

ANNE ARUNDEL COUNTY

Implementation Plan for Achieving Energy Efficiency and Conservation



DECEMBER 2013

PREPARED BY:

ARUNDEL COMMUNITY DEVELOPMENT SERVICES, INC.

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ANNE ARUNDEL COUNTY

IMPLEMENTATION PLAN

FOR

ACHIEVING ENERGY EFFICIENCY

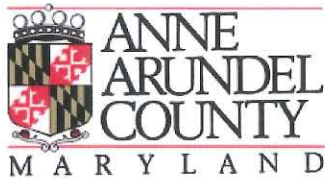
AND

CONSERVATION

LAURA NEUMAN
COUNTY EXECUTIVE
DECEMBER 2013

PREPARED BY:
ARUNDEL COMMUNITY DEVELOPMENT SERVICES, INC.





County Executive Laura Neuman
P.O. Box 2700, Annapolis, MD 21404
410-222-1821

December 20, 2013

Lauren Swiston Urbanek, LEED Green Associate
Energy Efficiency Program Manager
Maryland Energy Administration
60 West Street Suite 300
Annapolis, MD 21401

RE: Anne Arundel County Implementation Plan for Achieving Energy Efficiency and Conservation

Dear Ms. Urbanek:

I am pleased to adopt the *Anne Arundel County Implementation Plan for Achieving Energy Efficiency and Conservation*. This Implementation Plan reaffirms the County's commitment to energy efficiency and the utilization of safe and clean renewable energy resources, a commitment first established in 2009 when the Strategic Plan for Energy Efficiency and Conservation (Resolution Number 45-09) was adopted by the Anne Arundel County Council. This Implementation Plan is intended to be the blueprint for meeting the goals and objectives identified in the Strategic Plan.

One of the specific goals established in the Strategic Plan was for the County to make the energy efficiency improvements necessary to "reduce overall energy usage incurred by the operation of County buildings and facilities by 30 percent over the next ten years." This Implementation Plan establishes the framework to guide the County efforts towards meeting this goal through the implementation of specific initial energy conservation measures necessary to reduce electricity consumption by 15 percent over the next five years. The County will achieve this goal by incorporating energy saving actions into its building and facilities construction, retrofitting and operational practices.

The Strategic Plan also establishes the objective to "investigate possibilities and opportunities for developing renewable energy technologies." This Implementation Plan further defines this objective by establishing the goal to replace grid-based electricity purchases for County buildings and facilities by 20 percent with renewable energy generation by 2022. To achieve this objective a renewable energy action plan has been established to take advantage of the renewable energy resources available directly from either the sun or the earth. Sunlight, or solar energy, will be assessed for its utilization to generate electricity or hot water. In addition, geothermal energy tapped from the earth's internal heat will be investigated for the heating and cooling of County buildings.

I am proud to demonstrate Anne Arundel County's commitment to lower its energy usage costs and to reduce the environmental impacts associated with the generation of electricity through the adoption of the energy efficiency measures and the utilization of renewable energy resources provided in this *Anne Arundel County Implementation Plan for Achieving Energy Efficiency and Conservation*.

Sincerely,

A blue ink signature of Laura Neuman, consisting of a large, stylized 'L' and 'N' followed by a horizontal stroke.

Laura Neuman



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CHAPTER ONE

EXECUTIVE SUMMARY

Introduction

Anne Arundel County, Maryland is a full service government with a population of over 538,000 and only two incorporated areas, which include the City of Annapolis with just over 38,000 people, and the Town of Highland Beach with less than 100 people. The charter government for the County provides all services including police, fire, land use and building permits, recreation and parks, water and waste water services, waste collection, and schools.

Anne Arundel County is located in Maryland on the western shore of the Chesapeake Bay, centrally located within the corridor between Washington, D.C. and Baltimore. Deeply incised with scenic rivers, the County has over 500 linear miles of tidal shoreline with a long history of boating, sailing, and seafood harvesting. Its land use is diverse ranging from more urban development in the north, suburban development in the central section, to rural villages in the south. The County's natural environment is rich in diversity with many large and small rivers, streams and coves that form its shoreline, extensive woodlands, farmlands, and sensitive areas such as tidal and non-tidal wetland, and steep slopes. Preservation of these resources has been a high priority for the County as seen in the land use designation and policies of the General Development Plan. The County struggles to preserve these natural features as it deals with the continued pressure from economic and residential growth, even in these tough economic times. The County has been one of the fastest growing counties in the region.

As the population grows and employment opportunities continue to increase, the demand for public facilities and services continues to increase. This increased demand for services is seen in the County's operating cost, especially in its service oriented departments such as the Department of Public Works, Office of Central Services, the Department of Aging and Disability, and the Department of Recreation and Parks. The challenge as the County moves forward is to meet the demand for services while reducing the operating cost of the County, preserving the natural beauty of the area, and reducing the environmental impact from residential and economic growth. One way the County will achieve this goal is by focusing on implementing energy efficiency ideas and projects, as well as providing some of its energy needs through renewable energy sources.

The County recognizes energy efficiency and renewable energy as a high priority. The goal is to lead by example by reducing energy consumption within its municipal buildings and facilities, as

well as to serve as a leader among municipalities in achieving sustainability through renewable energy sources.

Policies

In 2009, the Anne Arundel County Council adopted a *Strategic Plan for Energy Efficiency and Conservation*. This Plan identifies the goals and objectives of the County in its efforts to move forward with energy efficiency. One of the specific goals identified in this Plan is to “reduce overall energy usage incurred by the operation of County buildings and facilities by 30 percent over the next ten years.” Another goal in this Plan is to investigate the possibilities and opportunities for developing renewable technologies. The County Administration has further defined this objective by setting a goal of receiving 20 percent of its electrical needs from renewable sources by 2022.

Anne Arundel County is committed to incorporating innovative and responsible environmental practices in the substantial rehabilitation and the new construction of public buildings and facilities. It is committed to achieving the goal of using less energy, while still providing the same level of service, by utilizing more efficient technologies. In an ongoing effort to create a healthier working environment, save energy, reduce carbon emissions, and to make the best use of every dollar, the County’s Office of Central Services has been concentrating efforts on the retrofitting of older buildings and facilities making them as energy efficient as possible. In addition, new energy efficiency standards are being developed for future substantial renovation and new construction projects.

Legislation was passed in 2009 requiring publicly funded building projects to meet certain energy efficiency requirements, as established by the United States Green Building Council (USGBC). Design standards and certification requirements have been adopted for the renovation or construction of County owned buildings over 10,000 square feet and funded with 30 percent or more of County of State funding. The design and construction of the building must achieve an environmentally sustainable construction certification from the USGBD of a silver level rating or higher in the Leadership in Energy and Environmental Design (LEED) rating systems.

In August 2012, the County completed a study which looked at the possibility of installing solar photovoltaic (CPV) systems on one or more of its land holdings. This study looked at the potential for development of a solar PV system at one or more of four County owned or leased properties. The County has a Request for Proposal currently available for two of these sites and plans to move forward on two additional sites in the upcoming years.

In an effort to streamline the review and approval process for the installation of solar technologies, in September 2013, the County passed zoning legislation to define and establish the conditions for solar energy systems. This legislation clarified development issues such as setback, height, coverage, etc. to enable a more expedited process for the issuance of building permits.

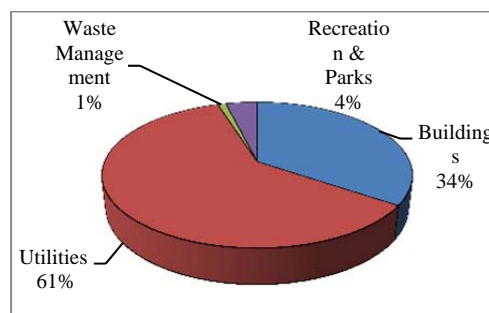
Goals

The Office of Central Services is responsible for energy usage at County buildings and facilities, including administrative office buildings, animal control facilities, communication towers, court houses, detention centers, fire stations, public libraries, police buildings, senior centers, parking garages and miscellaneous properties, comprising approximately 2.84 million square feet of finished space. To operate these buildings and facilities in fiscal year 2013, the Office of Central Services managed the County's consumption of 40,773 MWh of electricity.

The Department of Public Works is responsible for water and wastewater services to an estimated 117,000 households and businesses. It utilizes energy for the operation of water treatment plants, water booster pump stations, water reclamation facilities, water and sewer lines, and sewage pumping stations. In addition, the Department's Bureau of Waste Management Services operates an active landfill and three recycling centers. To keep the public utility system and waste management facilities operational in fiscal year 2013, the Department of Public Works used 72,860 MWh of electricity.

The Department of Recreation and Parks manages numerous parks, athletic fields, aquatic centers, visitor centers and recreation centers. While their administrative and park buildings are maintained by the Office of Central Services, it is the Department of Recreation and Parks responsibility to oversee electricity usage at the County's recreational facilities. In fiscal year 2013, the Department utilized 4,606 MWh of electricity to operate these facilities.

Figure 1
MWh Used in Baseline Year



In total, the Office of Central Services, Department of Public Works and the Department of Recreation and Parks used 118,239 MWh of electricity in the 2013 baseline year to operate buildings, public works facilities, recreational areas and other facilities. As the square footage of County buildings is projected to increase to 2.903 million square feet and water production and treatment is expected to increase 2.9 percent annually, it is projected the County's energy usage will increase to 130,163 MWh annually over the next five years without the implementation of increased energy savings measures.

As part of an economic plan to limit demand for energy consumption and reduce the operating cost of County government, the County has established a goal of reducing electricity consumption by 15 percent over the next five years. This will require the County to reduce its annual electricity consumption by 17,736 MWh annually, to 112,427 MWh in five years.

The County is also committed to exploring opportunities for utilizing renewable energy technologies to supplement its energy use. One major advantage with the use of renewable energy is that it is sustainable, as it is derived from natural and available resources.

The County has recently completed three successful renewable energy projects (1) a 750 kW solar PV installed as roof top project at the Office of Central Services warehouse, located in Millersville, (2) an 80 ton geothermal heat pump system for the Department of Aging and Disabilities at the Pascal Senior Center, located in Glen Burnie, and (3) solar hot water systems at the Lothian/Harwood and Central Glen Burnie fire stations. Together these three renewable energy facilities are providing the County with approximately in 1,240 MWh annually.

In order to diversify the County's energy sources by reducing conventional centralized electricity generation serving County buildings and facilities, the County has established a goal to generate 23,648 MWh or 20 percent of its electricity usage with renewable energy generation by 2022. This will require the County to generate an additional 22,408 MWh of electricity annually from renewable energy resources.

Table 1
Summary of Electricity Use and Goals

MWh Used in Baseline Year	Projected MWh Used in 5 Years Without Savings	Project Goal with 15% Savings	Projected 20% Goal with Renewable Energy Generation
118,239 MWh	130,163 MWh	112,427 MWh	22,648 MWh

Program Management Plan for Implementation, Monitoring and Oversight

The management and oversight of the County's efforts to reduce energy consumption and to explore opportunities for utilizing renewable energy resources will be an interagency collaborative effort. Arundel Community Development Services, Inc. (ACDS), the County's non-profit community development office, will be the lead agency responsible for coordinating and monitoring the prioritized efforts of the Department of Public Works, the Office of Central Services, and the Department of Recreation and Parks, in pursuing opportunities to reduce electricity consumption and to utilize available renewable energy resources. Reporting directly to the County Executive, ACDS will be responsible for (i) tracking and monitoring the County's energy usage, (ii) conducting ongoing assessments of the County's energy usage and assisting County departments and agencies with identification of opportunities for the reduction of energy consumption, (iii) and assisting County departments and agencies in their efforts to identify, evaluate and prioritize buildings and facilities for implementing energy efficiency improvements. In addition, ACDS in close cooperation with its interagency partners will explore opportunities to utilize renewable energy resources by, (i) conducting assessments of County owned or leased sites for the potential development of renewable energy, (ii) seeking out and exploring opportunities for renewable energy financial incentives and (iii) exploring ongoing opportunities to partner with solar service providers to enable the County to obtain energy at below current market prices.



CHAPTER TWO

ENERGY USAGE BASELINE INVENTORY

Identification of Baseline Year

The baseline for electricity usage for Anne Arundel County buildings, facilities, water and sewer service and waste management has been established for the time period from July 1, 2012 through June 30, 2013.

Consumption for the Baseline Year

In order to determine the County's electricity usage baseline, data tracking information from three separate County agencies was combined including (1) a database maintained by the County's Office of Central Services which includes major County buildings and facilities, (2) a database maintained by Enernoc on behalf of the County's Department of Public Works (DPW) which includes facilities operated by the County's Bureau of Utility Operations and the Bureau of Waste Management Services, and (3) an Excel spreadsheet maintained by the Department of Recreation and Parks.

The system maintained by the County's Office of Central Services is a spreadsheet database which is the Department's work order tracking system. This tracking system centralizes maintenance and repair operations in addition to recording energy usage at County buildings and facilities. The Office of Central Services is responsible for 91 buildings and facilities, including 11 general administrative office buildings, one warehouse, one horticulture facility, two animal control facilities, eight communication towers, two court houses, two detention centers, 22 fire stations and facilities, 15 public libraries, 12 police buildings, eight road operation facilities, seven senior centers, two structured parking garages and miscellaneous properties, comprising approximately 2.84 million square feet of finished space.

To use energy intelligently and cost effectively, the Department of Public Works utilizes the services of energy intelligence software provided by EnerNOC. Through the use of this proprietary Utility Bill Management System (UBMS), the Department tracks utility accounts with detailed reports routinely generated providing electricity usage profiles and cost information.



Anne Arundel County Fire Department

The Bureau of Utility Operations is responsible for water and wastewater services to an estimated 117,000 households and businesses. It manages 13 water treatment plants, 18 water booster pump stations, seven water reclamation facilities, 1,144 miles of water lines, 1,201 miles of sewer lines, and 249 sewage pumping stations. In addition, the Bureau of Waste Management Services operates one active landfill and three recycling centers.

The Department of Recreation and Parks administrative and park buildings are managed and maintained by the Office of Central Services; however, the electricity usage data for most of the Department's parks, ball fields is maintained by the Department. The Department of Recreation and Parks is responsible for operating 106 parks with lights, 328 athletic ball fields, two aquatic centers, two visitor centers, two recreation centers, wetland sanctuaries and historical sites. As electricity usage for many of these facilities is tracked by the Office of Central Services and numerous accounts are paid by private community organizations, the Department only tracks electricity usage for approximately 114 sites on an Excel spreadsheet that is updated semi-annually.

Not included in this baseline is electricity usage by Anne Arundel County Public Schools. Although the annual public school budget is set by the County Executive and County Council, the schools are overseen by a separate Board of Education which operates and maintains all its own buildings. Therefore, as the Board of Education is responsible for managing public school system, their electricity usage is not included in the establishment of baseline consumption.

Provided below is a summary of the County's electricity users subject to the policies established by this electricity usage baseline.

Table 2
Summary of County Buildings and Facilities

	Number
<i>Buildings and Facilities - 91</i>	
Electric Heat	45
Geothermal Heat	1
Other Heat	45
Subtotal	91
<i>Water and Waste Water</i>	
Drinking Water Plants	13
Wastewater Treatment Plants	7
Water Booster Pump Stations	18
Pumping Stations	249
Subtotal	287
<i>Waste Management Facilities</i>	
Landfill	1
Recycling Centers	3
Subtotal	4
<i>Recreation and Parks - 114</i>	
Parks with Lights	106
Aquatic Centers	2
Visitor Centers	2
Other Facilities	4
Subtotal	114
TOTAL	496

Anne Arundel County electricity usage has been divided into three sections including those utility accounts managed by the (1) Office of Central Services, (2) Department of Public Works, Bureau of Utility Operations, and (3) Department of Recreation and Parks. As shown on the table below, the Office of Central Services used 40,773 MWh of electricity in the baseline year to operate its 2.84 million square feet of buildings and related facilities. During the same time period, the County Department of Public Works used 71,685 MWh of electricity to operate its water and sewer facilities and the Bureau of Waste Management used 1,175 MWh of electricity. The Department of Recreation and Parks used 4,606 MWh of electricity. As shown below, the total County consumption of electricity for all buildings and facilities tracked in the baseline year – July 1, 2012 through June 31, 2013 – totals 118,239 MWh.

Table 3
Summary of Electricity Usage

Baseline Year FY13	MWh Used in Baseline Year
Buildings	40,773
Water and Waste Water	71,685
Waste Management	1,175
Recreation and Parks	4,606
TOTAL	118,239

Planned Expansion of County Facilities

In order to assess the impact of that the County's growth will have on its electricity usage required for the operation of its buildings and facilities over the next five years, the County's Capital Improvement Plan (CIP) was reviewed. The review of the CIP revealed that the County plans to add two new buildings during the next five years. One of these buildings is the Eastern District Police Station, to be located in Pasadena. This building is intended to replace the existing 16,500 square foot Eastern District Police Station. It has been designed and is currently in the construction bidding phase. The new building will comprise 20,016 Gross Square Feet (GSF) and is designed to exhibit the County's commitment to environmental stewardship through features such as passive solar considerations, efficient mechanical systems, and environmentally friendly materials.

The other planned new building is the 12,000 gross square footage Lake Shore Fire Station, which will be in Pasadena as well. This building is intended to replace the existing 7,500 square foot Lake Shore Volunteer Fire Station. However, as the local volunteer fire department is

responsible for paying the monthly utility bill for this facilities energy usage, the planned new fire station has not been included in the projection for increased County energy usage over the next five years.

The Department of Recreation and Parks anticipates constructing two new buildings in the next five to ten years. These include a 900 square foot concession stand and a new 59,000 square foot indoor tennis facility.

As the projected square footage of buildings operated by the Office of Central Services and the Department of Recreation and Parks is projected to increase from 2.840 million square feet of finished space to 2.903 million square feet over the next five years, it is anticipated with all other measures remaining the same and without energy savings measures the projected County's building electricity usage will increase to 41,683 MWh.

Another impact on the County's electricity use over the next five years is the anticipated increased demand and regulatory requirements for public water and sewer service. The Department of Public Works electricity usage over the next five years will mainly be affected by (i) population growth in the service area that will increase the demand for potable water and the resulting wastewater flows, (ii) regulatory drivers that require upgraded treatment processes in order to meet higher levels of treatment such as enhanced nutrient removal upgrades that will come online within the next five years, and (iii) the amount of water the County purchases from Baltimore City. The County currently produces approximately 80 percent of the annual average water demand and purchases the remaining 20 percent from Baltimore City. The Department of Public Works has set a goal to increase the production capacity of and reduce the amount of water purchased from the City. Due to the projected increase in population, increased demand due to regulatory requirements and the projected reduction in water purchases, it is projected water production and treatment will increase by approximately 2.9 percent annually through 2020.



Cox Creek Water Reclamation Facility

As the projected water production and treatment is anticipated to increase by 2.9 percent annually over the next five years, without energy savings measures, the projected electricity usage will increase to 82,699 MWh.

Waste Management Services has several future capital improvement projects in the planning and design stage which may impact energy consumption. These include the addition of compaction

refuse container, construction of a bio-gas to compressed natural gas system, and the commissions of a new leachate pre-treatment facility. While these future projects will support cleaner and improved operations at Waste Management Services facilities, their short term impact on energy usage will not be significant.

To project the County's electricity usage over the next five years, the additional square footage of planned new buildings and anticipated increased demand for water and wastewater services has been projected, as shown in Table 4.

Table 4
Projected Electricity Usage

	MWh Used n Baseline Year	Projected Square Footage in 5 Years	Projected Annual Increase in Water and Sewer Service	Projected MWh
				Used in 5 years
Buildings	40,773	2,903,266		41,683
Water and Waste Water	71,685		2.90%	82,699
Waste Management	1,175			1,175
Recreation and Parks	4,606			4,606
TOTAL	118,239			130,163

Electricity Usage Baseline

County electricity usage for buildings and facilities subject to this baseline has been established at 118,239 MWh and with anticipated growth, it is projected to increase to 130,163 MWh over the next five years. However, this data represents only purchases the County makes through the Baltimore Regional Cooperative Committee from Washington Gas as identified on energy usage data provided currently being managed and tracked through separate data bases and spreadsheets managed by the office of Central Services, Department of Public Works and the Department of Recreation and Parks. This energy usage data does not include accounts for private area lighting such as parking lots and some streetlight expenses. The database and spreadsheets that are used to track County energy usage by each Department also include some minor overlap, duplicity and inconsistencies. The County's energy usage tracking will be consolidated in the upcoming year to minimize any noted overlaps and duplicity in account data used for this Plan and to provide a more centralized and accurate tracking of future electricity usage.



CHAPTER THREE

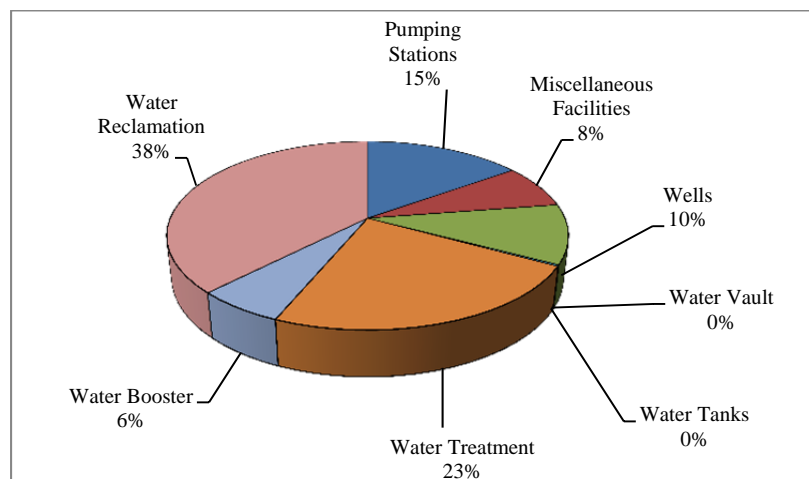
ELECTRICITY REDUCTION PLAN

Goal for Electricity Reduction

The County used 45,379 MWh of electricity in the baseline year to operate approximately 2.840 million square feet of buildings and related facilities exclusive of its public works facilities. As the projected square footage is projected to increase to 2.903 million square feet over the next five years, it is anticipated that without energy savings measures, the projected electricity usage will increase to 46,289 MWh. To meet the goal of reducing electricity consumption by 15 percent over the next five years, the County will need to reduce its projected annual electricity usage to 39,482 MWh.

The County used 71,685 MWh of electricity in the baseline year to operate its water and sewer facilities. Figure 2 shows a comparison of electricity usage by source category. Water reclamation facilities represent the highest usage, with 38 percent of the total, while water treatment plants and pumping stations are second and third, with 23 percent and 15 percent of usage, respectively. As the projected water production and treatment will increase by 2.9 percent annually over the next five years, it is anticipated that without energy savings measures, the projected electricity usage will increase to 82,699 MWh. To meet the goal of reducing electricity consumption by 15 percent over the next five years, the County will need to reduce its projected annual water and sewer facilities electricity usage to 71,946 MWh.

Figure 2
Electricity Usage for the Bureau of Utility Operations



The Bureau of Waste Management Services used 1,175 MWh of electricity in the baseline year to operate its Millersville Landfill and Resource Recovery Facility and its recycling centers located in Sudley and Glen Burnie. Its largest energy users were its pre-treatment plant and maintenance shop at the Millersville Landfill and Resource Recovery Facility. As the Bureau of Waste Management is not currently planning any new building or facilities that would significantly affect their electricity usage, it is anticipated their electricity usage will not change over the next five years.

In summary, the current baseline for total County electricity usage has been established at 118,239 MWh. Without any projected savings in County electricity usage over the next five years, the forecasted energy usage would total 130,163 MWh. However, by effectively implementing the strategies and policies provided herein, it is anticipated the County will be able to cut its electricity usage by 15 percent over the next five years, thereby saving 17,736 MWh of electricity annually with a projected usage of 112,427 MWh at the end of year five. Table 5 shows the baseline usage by general County buildings and facilities, Bureau of Utilities, and the Bureau of Waste Management with the 15 percent reduction goal.

Table 5
Baseline Usage and 15 Percent Reduction Goal

Baseline Year FY13	MWh Used in Baseline Year	Square Footage (Baseline)	MWh Per Square Foot	Projected Square Footage in 5 Years	Projected MWh Used in 5 Years Without Savings	15% Savings of Total MWh Baseline	Projected Planned Annual MWh Usage in 5 Years
Buildings	40,773	2,839,850	.014 MWh	2,903,266	41,683	6,116	35,567
Water and Waste Water	71,685				82,699	10,753	71,946
Waste Management	1,175				1,175	176	999
Recreation & Parks	4,606				4,606	691	3,915
TOTAL	118,239				130,163	17,736	112,427

Planned Energy Conservation Actions

Anne Arundel County is committed to implementing energy saving programs and action in an effort to reduce its energy consumption by 15 percent within the next five years. The County will achieve this goal by incorporating energy saving actions into its building operation practices and facility maintenance plans. These practices include retrofitting existing building with state-of-the-art energy management systems and implementing the utility company's peak demand program. The County will also achieve this goal by implementing innovative and responsible environmental practices into its substantial rehabilitation projects and all of its new construction

projects. In addition, the County has implemented an energy-efficient product procurement policy.

For energy saving ideas for facilities managed by the County's Department of Public Works, the County will focus on implementing the ideas outlined in a recently completed *Greenhouse Gas Inventory and Action Plan for the Bureau of Utility Operations Department of Public Works*. The purpose of this study was to complete an inventory of energy usage and greenhouse gas emissions generated by the County's water and waste water facilities and to develop a plan of action to reduce future energy use and greenhouse gas emissions.

The following outlines the action steps the County will work toward implementing in order to reach its goal of reducing its energy usage by 15 percent by Local Fiscal Year 2019.

Action One: Energy Management System

The heating ventilation and air conditioning systems in numerous 1960s and 1970s era County owned buildings have been retrofitted with state-of-the-art energy management systems. These energy management systems are designed to manage, monitor and control energy usage through a networked web browser program enabling facility managers to remotely receive alarms and event notifications and to update lighting or climate control schedules with one command. The County is committed to this system and will work toward equipping all of their buildings and facilities with the energy management system technology in order to have a fully integrated countywide system. In addition, when future upgrades to HVAC equipment is determined necessary for a County building or facility, the design professional will be required to specify the most cost effective high efficiency and properly sized HVAC equipment available for the intended use. All new HVAC systems are to be commissioned to ensure that the most efficient system possible is installed and it performs to specifications.

Action Two: Peak Demand Program

Demand response is generally used to refer to mechanisms used to encourage consumers to reduce demand, thereby reducing the peak demand for electricity. Baltimore Gas and Electric (BGE) currently operates a demand response program through the use of dedicated control systems to shed loads under conditions of tight electricity supply. Services (lights, machines, air conditioning) are reduced according to a preplanned load prioritization scheme during the critical time frames. Demand response can significantly decrease the peak price and, in general, electricity price volatility. The Office of Central Services currently has five building and the Department of Public Works has numerous wells and wastewater reclamation and water treatment facilities participating in the BGE demand response program. The County will continue to look at opportunities to connect additional buildings and facilities to this program.

Action Three: New Construction and Rehabilitation

Anne Arundel County is committed to incorporating innovative and responsible environmental practices in the substantial rehabilitation and the construction of public buildings and facilities. It is committed to achieving the goal of using less energy to provide the same level of service by utilizing more efficient technologies. In an ongoing effort to create healthier working environments, save energy, reduce carbon emissions, and to make the best use of every dollar, the County's Office of Central Services has been concentrating efforts on the retrofitting of older buildings and facilities making them as energy efficient as possible. In addition, new energy efficiency standards are being developed for future substantial renovation and new construction projects. Any new construction or major rehabilitation of County owned public buildings over 10,000 square feet that are funded with 30 percent or more of County or State funds must achieve a certification from the United States Green Building Council of Silver rating or higher.

Action Four: Energy Star Purchasing Policy

Because energy-efficient product procurement helps reduce energy loads, it can also increase the cost-effectiveness of other energy efficiency activities, such as facility upgrades. As the County replaces older equipment, all new equipment will specify, where practicable, a product which carries the Energy Star label. For product categories not rated by Energy Star, it is the policy of this County that departments will specify, where practicable, that the product be in the top 25 percent of its product category with regards to energy efficiency. While many energy efficient products are currently available for no price premium, should a price differential exist, the County will analyze the cost versus the long term benefit of the product.

Action Five: Utilities Energy Management Energy Program

The Bureau of Utility Operations proactive management programs have reduced energy use and improved efficiency in its water and waste water operations. The Bureau of Utility Operations will expand its current efforts under the leadership of a dedicated energy manager to oversee proactive management programs to reduce energy use, improve efficiency and verify the results. This effort includes (i) assembling a cross-functional energy management team; (ii) evaluating system and collecting data; (iii) identifying energy saving and management strategies; (iv) developing an implementation plan; (v) progress tracking and reporting; and (vi) assessing opportunities for energy savings on a regular basis.

Action Six: Aquifer Storage and Recovery

During off peak seasons, treated water is recharged into the aquifer to create a bubble of treated water in the County's aquifer. During peak demand, this treated water can be recovered and sent directly into the distribution system with minimal additional treatment. The energy usage of an aquifer storage and recovery system will be less than that to fully treat an equivalent volume of raw water. The County is currently implementing a project to test and install an ASR facility at a County owned well near Crain Highway. Based upon successful completion of this first installation, the County may continue to develop this aquifer storage and recovery technology.

Action Seven: Optimizing the Water Distribution System

The County water distribution system is currently monitored and controlled by a supervisory control and data acquisition system. The control strategy is currently designed to maintain a set pressure in the system and to manage storage tank levels. A strategy to optimize the water distribution system is to be identified to capitalize on existing opportunities to operate the system in a more energy efficient manner, thereby reducing operational cost. This strategy will involve refining the control strategies to deliver water from the most energy efficient water treatment plants, wells and water boost pump stations without sacrificing water pressure of the water distribution system for increased energy efficiency.

Action Eight: Filter Backwash Optimization

The Bureau of Utility Operations filters groundwater to remove iron and manganese to produce safe drinking water. To clean the filters after they have been operated for a period of time, water is pumped back through the filters to wash solids that have accumulated. The energy use associated with backwashing the filters can represent a significant portion of the energy used in water treatment. A strategy is to be developed to optimize the filtration and filter back wash process at the County's water treatment plants to reduce the amount of water by reducing the duration and rate of backwashing and the number of cycles.

Action Nine: Well Rehabilitation Program

Groundwater wells lose some of their capacity over time as a result of fouling and buildup of minerals around the well bore/screen area. Rehabilitation typically occurs every eight years on average and requires a month of downtime. The Bureau of Utility Operations operates approximately 40 production wells that supply water to the County. A strategy is to be developed to rehabilitate the wells more systematically and at shorter intervals in order to reduce the capacity loss of the wells by 10 percent.

Action Ten: PC Power Management

As the County moves forward to upgrade its computer technology the IT Department shall endeavor to evaluate strategies that will allow reduction in the electric energy consumed by County computers through a PC Power Management Program that will combine technology improvements and improved behavioral practices.

Action Eleven: Energy Efficiency Projects

The County will use the database of energy usage by County facilities as a way of prioritizing the County's focus on reducing energy usage by department and by facility. The prioritization will be further defined through future energy audits should funds become available. Buildings using less energy and performing more efficient than others are not current priorities for the energy efficiency upgrades. Similarly, large consumers per square footage will be prioritized for improving efficiency and reducing overall consumption. These improvements will be funded through three main sources which include (1) County annual appropriations for general maintenance of County buildings and facilities, (2) federal and state grants available including MEA Smart Energy Communities funds, and (3) a dedicated Energy Fund. The dedicated Energy Fund was created when the County Council adopted ordinance 57-10 in August of 2010. This ordinance states that net revenues available from the Landfill Gas to Energy Project at the Millersville Landfill and Resource Recovery Facility after debt service and the cost of electricity at the landfill facility will be divided such that 60 percent will be deposited into the Waste Collection Fund and 40 percent will be deposited into the Energy Fund. This fund, which is administered by Arundel Community Development Services, Inc., will be used toward energy efficiency projects on County building and facilities identified as the most inefficient County facilities.

Implementation Plan

ACDS will be responsible for the coordination and management of the multifaceted strategy outlined in this Plan, with a strong emphasis being placed on fiscal responsibility, transparency and accountability. The strategies identified and outlined in this Plan will be implemented in close partnership and cooperation with the Department of Public Works, Office of Central Services, and the Department of Recreation and Parks.

The County's strategy focuses on implementing the goals and objectives defined within this Plan through the establishment of specific milestones and a timetable for achieving the goals and objectives of this Plan. It is envisioned the Planned Energy Conservation Actions identified herein will be implemented in a four tier timeframe: ongoing actions; immediate actions (within one year); intermediate actions (one to three years); long term actions (three to five years).

The County is committed to achieving the stated goal of reducing County electricity usage by 19,523 MWh annually within a five year period. Provided below are the actions the County will implement to achieve this objective.

Ongoing Actions

Energy Management System – The County Office of Central Services has retrofitted numerous 1960's and 1970's County owned building with state-of-the art energy management systems. It is intended these efforts will continue as the County works toward equipping all their buildings and facilities with this technology in order to have a fully integrated countywide system. It is estimated this ongoing objective will result in a one percent savings in energy usage.

Peak Demand Program – The Office of Central Services has begun implementing the Demand Response Program at the Heritage Office Complex and the County Courthouse. The Department of Public Works has implemented the Demand Response Program at 14 well and water treatment facilities and the Harry Truman Building. It is intended that the County will continue to bring additional service accounts into the Demand Response Program on an ongoing basis with an anticipated one percent savings in energy usage.

Energy Star Purchasing Policy – As the County continues to replace older appliances and equipment, all new products will specify, where practical, a product which carries the Energy Star label. This will be an ongoing activity with an estimated one half percent reduction in energy usage.

Utilities Energy Management Program – The Bureau of Utility operation will expand its current energy savings effort under the leadership of a dedicated energy manager to oversee and coordinate its ongoing energy saving program. It is anticipated this strategy will reduce overall energy use by five percent from its current levels.

Aquifer Storage and Recovery – The County is currently implementing a project to test and installed an ASR facility at a County owned well near Crain Highway. A study is now being completed that will finalize strategies to enable the County to design and construction this aquifer storage and recovery technology at multiple sites on a long term basis, resulting in an estimated three percent savings at each of the County's major water treatment facilities.

Optimizing the Water Distribution System – The County water distribution system is currently monitored and controlled by a supervisory control and data acquisition system. The control strategy is currently designed to maintain a set pressure in the system and to manage storage tank levels. A strategy to optimize the water distribution system to capitalize on existing opportunities to operate the system in a more energy efficient manner is currently being

implemented on an ongoing basis. A one percent reduction in overall utility energy usage is anticipated from the optimization of the water distribution system.

Filter Backwash Optimization – A strategy is currently being implemented on an ongoing basis to optimize the filtration and filter back wash process at the County’s water treatment plants to reduce the amount of water by reducing the duration and rate of backwashing and the number of cycles. A two percent reduction in the water treatment plant energy use may be achieved through full implementation of this strategy.

Well Rehabilitation Program – A strategy is currently being implemented on an ongoing basis to rehabilitate the wells more systematically and at shorter intervals in order to reduce the capacity loss of the wells by 10 percent.

PC Power Management – As the County moves upgrades its computer technology IT Department it will on an ongoing basis endeavor to evaluate strategies that will allow reduction in the electric energy consumed by County computers through a PC Power Management Program that will combine technology improvements and improved behavioral practices.

Immediate Actions (within 1 year)

Police Headquarters – The County is currently replacing the old energy inefficient windows at the Police Headquarters, at 8495 Veterans Highway, in Millersville. The scope of work includes the installation of energy efficient windows with storefront window walls with thermal breaks, low-E coating and insulation at no-window locations. A 15 percent savings in energy usage is anticipated, saving 274,450 kWh annually.

O’Malley Senior Center, O’Malley Annex and South County Senior Center Retrofits - Operated by the Anne Arundel County Department of Aging and Disabilities, these senior center were built in the late 1980’s and offer a popular gathering place for many of the Odenton and South County older residents. The centers offer a variety of health screenings, financial counseling, activities, classes and bus trips. Utilizing 2013 funds allocated to Anne Arundel County through the Maryland Energy Administration Smart Energy Communities Program, energy efficiency improvements are to be completed at these facilities including, air sealing, insulation, lighting upgrades and hvac retrofits. It is anticipated a 20 percent savings in energy usage will be achieved, saving 126,000 kWh annually.

Intermediate Actions (1 to 3 years)

Eastern District Police Station – As discussed earlier, the construction of a new Eastern District Police Station, in Pasadena, is scheduled to begin in 2014. The new building will comprise 20,016 GSF and is designed as a LEED Silver rated building to exhibit the County’s commitment to environmental stewardship through features such as passive solar considerations, efficient mechanical systems, and environmentally friendly materials. When completed it is anticipated the new facility will save 95,480 kWh annually.

South Glen Burnie Fire Station – Built in the early 1970’s, the South Glen Burnie Fire Station, located at 7880 South Crain Highway, in Glen Burnie, is one of the busiest County fire stations. Due to the age of the facility and its high energy usage, this structure has been prioritized for energy efficiency improvements in the upcoming year. It is intended 2014 funds allocated through the Maryland Energy Administration Smart Energy Communities Program will be made available for this facility for air sealing, insulation, lighting upgrades and possible hvac retrofit. A 25 percent savings in energy usage is anticipated, saving 26,625 kWh annually.

Long Term Actions (3 to 5 years)

Energy Efficiency Projects – The County will use the database of energy usage by County facilities and energy audits as a way of prioritizing the County’s focus on reducing energy usage by department and by facility. Large consumers per square footage will be prioritized for improving efficiency and reducing overall consumption. These improvements will be funded through three main sources which include (1) County annual appropriations for general maintenance of County buildings and facilities, (2) federal and state grants available including MEA Smart Energy Communities funds, and (3) a dedicated Energy Revolving Fund created when the County Council adopted ordinance 57-10 in August of 2010. Potential projects that have been identified and prioritized to date include the Arundel Center, the Court House, Ordinance and Jennifer Road Detention Centers and the West County Library. When energy efficiency measures are completed, it is anticipated the County will save approximately 1,649,809 kWh annually. During the next five years, the County will continue to seek opportunities for additional energy efficiency projects for its buildings and facilities in an effort to find an additional 9,551,247 kWh in savings.

Table 6 identifies each activity or action to be implemented over time in an effort to reduce the County’s energy usage.

Table 6
Planned Energy Conservation Actions

Ongoing Actions	Description	Estimated Annual Savings (KWh)
Energy Management Systems	Continue to install energy management systems at County owned buildings	416,420
Demand Response Program	Install Demand Response meters at three service accounts annually	416,420
Energy Star Purchasing	Purchase Energy Star labeled appliances and equipment, where applicable	208,210
Utilities Energy Management Program	Dedicated energy manager to oversee energy savings activities	2,630,700
Aquifer Storage and Recovery	Implement system at multiple well locations (est. 3% savings)	712,973
Optimizing the Water Distribution	Implement system at multiple well locations (est. 1% utility operation savings)	526,140
Filter Backwash Optimization	Implement system at multiple well locations (est. 1% savings at WTP)	475,315
Well Rehabilitation Program	Implement system at multiple well locations (est. 1% utility operation savings)	526,140
PC Power Management	Implement cost saving strategies	100,000
Immediate Action		
Police Headquarters Retrofit	Replacement of inefficient windows	274,450
O'Malley Senior Center Retrofit	Complete energy efficiency improvements (est. 20% savings)	42,731
O'Malley Senior Center Annex	Complete energy efficiency improvements (depending on MEA funding availability)	34,454
South County Senior Center Retrofit	Complete energy efficiency improvements (est. 20% savings)	48,886
Intermediate Action (1 to 3 years)		
Eastern District Police Station	Replacement of inefficient building with new LEED Silver rated building (est. 15% savings)	95,480
South Glen Burnie Fire Station	Utilizing 2014 MEA Smart Energy Communities Program grant funds, energy efficiency improvements are to be completed (est. 25% savings)	26,625
Long Term (4 to 5 years)		
Arundel Center	Seek innovative ways to reduce energy consumption (est. 10% savings)	273,000
Court House	Seek innovative ways to reduce energy consumption (est. 10% savings)	522,450
Detention Center Jennifer Road	Seek innovative ways to reduce energy and consumption (est. 15% savings)	384,093
Detention Center Ordance Road	Seek innovative ways to reduce energy and install solar hot water or solar PV (15% savings)	338,266
West County Library	Seek innovative ways to reduce energy consumption (est. 10% savings)	132,000
Identify and Prioritize Future Energy Efficiency Projects and Measures	Seek additional buildings and facilities for energy efficiency improvements	9,551,247
TOTAL ELECTRICITY SAVINGS		17,736,000 KWh 17,736 MWh



CHAPTER FOUR

RENEWABLE ENERGY ACTION PLAN

Goal For Renewable Energy

The County's Renewable Energy Action Plan relies on renewable energy resources directly from either the sun or the earth. Sunlight, or solar energy, will be utilized directly for generating electricity and hot water heating. Geothermal energy tapped from the Earth's internal heat will be utilized for the heating and cooling of County buildings.

The County consumed 118,239 MWh of electricity in the baseline year to operate approximately 2.834 million square feet of its buildings, public works facilities and recreational areas. To meet the goal of reducing conventional centralized electricity generation serving County buildings and facilities by 20 percent with renewable energy generation by 2022, the County will need to generate 23,648 MWh of its electricity annually from renewable energy resources.

Table 7
Baseline Usage by Function

Baseline Years FY13	MWh Used in Baseline Year	% of Total MWh Baseline Electricity Consumption
Buildings	40,773	34%
Water and Wastewater	71,685	61%
Waste Management	1,175	1%
Recreation and Parks	4,606	4%
TOTAL	118,239	100%

The County currently produces approximately 1,240 MWh of renewable energy annually at (1) 750 kW solar PV system located at the Central Services Warehouse, Millersville, (2) an 80 ton geothermal closed loop heat pump hvac system recently installed at the Pascal Senior Center, and (3) solar hot water systems at the Lothian/Harwood and Central Glen Burnie fire stations. To meet the goal of utilizing 20 percent of its current electricity needs by 2022, the County must generate an additional 22,408 MWh annually from renewable energy technology.

Table 8
Renewable Energy Goal by County Function

	Existing Renewable Energy Generation as a Percentage of Existing Electricity Load	Cumulative MD Smart Energy Goal by 2022	Renewable Energy Goal
Buildings and Facilities	2%	11%	9%
Water and Sewer Facilities	0%	1%	1%
Waste Management Facilities	0%	3%	3%
Recreation and Parks	0%	5%	5%
Total	2%	20%	18%

Renewable Energy Resource Conversion Technologies

A factor that must be taken into account when consideration is given to renewable energy resource conversion technologies is how the County currently purchases electricity and how much it pays for this energy resource.

The County along with five regional counties, the Cities of Baltimore and Annapolis, and their respective school systems have formed the Baltimore Regional Cooperative Committee for the purchase of goods, including the purchase of electricity. By consolidating administrative costs and purchasing in quantity, this consortium is able to leverage their buying power to purchase electricity at competitive and affordable pricing. The Baltimore Regional Cooperative Committee energy consortium currently purchases an average of 1.6 million MW of electricity annually on the wholesale market. Throughout 2013, the County paid approximately 8 cents per kilowatt-hour. Therefore, any consideration for switching to renewable energy must assess its economic benefit to the County.

This Renewable Energy Action Plan provides for the County to develop, utilize and generate renewable energy resources as viable energy alternatives to supplement its increasing energy needs. While there are numerous renewable energy alternatives currently being developed that will continue to be explored, the County is committed to developing opportunities to take advantage of existing technologies for the installation of solar photovoltaic (PV), solar hot water, and geothermal systems for its owned or leased properties.

Solar Photovoltaics

Solar PV systems are devices that convert sunlight directly into electricity without moving parts, emissions or noise. They require only space (roofs or fields) with unobstructed access to the sky. Solar PV works well in most regions of the United States, including the State of Maryland.

Conversion to solar as a renewable energy resource technology first requires consideration as to the three types of utility connections that are available and will be utilized to ensure solar service providers are compensated for the renewable energy produced. These utility connection methods are Grid Interconnect, Net Metering and Aggregate Net Metering.

Grid Interconnect – This is a form of utility connection that provides for the power generated through a solar PV system to be connected directly to the electrical grid whereby no power is channeled to on-site facilities. When solar is generated and connected directly to the power grid, it is like any other power plant, and the electricity sells directly at wholesale prices. In this case, solar competes directly with other sources of power such as coal, gas and nuclear. Historical electrical prices are available from U.S. Department of Energy, Energy Information Administration (EIA) - Wholesale Market Data from Intercontinental Exchange (ICE). The current wholesale price has been just under \$60 MWh, or 6 cents per kilowatt-hour.

Net Metering – Is when the power is connected to an on-site facility or an adjacent or nearby facility and helps offset the facilities' utility usage. This approach utilizes an accounting method whereby electricity produced by the solar PV is credited to the facility's monthly utility bill. To be eligible for net metering, the generating capacity of the solar PV system cannot exceed the sites annual electric needs.

Maryland law permits outright solar PV ownership through third-party ownership structures (e.g. leases and power purchase agreements). This allows the County to enter into an agreement with a third-party solar provider who constructs and owns the solar PV system and sells the generated electricity to the County at an agreed upon price, typically at or below the price the County pays.

Aggregate Net Metering – Aggregate net metering enables the County to aggregate their load from multiple meters and procure power from an off-site array. This method allows the County to total the readings from multiple meters and off-set the cost



Solar PV System

through aggregate metering, the benefits from which are then passed along to the County in the form of a cost-saving power purchase agreement rate.

Solar Water Heating

A solar water heating (SWH) system is a simple and reliable energy source. Sized to fit the location's needs, solar collectors are mounted on a south facing sloped or flat roof. The most common type of SWH are flat-plate collectors that contain a working fluid such as water or glycol that flows through tubes in the collector, is heated directly by the sun, and carries that heat to the water storage tank. Dark glass covering and insulated backing are specially designed to collect heat and prevent it from being radiated back out of the collector.

SWH installations fall into two groups: passive (sometimes called "compact") and active (sometimes called "pumped") systems. Both typically include an auxiliary energy source (electric heating element or connection to a gas or fuel oil central heating system) which is activated when the water in the tank falls below a minimum temperature setting such as 55 °C. Hence, hot water is always available.

Large scale SWH systems are best suited for use in buildings with a high demand for hot water, such as the County's aquatic centers, detention facilities and fire stations.

Geothermal

Geothermal energy has been used for thousands of years in some countries for cooking and heating. It is simply power derived from the Earth's internal heat. This thermal energy is contained in the rock and fluids beneath Earth's surface. A geothermal heat pump system can take advantage of the constant temperature of the Earth to heat a building in the winter, while extracting heat from the building and transferring it back to the relatively cooler ground in the summer. A conventional high efficiency gas forced air heating system can be in the range of 92-94% efficient heat generation for each unit of energy consumed. By comparison, a geothermal heat pump system provides four units of heat for each unit of energy consumed. Although geothermal hvac systems are more of an initial investment than conventional systems, a properly designed and installed geothermal system will provide returns that can be enormous even without calculating future energy price increases.

Renewable Energy Project Financing

There are tax incentives available for producing renewable energy. However, government entities, such as Anne Arundel County, do not pay taxes and therefore do not benefit from these incentives directly. It is intended Anne Arundel County will finance its solar PV energy projects through a long term contract called a Power Purchase Agreement. This is a financial arrangement in which a third-party solar service provider owns, operates, and maintains the solar PV system, after the County has agreed to allow the installation of the solar PV system on its

owned or leased property. In exchange, the County will agree to purchase the system's electric output from the solar services provider at a predetermined price and period. This financial arrangement allows the County to receive stable, and sometimes lower cost electricity, while the solar services provider or another party acquires valuable financial benefits such as tax credits, the sale of Solar Renewable Energy Certificates (SRECs), and income generated from the sale of electricity.

The County will also continue to explore the utilization of geothermal resources in its buildings when considering the installation of new or replacement mechanical systems. County project managers and design professionals will consider the cost and the benefit of high efficiency hvac equipment that utilizes geothermal technologies when planning and designing mechanical systems. The expenditures associated with geothermal technologies may be partially funded through various sources including (1) federal and state grants, including MEA Smart Energy Communities funds, and (2) the dedicated Energy Fund from net revenues generated by the Landfill Gas to Energy Project at the Millersville Landfill and Resource Recovery Facility.

Renewable Energy Resource Assessment

To date, the County has completed several successful renewable energy projects. The County recently had a 750 kW solar PV system installed on the roof at the Office of Central Services warehouse, located in Millersville. In addition, the County replaced an aging inefficient hvac unit with an 80 ton geothermal heat pump system for the Department of Aging and Disabilities at the Pascal Senior Center, located in Glen Burnie. The County also installed solar hot water systems at the Lothian/Harwood and Central Glen Burnie fire stations. Together these renewable energy systems are currently providing the County with approximately in 1,240 MWh annually.

In August 2012, the County completed a detailed *Solar Photovoltaics Feasibility Study* which identified four of its owned or leased sites as being suitable and economically viable for the installation of solar PV systems. These sites include the Millersville Landfill and Resources Recovery Facility, the closed Glen Burnie Landfill, U.S. Dairy Farm currently being leased from the U.S. Navy, and the Annapolis Water Reclamation Facility.

The County recently issued a Request for Proposals to obtain one or two solar service providers for the design, installation and operation of a 1 MW solar PV system for the



U.S. Naval Academy Dairy Farm Site

Millersville Landfill and Resources Recovery Facility, and a 1 MW solar PV system at the Annapolis Water Reclamation facility. It is intended the County will enter into power purchase agreement with the selected firm through a net metering arrangement. In the near future, it is intended the County will solicit for the services of a solar system providers for the design, installation and operation of a 2 MW solar PV system at the Glen Burnie Landfill through an aggregate net metering arrangement. Once completed, it is anticipated these three solar PV projects will provide the County approximately 4,908 MWh of electricity annually within the next three years.

In addition, the *Feasibility Study* identified the U.S. Dairy Farm as another potential location for the installation of a 5 MW solar PV system on approximately 25 acres of the site. This site is located on Dairy Farm Road, in Gambrills and is comprised of approximately 856 acres. The property is owned by the U.S. Department of the Navy and leased to Anne Arundel County through January 31, 2038. It is anticipated the County would enter into an aggregate net metering arrangement with a solar system provider. In order for the County to move forward with this scenario, the federal government would need to determine that a solar PV facility is rural and agricultural in nature in order to meet the restriction defined by the federal U.S. Code Title 10, Subtitle C, Part 3, Chapter 603. Also, in compliance with the National Environmental Policy Act (NEPA), an Environmental Assessment would need to be completed.

Also in 2012, an informal solar PV resource assessment was completed by an independent solar developer to identify County owned properties where renewable energy conversion technologies could successfully be utilized. The sites were assessed for any adverse engineering issues and adequacy of the land or building. Based on this assessment, 12 sites were identified as being suitable to take advantage of solar PV technology. These sites include the County facilities located at its Millersville complex including the: Central Garage; Police Headquarters; Utility Operations Water, Truck Barn and Maintenance Operations facilities; Fire Department Headquarters and Training Facilities; and Animal Control. In addition, the Annapolis Olympic Swim Center and North Arundel Aquatic Center, Heritage Administrative Office buildings, and the Route 214 Road Operations facility were



Annapolis Water Reclamation Facility Site (WRF)

also assessed and determined to be adequate for solar PV. If fully utilized, these buildings and facilities have the capacity to produce 9,930 MWh of electricity annually.

In addition to the solar PV currently being planned for the Annapolis Water Reclamation Facility, the Department of Public Works will continue to assess the viability of utilizing solar PV at its other water reclamation facilities and investigate alternative strategies that will enable it to produce an additional 4,539 MWh of solar PV electricity annually at these facilities.

The County will continue to explore opportunities for the inclusion of geothermal mechanical systems during the planning and design for the retrofit of antiquated hvac systems and the construction of new buildings. The County will also explore the replacement of existing hot water systems at the end of their useful life with solar hot water at buildings with high hot water demand, including the North Arundel Aquatic Center, Arundel Olympic Swim Center, Jennifer Road Detention Center, Ordinance Road Correctional Detention Center and multiple fire stations. By utilizing cost effective geothermal and hot water technologies when it is determined advantageous for the County to do so, it is anticipated the County will be able to produce 3,452 MWh of electricity annually by 2022.

As indicated in Table 9, the County's renewable energy technologies currently in production and those planned for the short and long term have the potential to generate sufficient electricity to meet its goal of producing approximately 23,647,800 kWh annually by 2022.

Table 9
Existing and Planned Renewable Energy Projects

Project	Renewable Energy Resource	Resource Availability	Status	Location	Renewable Energy Generation Capacity	Capacity Factor (14% efficiency)	Projected Annual Output
Existing							
1	Solar PV	Central Services Warehouse, Millersville	Project Complete	Roof Top	750KW	1,227 hrs.	920,250 kWh
2	Geothermal	Pascal Senior Center	Project Complete	HVAC System	80 Ton		300,000 kWh
3	Solar Hot Water	Lothian/Harwood and Central Glen Burnie Fire Stations	Project Complete	Roof Top	--		20,000 kWh
Existing							1,240,250 kWh
Short Term (1 to 5 years)							
4	Solar PV	Millersville Landfill and Resources Recovery Facility	Feasibility Study Complete	Cell 4 Cap	1MW	1,227 hrs.	1,227,000 kWh
5	Solar PV	Glen Burnie Landfill	Feasibility Study Complete	North Mound	2MW	1,227 hrs.	2,454,000 kWh
6	Solar PV	Annapolis Water Reclamation Facility	Feasibility Study Complete	Shellfish Ponds	1MW	1,227 hrs.	1,227,000 kWh
Short Term							4,908,000 kWh
Long Term (4 to 8 years)							
7	Solar PV	U.S. Navy Dairy Farm (Leased)	Feasibility Study Complete	Farmland	5MW	1,227 hrs.	6,135,000 kWh
8	Solar PV	Police Headquarters	Preliminary Analysis Complete	Rooftop and Parking Lot	150KW	1,227 hrs.	716,568 kWh
9	Solar PV	Fire Headquarters and Training	Preliminary Analysis Complete	Rooftop and Parking Lot	102 KW	1,227 hrs.	125,154 kWh
10	Solar PV	Animal Control	Preliminary Analysis Complete	Roof Mounted	20 KW	1,227 hrs.	24,540 kWh
11	Solar PV	Central Garage	Preliminary Analysis Complete	Rooftop and Parking Lot	125KW	1,227 hrs.	153,375 kWh
12	Solar PV	Utilities Central Water/ Maintenance/ Truck Barn	Preliminary Analysis Complete	Rooftop	350KW	1,227 hrs.	429,450 kWh
13	Solar PV	Heritage Office Complex	Preliminary Analysis Complete	Parking Lot	1.2MW	1,227 hrs.	1,472,400 kWh
14	Solar PV	Southern Road Operation	Preliminary Analysis Complete	Rooftop and Parking Lot	280 KW	1,227 hrs.	343,560 kWh
15	Solar PV and Hot Water	Aquatic Center	Preliminary Analysis Complete	Rooftop and Parking Lot	432KW	1,227 hrs.	530,064 kWh
16	Solar PV	Additional Water Reclamation Facilities	Preliminary Analysis Complete	Rooftop and Ground	3.7 MW	1,227 hrs.	3,312,900 kWh
17	Geothermal	Future New and Retrofit HVAC Projects	Future	Multiple			3,451,539
18	Solar Hot Water	Fire Stations and Detention Centers	Future	Multiple			805,000 kWh
Long Term							17,499,550 kWh
TOTAL							23,647,800 kWh
							23,648 MWh

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