Energy efficiency improvement is defined as reducing the energy required for a given unit of physical work or economic output. Efficiency gains are distinct from load management (short-term reductions in use during peak demand periods) or reductions in energy use from reduced economic activity. Two load side management programs available are demand response and smart metering. A Smart meter generally refers to a type of advanced meter (usually an electrical meter) that identifies consumption in more detail and more frequent intervals than a conventional meter; and optionally, but generally, communicates that information via some network back to the local utility for monitoring and billing purposes. It is anticipated that the Montgomery County facilities will be able to implement projects that will take advantage of Smart Meters for a reduction in cost of provided electricity.

1.6.2 Demand Response

In electricity grids, demand response (DR) is similar to dynamic demand mechanisms to manage customer consumption of electricity in response to supply conditions, for example, having electricity customers reduce their consumption at critical times or in response to market prices. The difference is that demand response mechanisms respond to explicit requests to shut off, whereas dynamic demand devices passively shut off when stress in the grid is sensed. Demand response can involve actually curtailing power used or by starting on site generation which may or may not be connected in parallel with the grid. PJM is the Regional Transmission Organization that offers Demand Response program to Maryland. They have multiple Demand Response programs that can lead to a reduction in electricity cost and/or cash rebates for participation. Projects can be implemented to maximize the value of these programs.

1.7 SOURCES OF FUNDING

1.7.1 Self-funding

Sometimes, energy efficiency projects that have rapid returns on investment or have low capital requirements can be self-funded by governments. Maintenance or permanent improvement funds can potentially be tapped and later refunded by the savings in the utility budget. Self-funding can often be augmented with state, federal, and utility incentive programs. The benefit of this funding mechanism is that all of the savings stay internal t the finances of the facility. The drawbacks are that of internal implementation responsibility as well budgetary constraints on even small capital projects.

1.7.2 Energy Performance Contracting: ESCO

The most common form of funding for energy efficiency projects is energy performance contracting.

The advantage of an energy performance contract is that the facility owner hires one Energy Service Company (ESCO) with single source responsibility who can likely complete large, complex projects in a short time frame. In addition, the ESCO has the responsibility of project financing and is repaid through future energy savings.

Although a energy performance contract is often the preferred financing arrangement, there are some drawbacksthat should be considered. , such as:

- It is common for an ESCO to offer energy solutions that focus on their area of expertise and product lines that they represent. This may not be the optimum solution for the facility of the county.
- It is in an ESCOs best interest to maximize their profit. Depending on the contract language, this can lead to either a situation that only includes the most profitable energy efficiency projects or it could include more machinery than is necessary in order to take advantage of profits that can only be realized with projects with a high initial capital cost.
- There is a booming demand for energy performance contracts and that many ESCOs are new to the marketplace and more established companies are being forced to rely on less experienced project managers and may emphasize profits over quality of service.
- The most effective whole building approach including maintenance and operational measures as well as clean technology opportunities are often not identified and addressed by ESCOs as it is not necessarily their area of expertise or in their financial interest.

In order to take advantage of the benefits of energy performance contracts while avoiding their pitfalls, the following is recommended:

- An energy audit should be completed for each facility to determine if a performance contract is a viable option for the facility. It would also serve to develop an energy base line and the potential scope of ECMs that will be needed should the county decide to develop an RFR for procurement of an Energy Performance Contract.

- Typical performance contracts can be complex with many considerations that may be used to maximize profits of the ESCO in place of maximizing benefit to the municipality. There are many contract parameters that need to be well understood and negotiated with ESCOs including the parameters used to establish the baseline energy consumption, methods for adjusting the baseline, the finance rate, the terms of any required maintenance agreements, the baseline fuel costs, anticipated utility rate inflation, etc. The energy auditors can be used as a third party to serve on the RFR development team and/or lead the procurement process.

It is generally agreed that Energy Performance Contracting can be an excellent method for financing energy capital projects in the public sector, but care nust be taken in the procurement process to maximize their benefit.

1.7.3 Other Sources of Project Financing

The federal government has many tax incentives that can be utilized by government agencies even though they do not pay taxes. Federal tax credits are currently offered for renewable energy. Sale of these tax credits or third-party ownership of the renewable energy equipment with sale of the energy back to the agency are two ways that tax credits can be taken advantage of by a governmental agency. In addition, EPACT, is a federal program that allows tax deductions for building energy efficiency improvements. Although the benefit of this tax deduction is usually taken by private building owners against profits, the legislation allows the designer of facilities for government agencies or nonprofit organizations to take the tax deduction for buildings that meet EPACT standards. Understanding this benefit can assist the government agency to negotiate the best rate for their services.

1.8 MEASUREMENT AND VERIFICATION

Some implemented energy conservation measures will require performance verification. For these measures, it is necessary to develop a Measurement and Verification (M&V) Plan.

The objective of this plan is to make sure that the equipment is performing as originally specified and that the projected savings are being realized.

M&V can be performed at the system or component level, and might include:

- Chillers
- Boilers
- Variable speed drive applications
- Pumps
- Lighting systems

The equipment will be monitored using sensors and data collection equipment to determine energy efficiency curves. For example, in a typical chiller test, the chiller is monitored for a certain period so varying load conditions can be recorded. Then, the developed chiller efficiency curves will be compared to the manufacturer's published efficiency curve.

1.8.1 General Requirements

During M&V, the engineering company will require the following assistance from the operating staff of the facility:

A copy of the manufacturer's published performance curves for each device to be tested.

Operating conditions for the equipment performance curves. (For example, for a chiller test, the engineers will need to know the chiller hot water temperature, chilled water temperature, air temperatures, and so on. For a variable speed drive, they will require the temperature and frequency of the drive.)
Address, contact information, and procedures for accessing the facilities where the equipment is housed.

It is necessary to work directly with the building operating staff to determine which equipment to run during the tests and at what settings. (For example, which chiller to lead with, the condenser water set point, chilled water set point, and other information that is needed to conduct the test.)

1.8.2 M&V Deliverables

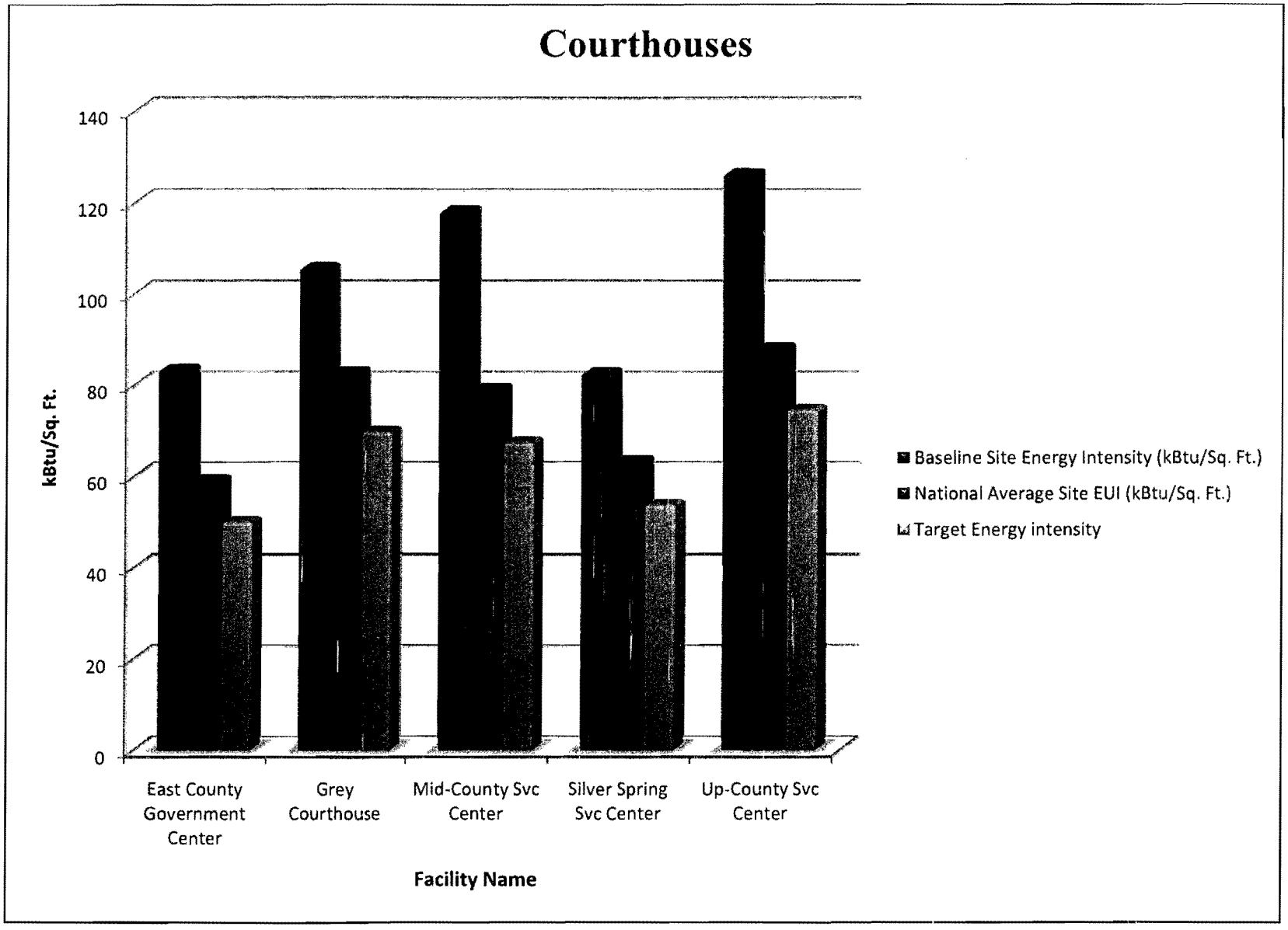
At the end of the M&V assessment, a report is compiled that presents the findings of the equipment tests. The manufacturer's data is incorporated into the report for comparative purposes. This report will include a brief summary of findings along with performance curves.

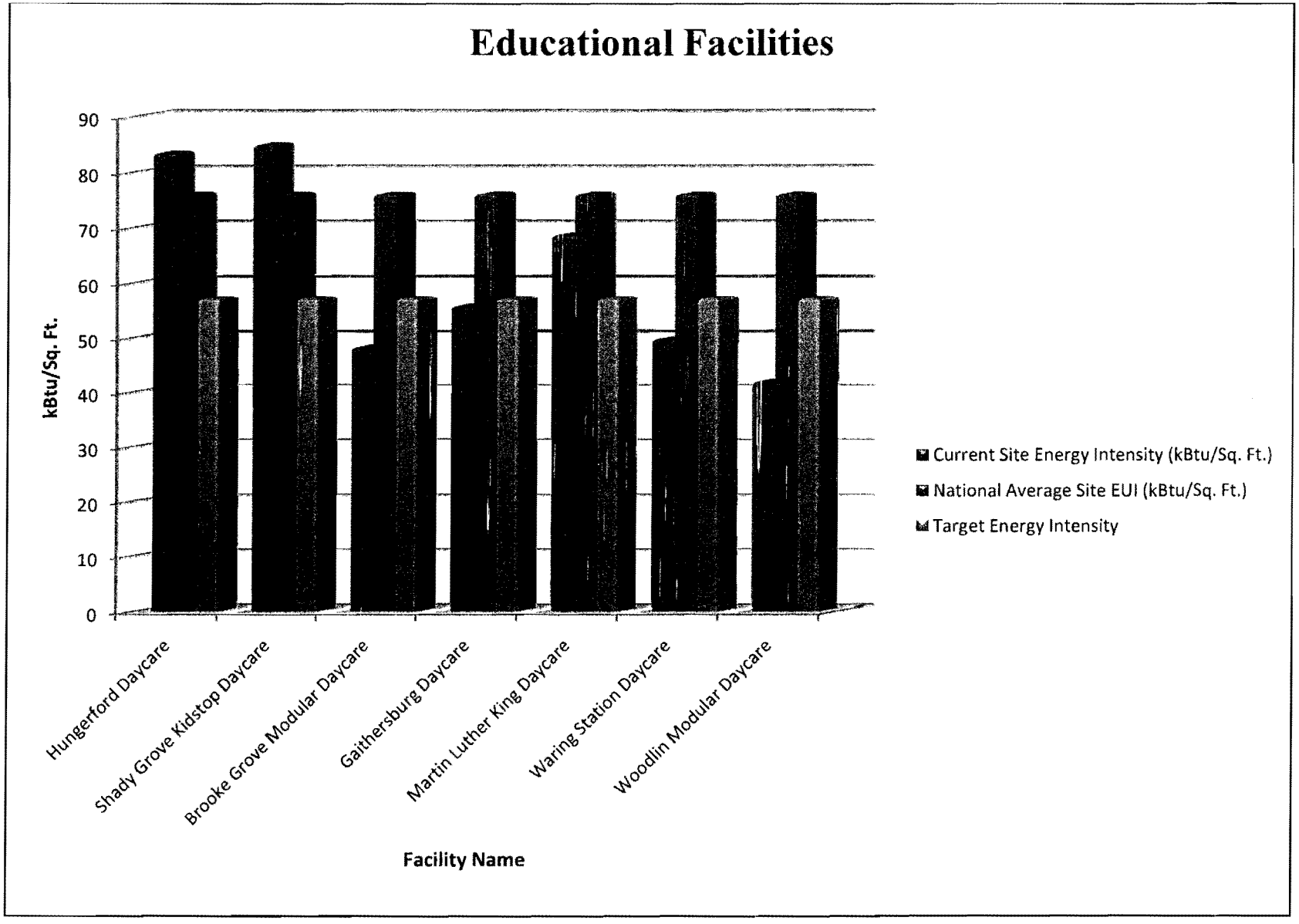
1.9 Stay Committed to Sustainability

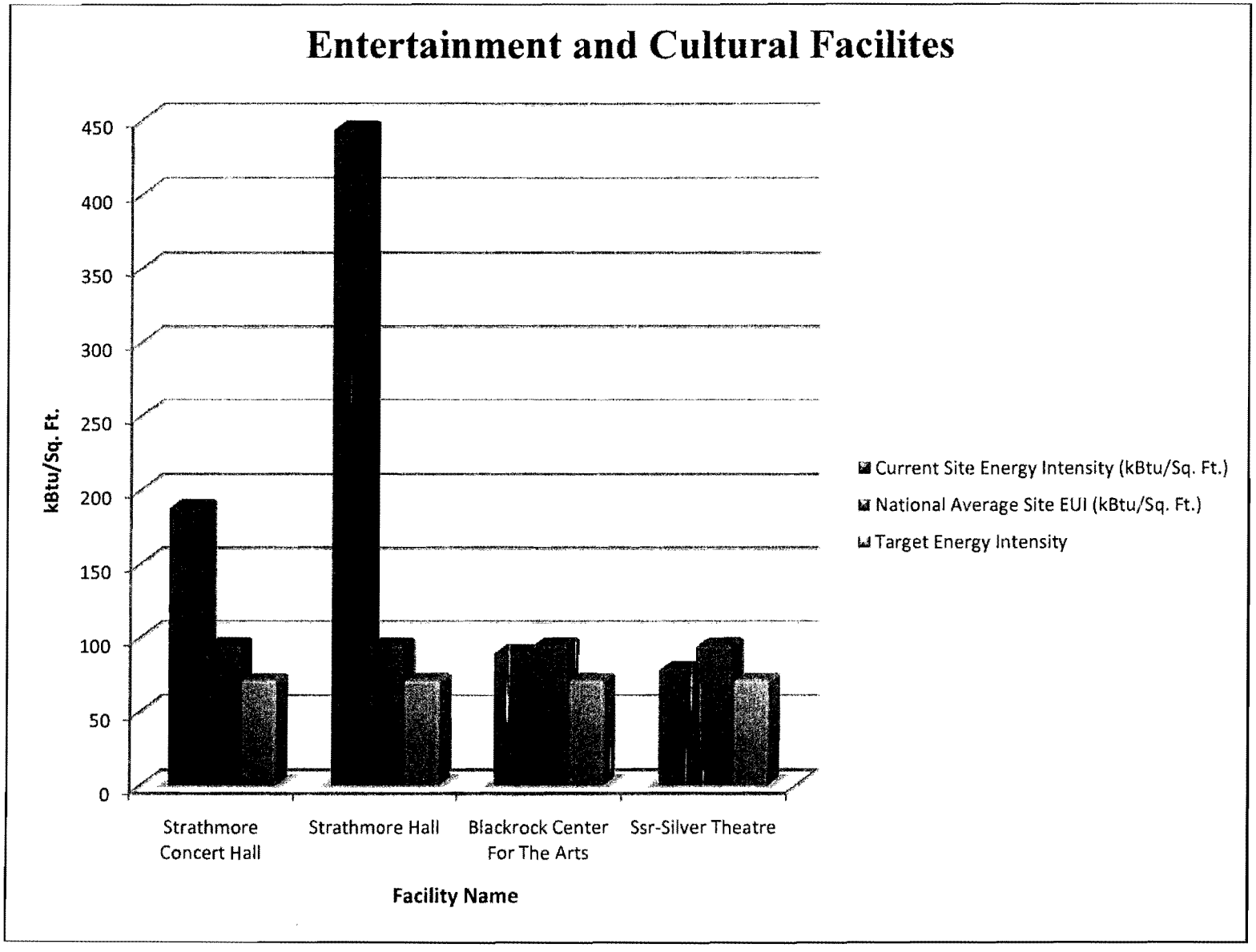
Energy awareness should be maintained at all of Montgomery County's facilities. No/low cost ECMs including operation and maintenance practices should be continually reviewed for additional energy conservation potential. And, as a result of the energy audits and clean technology and procurement related feasibility studies, some potential projects will return simple payback periods that extend them past the intended payback of our target. These projects should be banked and periodically reviewed against energy cost and potential incentives to re-evaluate their justification.

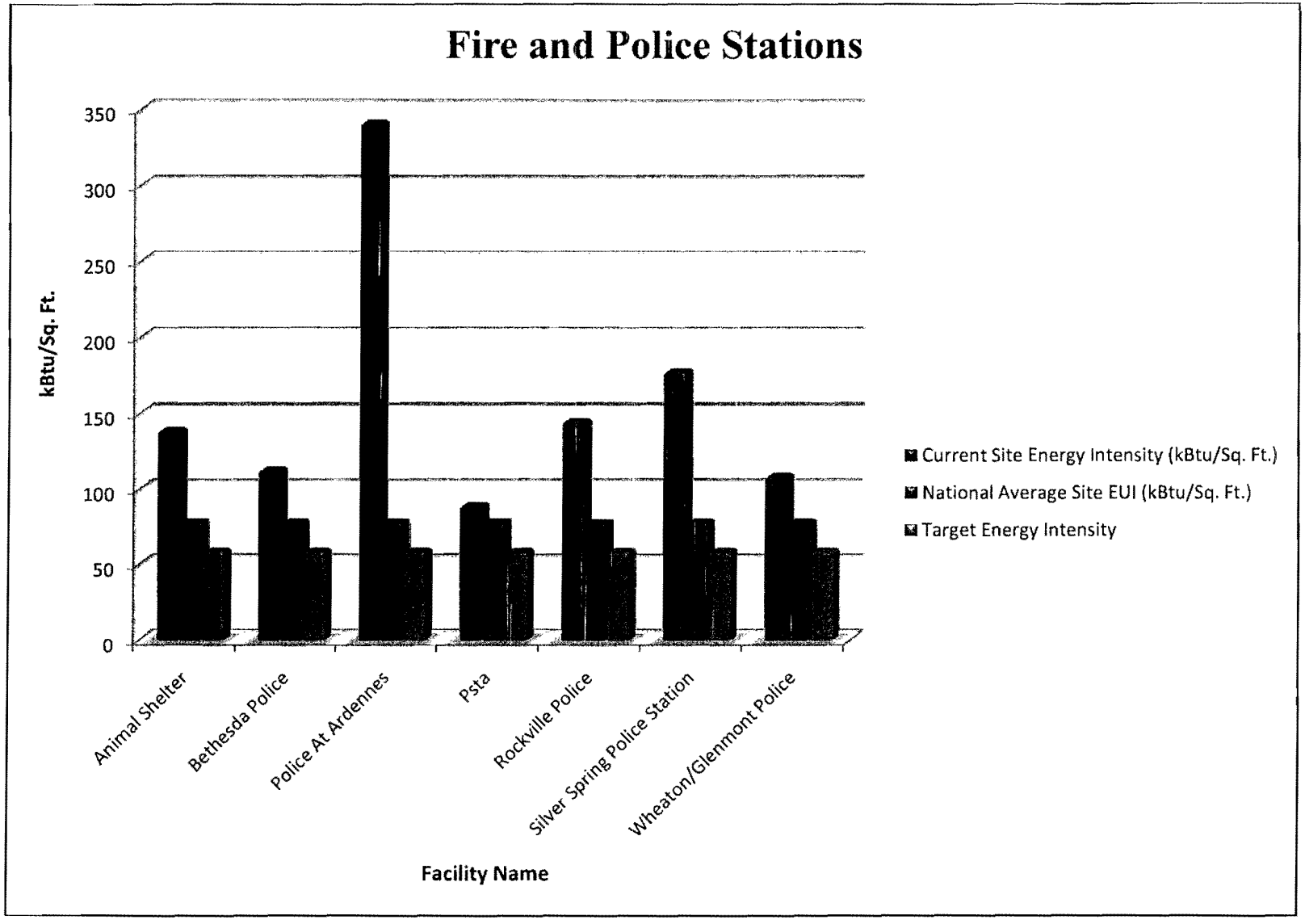
Once justified ECMs, procurement, and clean technology have been implemented and their savings realized and measured, Montgomery County can receive recognition through the national LEED program as well as the Energy Star program.

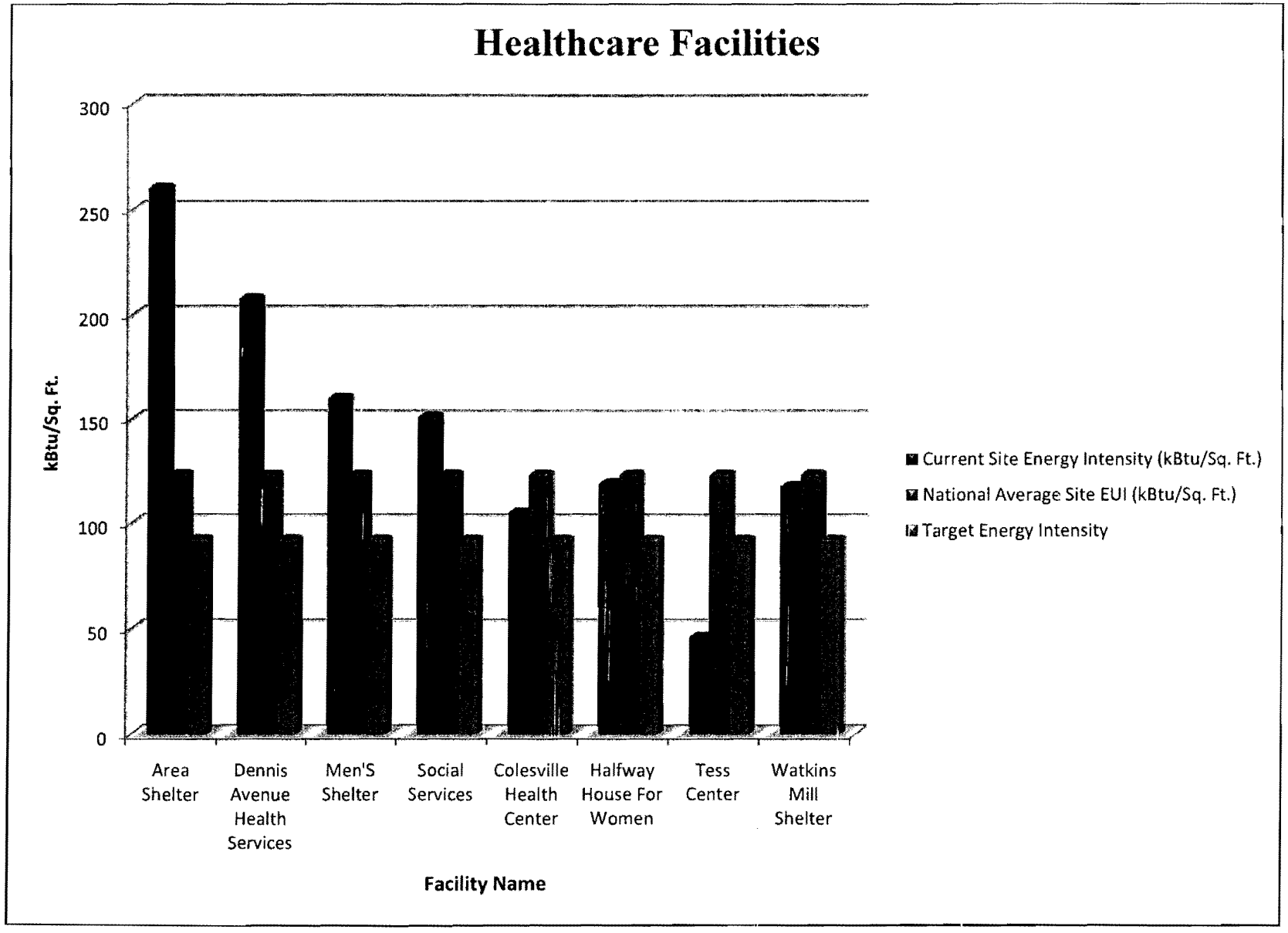
APPENDIX A
CATEGORY BAR CHARTS

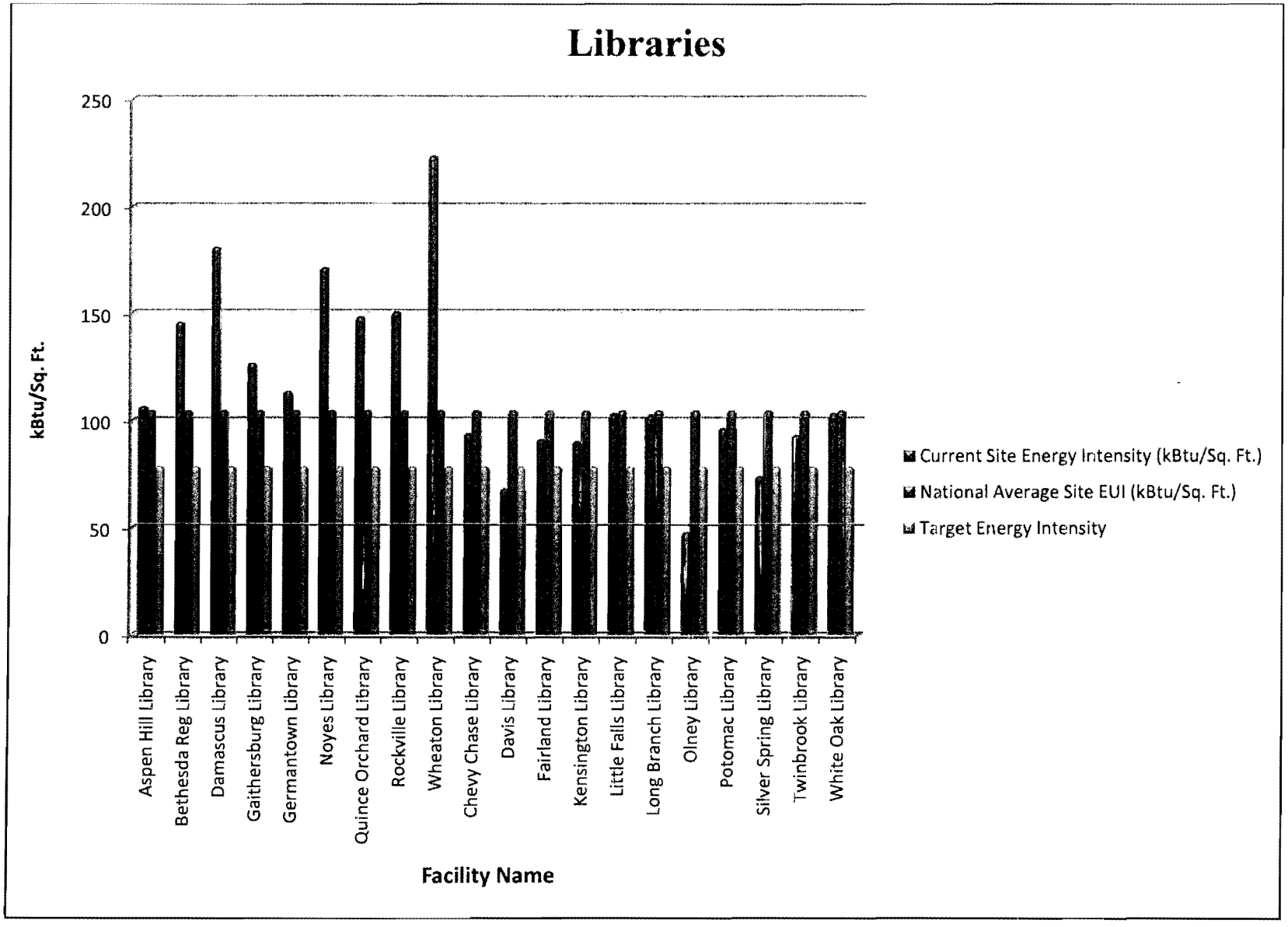

Courthouses
140
120
100
80
60
40
20
0
kBtu/Sq. Ft.
East County Government Center
Grey Courthouse
Mid-County Svc Center
Silver Spring Svc Center
Up-County Svc Center
Facility Name
Baseline Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy intensity

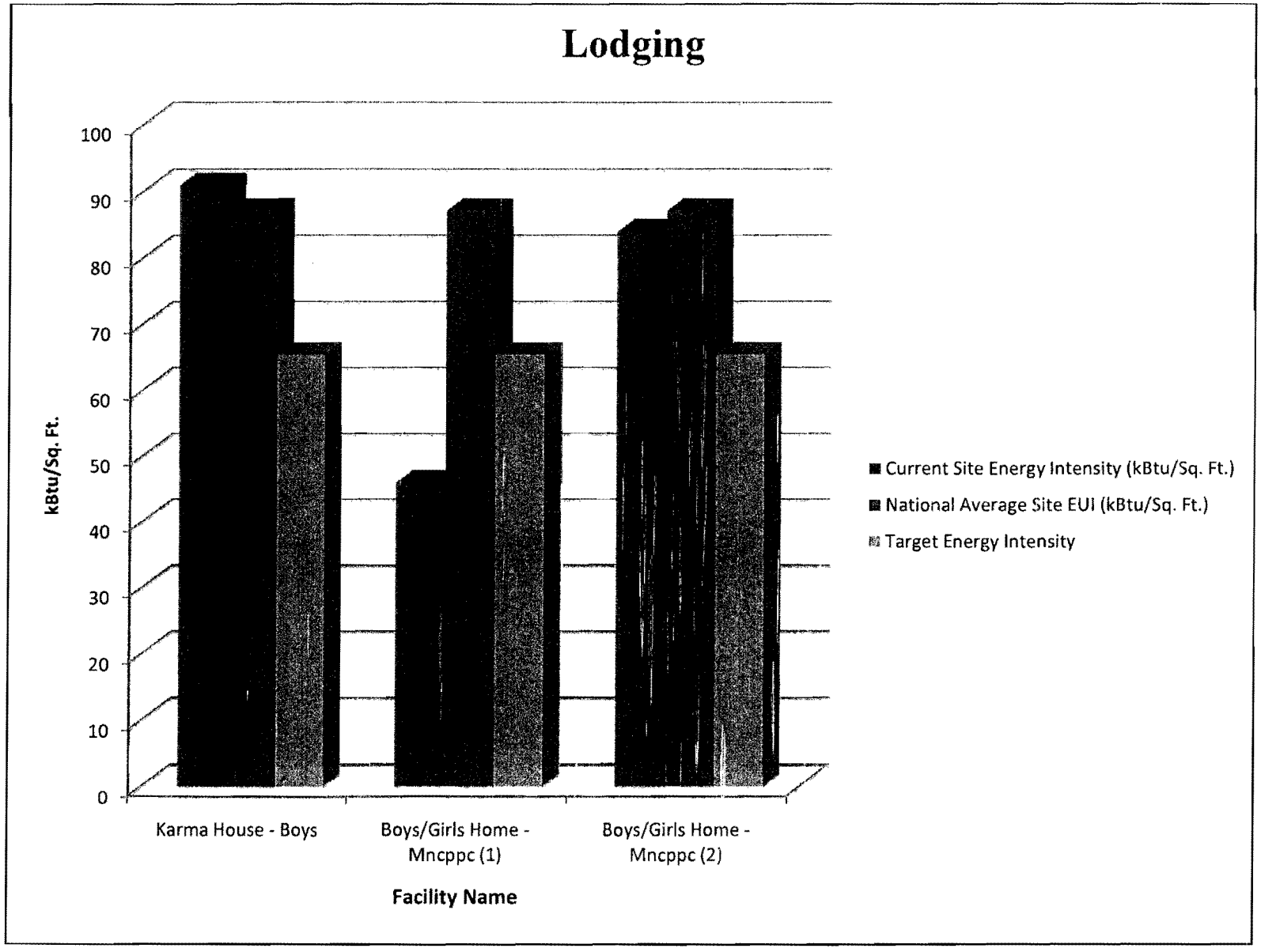

Educational Facilities
90
80
70
60
50
40
30
20
10
0
kBtu/Sq. Ft.
Hungerford Daycare
Shady Grove Kidstop Daycare
Brooke Grove Modular Daycare
Gaithersburg Daycare
Martin Luther King Daycare
Waring Station Daycare
Woodlin Modular Daycare
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity

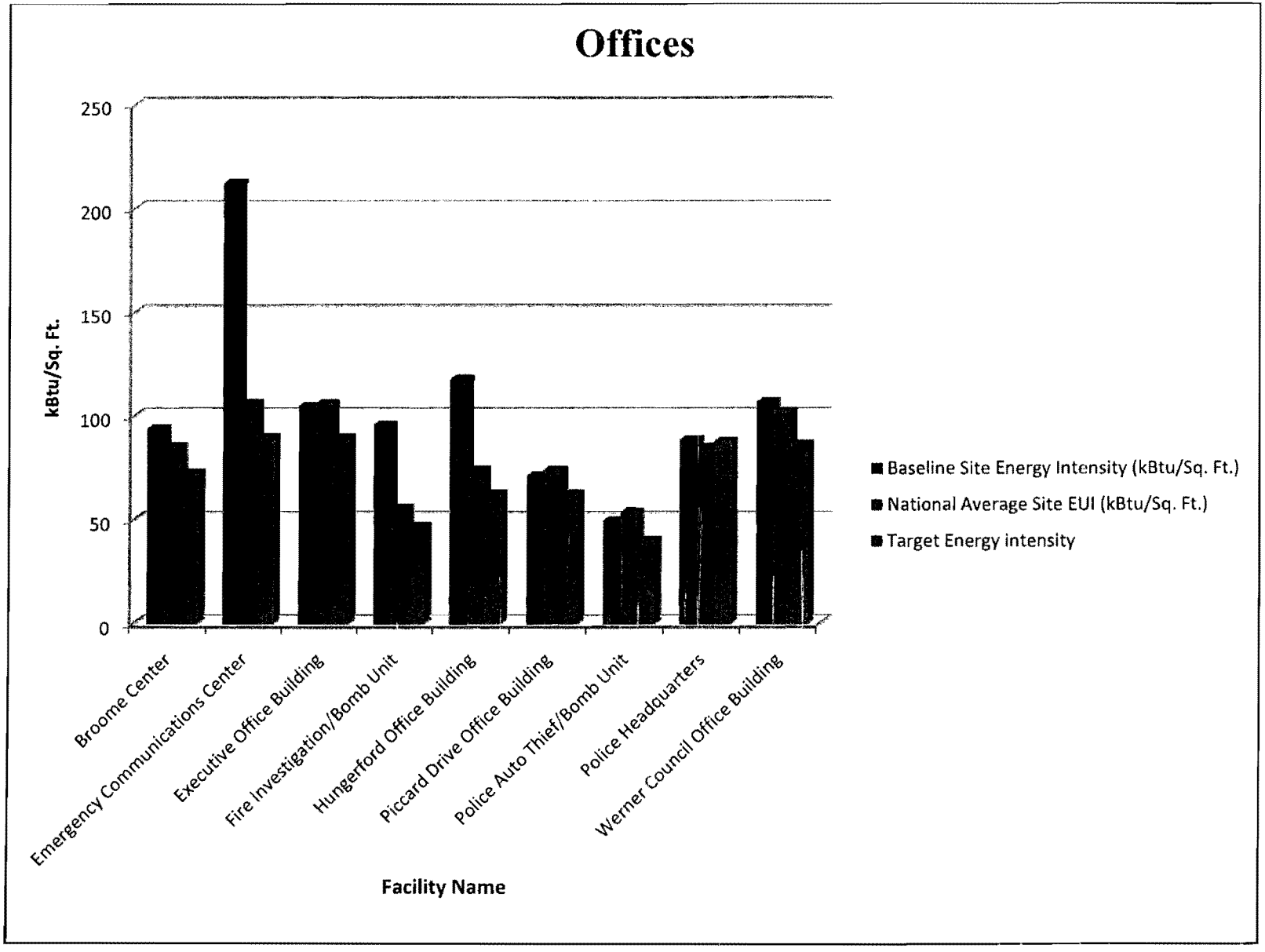

Entertainment and Cultural Facilites
kBtu/Sq. Ft.
450
400
350
300
250
200
150
100
50
0
Strathmore Concert Hall
Strathmore Hall
Blackrock Center For The Arts
Ssr-Silver Theatre
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity

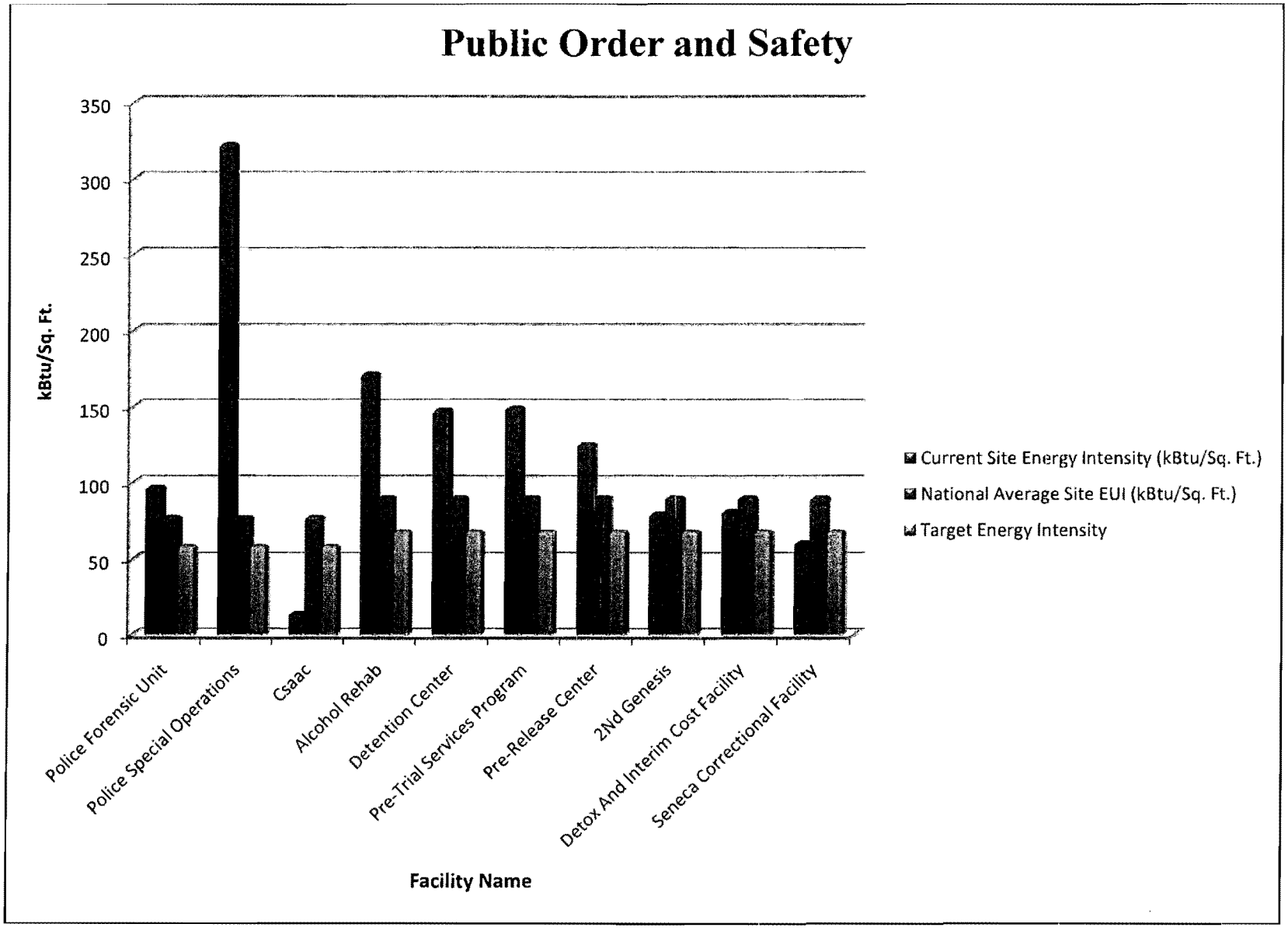

Fire and Police Stations
kBtu/Sq. Ft.
350
300
250
200
150
100
50
0
Animal Shelter
Bethesda Police
Police At Ardennes
Psta
Rockville Police
Silver Spring Police Station
Wheaton/Glenmont Police
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity

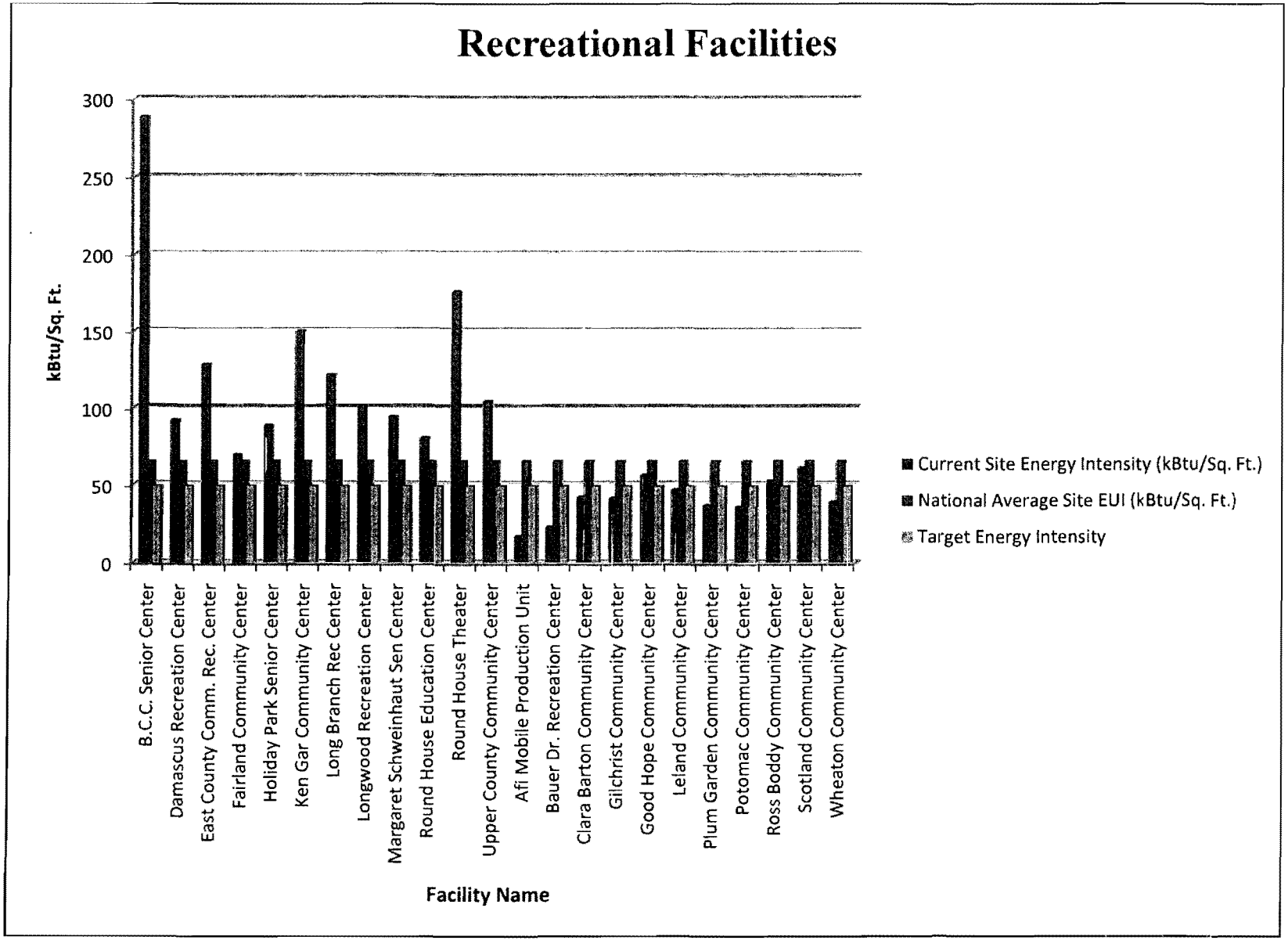

Healthcare Facilities
300
250
200
150
100
50
0
kBtu/Sq. Ft.
Area Shelter
Dennis Avenue Health Services
Men'S Shelter
Social Services
Colesville Health Center
Halfway House For Women
Tess Center
Watkins Mill Shelter
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity

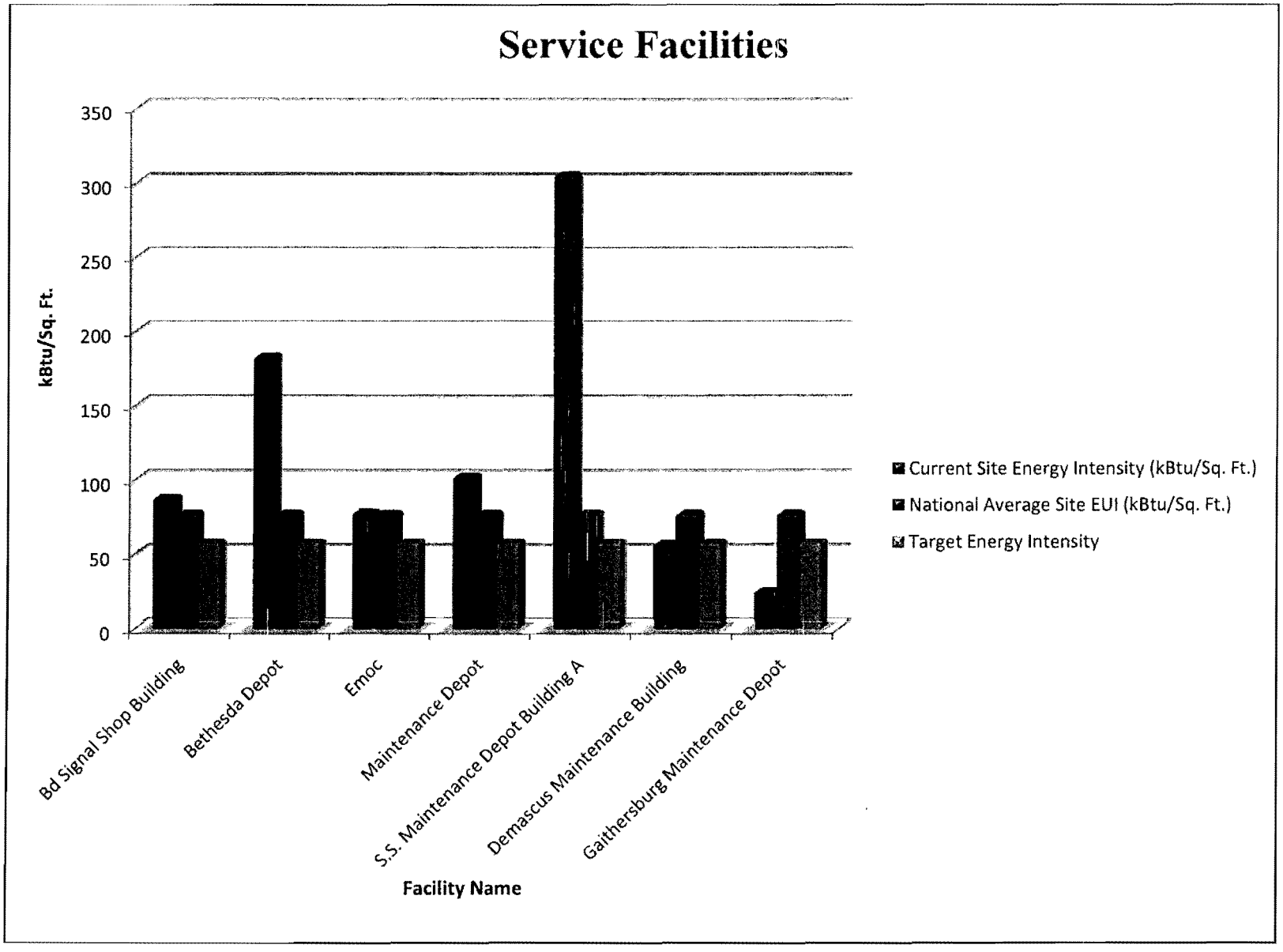

Libraries
250
200
150
100
50
0
kBtu/Sq. Ft.
Aspen Hill Library
Bethesda Reg Library
Damascus Library
Gaithersburg Library
Germantown Library
Noyes Library
Quince Orchard Library
Rockville Library
Wheaton Library
Chevy Chase Library
Davis Library
Fairland Library
Kensington Library
Little Falls Library
Long Branch Library
Olney Library
Potomac Library
Silver Spring Library
Twinbrook Library
White Oak Library
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity

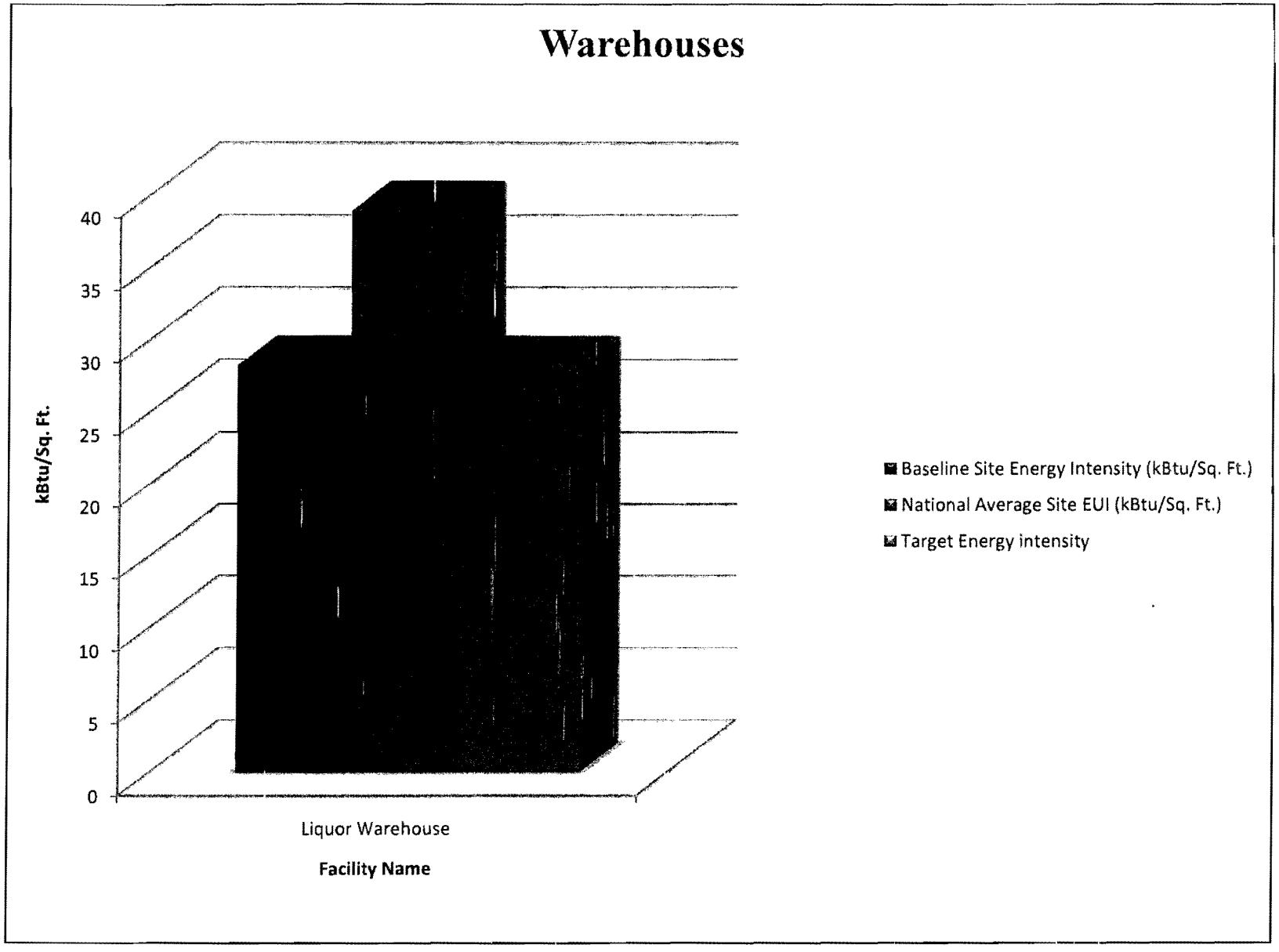

Lodging
100
90
80
70
60
50
40
30
20
10
0
kBtu/Sq. Ft.
Karma House - Boys
Boys/Girls Home - Mncppc (1)
Boys/Girls Home - Mncppc (2)
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity


Offices
250
200
150
100
50
0
kBtu/Sq. Ft.
Broome Center
Emergency Communications Center
Executive Office Building
Fire Investigation/Bomb Unit
Hungerford Office Building
Piccard Drive Office Building
Police Auto Thief/Bomb Unit
Police Headquarters
Werner Council Office Building
Facility Name
Baseline Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy intensity


Public Order and Safety
kBtu/Sq. Ft.
350
300
250
200
150
100
50
0
Police Forensic Unit
Police Special Operations
Csaac
Alcohol Rehab
Detention Center
Pre-Trial Services Program
Pre-Release Center
2Nd Genesis
Detox And Interim Cost Facility
Seneca Correctional Facility
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity


Recreational Facilities
kBtu/Sq. Ft.
300
250
200
150
100
50
0
B.C.C. Senior Center
Damascus Recreation Center
East County Comm. Rec. Center
Fairland Community Center
Holiday Park Senior Center
Ken Gar Community Center
Long Branch Rec Center
Longwood Recreation Center
Margaret Schweinhaut Sen Center
Round House Education Center
Round House Theater
Upper County Community Center
Afi Mobile Production Unit
Bauer Dr. Recreation Center
Clara Barton Community Center
Gilchrist Community Center
Good Hope Community Center
Leland Community Center
Plum Garden Community Center
Potomac Community Center
Ross Boddy Community Center
Scotland Community Center
Wheaton Community Center
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity


Service Facilities
kBtu/Sq. Ft.
350
300
250
200
150
100
50
0
Bd Signal Shop Building
Bethesda Depot
Emoc
Maintenance Depot
S.S. Maintenance Depot Building A
Demascus Maintenance Building
Gaithersburg Maintenance Depot
Facility Name
Current Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy Intensity


Warehouses
kBtu/Sq. Ft.
40
35
30
25
20
15
10
5
0
Liquor Warehouse
Facility Name
Baseline Site Energy Intensity (kBtu/Sq. Ft.)
National Average Site EUI (kBtu/Sq. Ft.)
Target Energy intensity