Arlington County Operations Energy Plan

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Abbreviations and Acronyms

AIRE – Arlington Initiative to Rethink Energy (formerly Arlington Initiative to Reduce Emissions)

APS – Arlington Public Schools

ART – Arlington Transit, the county bus service supplementing that of Metrobus

BBC – Better Buildings Challenge, a U.S. Department of Energy voluntary program

Btu – British thermal unit, a measure of heat equal to the amount of energy it takes to raise one pound of water by one degree Fahrenheit, also, the heat given by a common match flame

CEP – Arlington's Community Energy Plan

CO_2e – carbon dioxide equivalent, wherein all greenhouse gas emissions are combined to a single metric; a pound of methane has about 20 times the heat-trapping capability as a pound of carbon dioxide, and so emissions of 1 pound of methane and 5 pounds of CO_2 would represent a total of 25 lbs CO_2e

COEP – County Operations Energy Plan

EMIS – energy management information system

EPA – U.S. Environmental Protection Agency

FOG – fats, oils, and grease

GHG – greenhouse gas. Carbon dioxide, methane, and other gases that accumulate in the atmosphere inhibiting radiant heat loss to space

HVAC – heating, ventilation, and air conditioning

ICLEI – formerly known as the International Council of Local Environmental Initiatives, this membership organization is known simply by its acronym, and sometimes as ICLEI-Local Governments for Sustainability

kW – kilowatt, a measure of instantaneous electric power

kWh – kilowatt-hour, an amount of electrical energy, as one kilowatt of power over a period of one hour. Equal to 3,412 British thermal units (Btu)

LED – light emitting diode

LEED – Leadership in Energy and Environmental Design, the certification distinction provided by the U.S. Green Building Council (USGBC)

mt – metric ton (2206 lbs)

NZE – net-zero energy, a term used to describe a building designed and built to consume only as much energy as can be produced on site over the course of a year

therm – a unit of natural gas, equal to 100,000 Btu.

USGBC – United States Green Building Council

VMT – vehicle miles travelled

WRI – World Resources Institute

Summary

This County Operations Energy Plan (COEP) is a complement to the Community Energy Plan (CEP) adopted in June 2013 by the Arlington County Board as an element of the Comprehensive Plan. The CEP's long-term goal is to reduce greenhouse gas (GHG) emissions by more than 70 percent by the year 2050 (from a year 2007 baseline). Consistent with the CEP, this COEP identifies how the County and Schools can reduce GHG emissions by 25 percent by 2020 (from 2007), an interim goal on the way to a 76 percent reduction by 2050.

In 2007 the Arlington County Board established the Arlington Initiative to Rethink Energy (AIRE), an energy and climate action program, with a goal of a ten percent reduction in GHG emissions between 2000 and 2012. The County and Schools achieved and exceeded that goal, reducing net GHG emissions by 11 percent between 2007 and 2012. The CEP and this COEP are successors to that original AIRE goal, and the lessons learned from that program very much inform the plan that follows.

This Plan is intended to be a guide for managers and staff whose work influences the energy performance of County and School operations. This report outlines how the 2012 AIRE goal was achieved, and estimates how the 25 percent reduction in GHG emissions can be accomplished, even in the face of expected growth in the public services provided by County and Schools.

The COEP includes information on both Objectives and Strategies. Objectives are the COEP's goals, while the Strategies are the tools to use to meet the goals. There are seven key Objectives:

COEP Objectives

1. Increase facility and infrastructure energy productivity through continuous improvements in energy efficiency,
2. Improve transportation energy productivity through fleet efficiency, fuel choices and methods of reducing vehicle miles traveled,
3. Make use of waste heat and process optimization for efficiency and resource recovery,
4. Increase production and use of renewable energy,
5. Be a leader in early adoption and promotion of innovative technology,
6. Pursue sustainable funding strategies, and
7. Institutionalize energy management.

The importance of setting goals cannot be overstated. When the AIRE target was announced in 2007, it was not clear whether or how the County would achieve it. When the County joined the U.S. Department of Energy's Better Buildings Challenge, it was not clear whether or how that program's 20 percent improvement in efficiency would be achieved. The County is on track and expecting to meet that goal as well.

The climate crisis makes progress on energy and GHG emissions imperative. This Plan will guide the County and Schools to make that progress. One important area of discussion below

concerns how and when to normalize energy consumption and greenhouse gas emissions to units of output, activity, or population. Although the key long-term community goal in the CEP is normalized based on population (i.e. carbon emissions per person), this COEP embraces targets for absolute reductions in carbon emissions, not normalized per unit of output or population. The best explanation for this approach is that energy and carbon are most commonly adjusted for population at the community scale, but at a smaller institutional scale, absolute energy and carbon emissions are most relevant.

This Plan was prepared mostly by AIRE staff, with substantial input and review by an inter-departmental work group including representatives from all aspects of Environmental Services, Parks and Recreation, Human Services, Technology Services, Fire, Libraries, Office of the Sheriff, Office of Emergency Management, and Arlington Public Schools.

Introduction

Arlington County Government and Arlington Public Schools are leaders in reducing energy use throughout their operations, reducing operating costs, tracking energy use and making that information public, cutting pollution, and meeting more energy needs with local renewable resources. Energy use in county operations has a substantial cost to taxpayers – over $16 million in Fiscal Year 2014 (1.5 percent of total expenditures) – and reducing this expense will contribute to the County's ability to maintain critical services.

This County Operations Energy Plan (COEP) is a complement to the Community Energy Plan (CEP) adopted in June 2013 by the Arlington County Board as an element of the Comprehensive Plan. Implementing the CEP will improve Arlington's economic competitiveness and energy reliability, while advancing Arlington's environmental commitment. The CEP long-term goal is to reduce greenhouse gas (GHG) emissions by more than 70 percent, to three (3) metric tons of carbon dioxide equivalent (CO_2e) per capita per year by 2050. The CEP includes a goal to reduce emissions from County government activities by 76 percent by 2050, with a first interim target of a 25% reduction by 2020. Activities by Arlington County Government and Arlington Public Schools are addressed in this COEP.

The CEP calls for the County to improve energy productivity with a prioritization framework:

1. Increase the energy efficiency of buildings, vehicles, and infrastructure,
2. Use of waste or excess heat,
3. Use of renewable sources of energy,
4. Use distributed energy generation close to points of energy use.

Within this framework further prioritizations are employed. The guiding notion is that by addressing measures in a stepwise manner, the largest capital expenditures can be reduced by right-sizing the equipment to serve reduced energy loads. For example, increasing energy efficiency in buildings typically follows a progression from simple conservation behavior (e.g. turning off lights) to operational improvements in scheduling of equipment, to retrofits of lighting and smaller equipment, then optimizing the HVAC distribution system including motors, and lastly upgrading central equipment such as boilers, chillers, and rooftop units.

Similarly, the use of waste heat can be as simple as capturing heat created by refrigeration equipment and using it to heat water, or as large as a multi-building district heating system using waste heat from a power plant.

This 2015 COEP provides a roadmap for achieving the goals set in the CEP for government activities. This effort builds upon years of efforts and success where the County has improved buildings' energy efficiency, increased the use of fuel-efficient vehicles and alternative fueled

vehicles, pursued use of advanced technologies and processes in County infrastructure, and expanded the use of renewable energy.

The economics of energy and the field of energy technology are advancing rapidly. This COEP will be updated as needed to reflect and incorporate advances as well as changes in availability and cost of fuels—both traditional and alternative—and innovations in sustainable development practices. COEP updates will also be informed by the County's actual performance in meeting goals and performance indicators for improving energy efficiency, using and producing alternative energy, and reducing GHG emissions.

Execution of this County Operations Energy Plan will be a County-wide effort and responsibility. All departments and divisions of Arlington County government and Arlington Public Schools should be strongly encouraged to save energy and to obtain more of the energy they need from renewable resources where appropriate. One strategy described below recommends incentivizing energy-smart behavior and ideas by employees.

Preparation of this Plan involved some introspection of current practices. The federal ENERGY STAR program provides a self-assessment tool for institutional energy management. County staff completed this self-assessment, presented in Appendix 1. This Plan seeks to fulfill the opportunities for improvement noted in the self-assessment tool.

Key Objectives

The headline goal of the COEP, from the Community Energy Plan, is to improve energy productivity such that net greenhouse gas (GHG) emissions from County operations fall by 76 percent by 2050, from a 2007 baseline, with intermediate GHG emission reductions out to 2050 as shown in Table 1:

Table 1. Baseline and Target Net GHG Emissions from Arlington County (Government and Public Schools) Operations, 2007 - 2050

	GHG Emissions CO_2e metric tons	GHG Emissions % change from 2007
2007 baseline	93,575	--
2020 target	70,181	25 percent reduction
2030 target	50,531	42 percent reduction
2040 target	40,237	59 percent reduction
2050 goal	20,587	76 percent reduction

This first COEP focuses on achieving the 2020 target, with some consideration of preparing to meet the 2030 target.

The success in meeting the 2012 AIRE goal of a 10 percent reduction in County government and APS GHG emissions from 2000 to 2012 is instructive for the present goal. Not only did Arlington exceed the 10 percent reduction goal from 2000 to 2012, the County and APS beat the goal from a 2007 baseline as well (see Table 2), despite a growth in services.

Table 2. Total and Net Emissions from Arlington County Operations, by Inventory Year ($mtCO_2e$)

Sector / Reduction Opportunity	2007	2012	% Change 2007-2012
Total Government Activity Emissions	61,382	57,455	-2.8%
(-) Green Power Purchases	-2,292	-5,256	n/a
(-) Carbon Offset Purchases	0	-11	n/a
(-) ART Bus Program Credits	-258	-643	n/a
Net Government Activity Emissions	58,832	51,545	-12.4%
Total School Emissions	34,742	33,827	-2.6%
(-) Green Power Purchases	0	-1,452	n/a
Net School Emissions	34,742	32,376	-6.8%
Total Government Operations Emissions	96,125	91,282	-5.0%
(-) Green Power Purchases	-2,292	-6,708	n/a
(-) Carbon Offset Purchases	0	-11	n/a
(-) ART Bus Program Credits	-258	-643	n/a
Net Total Operations Emissions	**93,575**	**83,291**	**-11.0%**

Source: Government Operations Greenhouse Gas Inventory for Arlington County, Virginia 2012, prepared by SAIC for Arlington County Department of Environmental Services, May 2013.

The 2015 COEP Plan focuses on the following seven key objectives for reducing energy use and GHG emissions by Arlington County government and school operations, and improving energy assurance and resilience in those operations. Strategies for achieving each objective are outlined later in this plan.

Objective 1. Increase facility and infrastructure energy productivity through continuous improvements in energy efficiency

Efforts to improve efficiency and save money must be integrated within all aspects of County and APS operations. Routine review of energy performance data and periodic energy assessments will inform decisions and direct actions to improve operations. These reviews drive future retrofits for energy savings.

Objective 2. Improve transportation energy productivity through fleet efficiency, fuel choices and methods of reducing vehicle miles traveled.

The County's fleet must provide for transportation needs for employees. Such a fleet should be energy efficient, incorporating the latest vehicle technologies and using practices that reduce idling, route vehicles efficiently, and avoid unnecessary trips.

Objective 3. Make use of waste heat and process optimization for efficiency and resource recovery

Thermal energy (heat) is a common byproduct of energy use, but is usually discarded. Recycling waste heat for other activities through heat pumps, heat exchangers and other engineering solutions can generate savings out of waste. Facilities like the County's wastewater treatment plant offer tremendous resource recovery opportunities for energy savings, energy production, and financial gain through process optimization and recovery of energy embedded in the wastewater stream. In addition, project designers for new County and School building projects should consider the feasibility of combined heat and power (CHP) and small-scale integrated thermal energy systems.

Objective 4. Increase production and use of renewable energy

The cost of solar energy has plummeted and there are many opportunities to substantially increase County and APS use of solar photovoltaic (PV) and solar thermal energy in buildings. Solar PV aids energy resilience at the macro scale by shaving grid peak load, and it also furthers local energy resilience when combined with rapidly-evolving energy storage technologies.

Objective 5. Be a leader in early adoption and promotion of innovative technology

The County can help build a green economy and reduce government and community energy use by helping to test and support adoption of innovative energy technologies. Advanced technology is rapidly changing the economics and feasibility of profound improvements in energy productivity, from LED lighting and the Internet-of-Things to advanced battery storage and fuel cell technologies. Embracing new technology has been and will continue to be a critical strategy component in meeting the County's ambitious energy goals.

Objective 6. Pursue sustainable funding strategies

Meeting the County's energy targets will require a commitment to funding. Smart, consistent reinvestments in County and APS facilities will achieve these energy and GHG goals while improving the assets critical to public service. Certain administrative policies can help streamline energy payments and potentially provide more options for funding projects throughout County and APS activities. In addition to internal funding streams and mechanisms, the County should consider outside funding sources to maximize progress towards its goals.

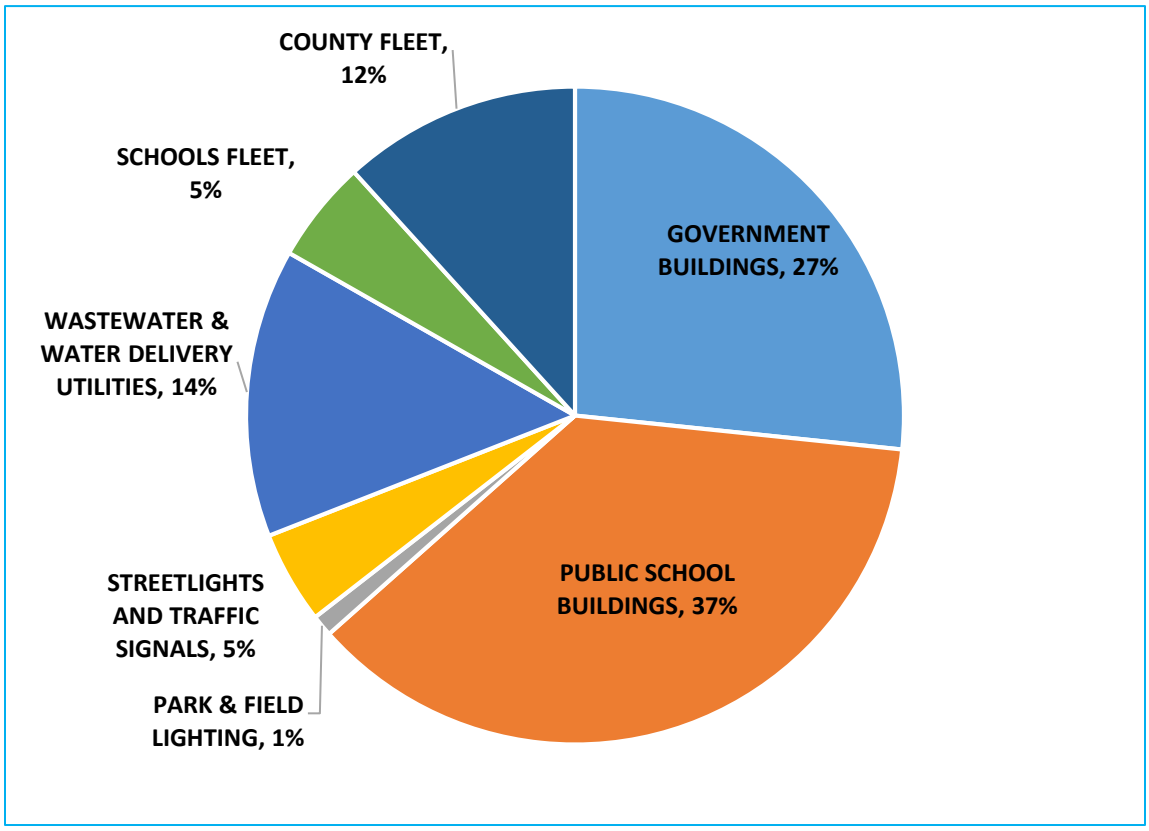
Objective 7. Institutionalize energy management

Many of the Strategies identified in this Plan will be most effectively implemented with improved coordination between the staff who focus on energy issues and other professionals who make decisions affecting energy use in the course of their daily duties, although energy is not the focus of their work. The primary focus of this Objective is establishing a permanent interdepartmental workgroup across County and Schools staff, to meet quarterly on energy topics.

Energy Profile and Trends

Energy use by County and APS activities span a broad range of uses and purposes, totaling nearly 900 billion Btu annually (about as much as 9,000 homes). As a group, APS buildings consume 37 percent of the total while County buildings consume 27 percent (see Figure 1).

Figure 1. Energy Use by County and APS Sector, 2014



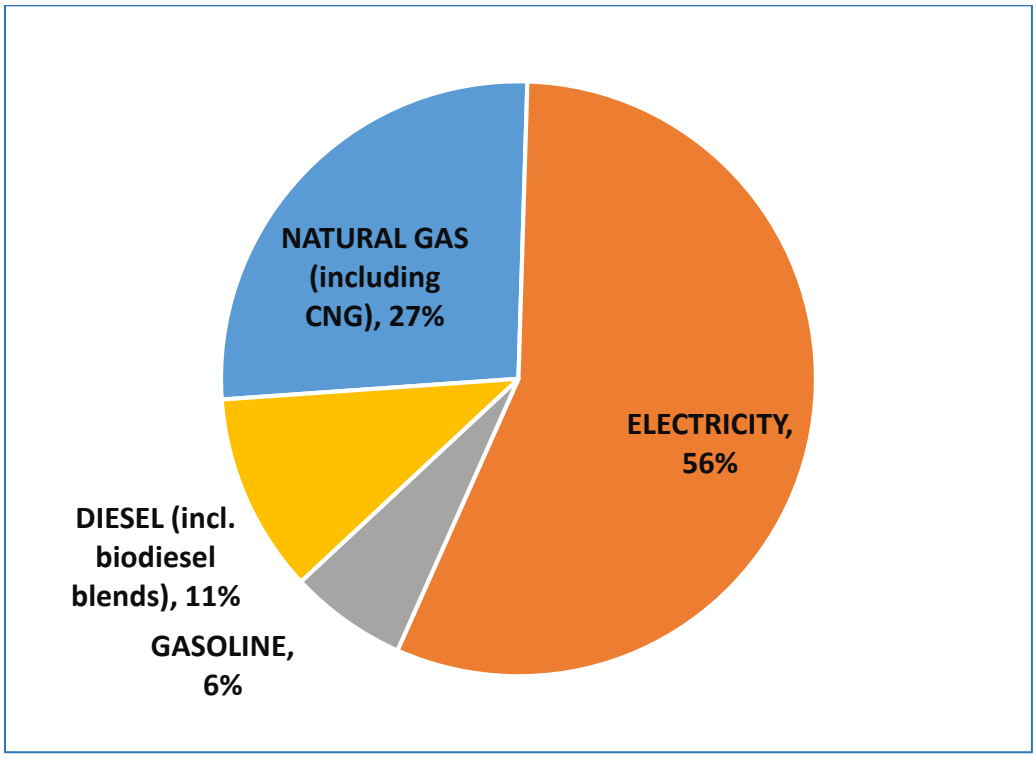
The wastewater treatment plant is the single largest energy user in County operations, consuming 13 percent of all energy used by the County and APS (the water distribution and wastewater collection systems add another 1 percent, for a total water utility share of 14

percent). Total energy use by County and APS activities have grown 11 percent since 2007 even with efficiency improvements, due to growth in public services provided, such as increased bus routes and new facilities. However, net GHG emissions have fallen by 11 percent due to changes in fuel mixes in transportation and electricity, as well as the purchase of renewable energy credits and carbon offsets.

APS facilities are the fastest growing major segment of the County's energy use due to rapid expansion of new buildings, including relocatable trailers. (Fuel use for the Arlington Transit fleet is growing quickly as well, but the ART fleet is only six percent of the total operations energy use.) Growth in APS facilities will continue to increase in response to a growing school population, which poses a significant challenge to our energy and GHG goals. Arlington government facilities will also continue to increase over the next five to 10 years, with new community centers, fire stations, storage facilities, along with growth in the transportation and water infrastructure to meet the needs of Arlington's increasing population.

Electricity is the single largest fuel type consumed in County and APS buildings (Figure 2). Electricity is the most expensive fuel type on a per-Btu basis, and therefore electricity costs are over 80 percent of the total energy bill for the County and APS.

Figure 2. Energy Use by Fuel Type, County and APS, 2014



Despite expanding government services and school facilities, Arlington has reduced net GHG emissions in recent years. Arlington exceeded the original AIRE target of a ten percent reduction in GHG emissions between 2000 and 2012 using a mix of complementary approaches:

- Improvements in energy efficiency in buildings, water pumping, wastewater treatment, and transportation infrastructure,
- Switching to biodiesel in heavy-duty vehicles and adding hybrid vehicles to the fleet,
- Improvements in the emissions rate from electricity purchased from the grid,
- The use of on-site renewable energy, and
- Purchases of green power and carbon offsets.

Energy Targets, and the Use of Normalized Energy Use as Metrics

This COEP sets out to achieve GHG reduction goals in the CEP. Due to the variety of energy-using sectors and the multiple factors that affect GHG emissions, it is helpful to examine how energy use is counted and affected in sectors separately.

GHG emissions are driven by a combination of the number of energy-using things, the amount of energy the thing consumes for a given purpose, and the GHG emission rate of the energy used for those purposes. One way to view this is:

GHG emissions = (Services provided) × (Energy use per service provided) × (GHG emissions per unit of energy)

Services provided are the goods and services provided by the County and Schools. Generally speaking, these public services will grow with a growing population and increasing resident needs. This indicator can take the form of the number of County and APS buildings; the building area of those facilities; the miles traveled by County and APS vehicles performing services; the volume of water delivered or wastewater treated; etc.

Energy use per service provided is an indicator of efficiency. Some of these measures, such as 'miles per gallon' are widely understood. There are different efficiency indicators for different energy end uses and functions. Generally accepted measures include energy per square foot for buildings, and energy per thousand gallons treated for wastewater treatment plants. In addition, normalization for weather is commonly used to compare heating and cooling energy use year-to-year.

GHG emissions per unit of energy is determined by the choice of fuel for an energy service. For example, a gallon of biodiesel produces fewer GHG emissions than a gallon of petroleum diesel; solar photovoltaic electricity produces zero GHG emissions whereas grid electricity emits varying GHG amounts depending on the fuel mix used by utilities to generate the power.

To decrease GHG emissions with an increase in services provided, efficiency or fuel impact need to improve in a commensurate manner. For example, reducing energy used per square foot in buildings can overcome an increase in total square footage of buildings when calculating total GHG emissions. It is also possible for investments to decrease a measure of a service provided without negative consequences. For example, reducing water infiltration into wastewater pipes by sewer relining can decrease the amount of wastewater treated at the WPCP, thereby reducing the amount of energy needed at the plant.

Sample normalization metrics for efficiency are given in Table 3. These are discussed in greater detail further below.

The 2020 goal for GHG emissions from County and APS operations is a 25 percent reduction from 2007 levels, a net decline of over 23,000 metric tons CO_2e. From the perspective of this discussion, the 11 percent decline in net emissions achieved between 2007 and 2012 discussed previously was the result of the combination of growth in services, improvements in efficiency, and decreasing emissions rates in multiple sectors. The changes between 2007 and 2012 are outlined in Table 4.

Some have asked whether the County and Schools should normalize overall GHG emissions for the overall scope of services provided, such as per worker, or per resident population, or per students enrolled, or per million dollars of budget. Although it is very helpful to parse individual services and sectors with normalized values, to identify progress and areas of challenge, the overall goal for County and Schools operations in the CEP is clearly stated as an absolute reduction in GHG emissions. This COEP holds to that ambitious target.

Table 3. Common Indicators and Normalization Metrics

	Service Metric	Efficiency (energy use/amenity)
Buildings	Area (square feet)	Thousand Btu/(square feet) Comparisons are generally made for a particular building over time and within building type (e.g. school, fire station, office building, etc.)
Vehicles	Miles traveled	Gallons/mile Comparisons generally made for a particular class of vehicles over time, and within vehicle classes (e.g. buses, sedans, heavy trucks, light trucks, etc.)
Wastewater treatment	Gallons treated	Energy/(1000 gallons treated)
Street lights	Number of street lights Lumens delivered	Energy/street light Energy/lumen

Table 4. Approximate Changes Leading to an 11% Decline in GHG Emissions 2007-2012

	Service metric	Efficiency	GHG Emission Rate
County buildings	Building area increased 2%	Btu/sf improved 9%	Electricity became 7% cleaner
APS buildings	Building area increased 6%	Btu/sf improved 5%	Electricity became 7% cleaner
County and APS fleet	Vehicle miles decreased 2%	Gallons per mile improved 5%	No change (use of biodiesel began in 2002)
Wastewater treatment Water supply utility	Water volume to the WPCP decreased 11%	No change	Electricity became 7% cleaner
Street lights & traffic signals	Number of fixtures increased 10%	Energy use per fixture improved 18% on average	Electricity became 7% cleaner

Meeting the 2020 goal will require overcoming a continued increase in services for the community, largely from growth in APS and County facilities. Table 5 summarizes expectations of future changes in County services and the commensurate improvements in energy productivity needed to achieve the 2020 GHG goal. Estimates of the changes in services provided are based on recent history, discussions with staff in each sector, and current capital planning.

The projection of continued improvement in the emissions rate from electricity is based on two variables:

1. Steadily cleaner power from the regional grid, primarily due to continued shifts in electricity generation from coal to natural gas, and
2. Increasing use of on-site solar power on County and APS facilities.

Arlington has no control over the first variable, but considerable control over the second. In addition, increasing purchases of certified green power can help reduce net emissions.

Table 5. Projected Conditions for Achieving the 2020 GHG Emissions Goal (from 2012 levels)

	Service Metric	Efficiency	GHG Emission Rate
County buildings	Increase building area 5%	Improve energy per sq. ft. by 15%	Decrease emissions rate from electricity by 15%
APS buildings	Increase building area 15%	Improve energy per sq. ft. by 10%	Decrease emissions rate from electricity by 15%
County and APS fleet	No change	Improve gallons per mile by 5%	Decrease vehicle fuel emission rate 5%
Water supply and wastewater treatment	No change	Improve energy per 1000 gallons by 10%	Decrease emissions rate from electricity by 15%
Streetlights and traffic signals	Increase signaled intersections 1%	No change	Decrease emissions rate from electricity by 15%
ART bus service	Increase VMT 10%	Improve gallons per mile per gallon by 5%	No change

Execution of this County Operations Energy Plan will be a County-wide effort and responsibility. All departments and divisions of Arlington County government and Arlington Public Schools are strongly encouraged to consider the energy requirements of the public services they provide, improve efficiency to save energy, and obtain more of the energy they need from renewable resources where appropriate. The AIRE program is the primary coordinating agency for energy-related activities, but funding and implementing energy improvements is not solely borne by the AIRE program.

Strategies Supporting the Objectives

Objective One: 1. Increase facility & infrastructure energy productivity through continuous improvements in efficiency

Evaluating the energy efficiency of major buildings and facilities and comparing performance against best practices provides critical information for determining where energy efficiency investments should be made. When designing capital projects, the County will consider opportunities for long-term energy savings and reductions in GHG emissions and will pursue these options when they are effective.

The AIRE program will continue to monitor energy use in order to validate savings, identify opportunities for adjusting operations to achieve additional savings, and evaluate the County's progress toward meeting energy-efficiency goals.

STRATEGY 1 – MAINTAIN AND ENHANCE COMPREHENSIVE FACILITY ENERGY DATA

Energy accounting is the foundation for identifying energy waste, planning energy-saving projects, and measuring and validating the results of those efforts. The County and APS have established strong energy data accounting systems through the software packages EnergyCAP and Utility Manager Pro, respectively. Continuing refinements to these packages will ensure energy performance is properly tracked in a timely manner.

The AIRE program will continue to report combined County and APS data on an annual basis.

Facility and operational energy information is essential to:

a. Establish facility baselines and goals and provide regular feedback to departments on project and program progress toward energy plan targets,
b. Prioritize energy-related actions that will help to meet this plan's targets and quantify expected savings from proposed actions,
c. Track consumption patterns to verify the success of implemented savings programs,
d. Make accurate projections of energy use to help create budgets and forecasts, noting that accuracy of these projections will be largely influenced by fuel prices and economic conditions, and
e. Provide data from the County's energy accounting system to the EPA's Energy Star Portfolio Manager database to benchmark County and APS building performance. Benchmarking in this national database is used to achieve Energy Star certification, and for participation in the Department of Energy's Better Buildings Challenge.

STRATEGY 2 – CREATE AN ENERGY INFORMATION MANAGEMENT SYSTEM TO COORDINATE AND ANALYZE ENERGY USE ACROSS OPERATIONAL CATEGORIES

Energy management information systems (EMIS) allow for review and analysis of multiple streams of data in a single platform. Such systems can provide granular information about energy use, equipment status, and occupancy integrated into a dashboard, allowing for broader understanding of essential information by a wide variety of audiences and stakeholders. Data inputs can include existing data streams, as well as the addition of sensors and meters that provide additional real time information. The use of an EMIS can ultimately lead to better control of energy use and the potential for energy savings. To this end, development of an energy management information system (EMIS) is a priority in the County's Capital Improvement Plan for energy.

Another aspect of an EMIS approach is the potential for electronic payments of electric and natural gas accounts by County and School agencies. At present, the energy utilities mail paper invoices to the County and Schools every month for individual accounts. Hundreds of invoices are processed by hand each month, with checks mailed to the utilities for payment. Electronic bill-paying is feasible with both Dominion and Washington Gas, and this approach would speed payments, reduce late fees, and save the County and Schools thousands of dollars in postage each year. Electronic bill-payment is an active topic between AIRE, DMF, and other agencies.

EMIS and its associated components is led by AIRE with considerable collaboration with Facilities Management, Technology Services, and other agencies.

STRATEGY 3 – CONDUCT AND/OR UPDATE ENERGY ASSESSMENTS OF ALL COUNTY AND APS BUILDINGS BY 2018; CREATE A PRIORITIZED ACTION PLAN FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY ACROSS THE EXISTING BUILDING PORTFOLIO

Energy assessments (energy audits) identify both operating measures and equipment replacement measures to reduce energy use. AIRE staff have periodically reviewed County government facilities, and sometimes used consultants for assistance, to complete energy assessments. A high-level summary of current needs and opportunities at County facilities prepared by AIRE is included as Appendix 2 in this COEP. Additional equipment assessments will investigate equipment and systems in buildings and facilities for opportunities to save energy and/or reduce GHG emissions through cost-effective equipment replacement.

The need for frequent review of properties through energy assessments is demonstrated by rapidly-evolving technological improvements. The emergence of practical, low-cost linear LED tubes as a replacement for traditional indoor fluorescent ceiling lighting was not anticipated just a few years ago. Deploying such new technologies across the portfolio in a methodical manner allows economies of scale to be realized, and also consistency in

products and services. The County should collaborate with APS to ensure savings opportunities in schools are captured in a forthright manner.

Investments in energy conservation measures will be prioritized and implemented using agency operating funds, AIRE operating funds, Facilities Maintenance funds, or capital funds. Energy savings performance contracting may also be used as warranted by needs, opportunities, and capital constraints.

Facilities Management leads the updating of existing facilities, usually in close collaboration with AIRE staff. AIRE also engages Parks Operations for energy improvements in the smaller facilities Parks maintains. The Maintenance division of APS' Facilities and Operations department leads improvements for the school system; additional collaboration with the County and specifically AIRE may help achieve economies of scale in energy retrofits and other upgrades.

STRATEGY 4 – DEVELOP OR RE-EXAMINE ENERGY MANAGEMENT PLANS FOR LARGE, ENERGY-INTENSIVE AND SPECIAL-PURPOSE FACILITIES

Large, energy-intensive facilities include the Arlington Water Pollution Control Plant (WPCP), the Arlington County Justice Center, and the three APS high schools which also house swimming pools (Washington-Lee, Wakefield, and Yorktown). Together, these five facilities consume 27 percent of total County/APS energy use and contribute 30 percent of the total County/APS GHG emissions. While effective energy management practices have value across the entire County and APS portfolios as described in Strategy 3, the scale of these large energy users offers the greatest potential absolute savings. Energy management plans for these facilities should include specific approaches for each facility's use and, where appropriate, the production of clean energy on-site.

The County (Facilities Management and AIRE) is the lead for the Justice Center, Schools' Facilities & Operations has the lead for the high schools, and the County water utility enterprise fund has the lead for the wastewater treatment plant. Collaboration across these parties, and involvement of consultants is essential to maximize productivity and effectiveness of strategies chosen. A 'fresh set of eyes' can very often identify genuine yet previously-unrecognized opportunities.

STRATEGY 5 – ENSURE THAT THE DESIGN, CONSTRUCTION, MAINTENANCE AND OPERATION OF CAPITAL PROJECTS OWNED OR FINANCED BY ARLINGTON COUNTY ACHIEVE MINIMUM TARGETS FOR ENERGY PERFORMANCE

The County and Schools have green building standards requiring LEED certification for any new construction or significant renovation. The County is available as an Administrative Regulation online, and that policy is attached as Appendix 4 to this Plan.

In addition, the Arlington County Design Guidelines for Vertical Infrastructure and Construction specify targets for energy performance for a variety of building types. These targets are set at maximum Btu/square foot per year, where a lower number is better. For life cycle cost savings and as a matter of policy, these requirements should be adhered to and exceeded whenever practical.

The Building Energy Report Cards posted by AIRE and School Energy Report Cards posted by APS document the progress toward targets, and the achievement of the targets.

Beyond mere minimum building energy performance targets, a growing trend across the United States is toward 'net-zero energy' (NZE) buildings. A NZE building is designed and constructed to be so energy-efficient that its commercial (purchased) energy use is virtually zero over the course of a year, with on-site renewable energy providing surplus energy in some months to offset commercial energy use in other months. Discovery Elementary, which opened in September 2015, was designed to be NZE. There are also a couple NZE homes in Arlington.

A challenge of NZE is that of diminishing returns and rising costs as one approaches net zero. The last 10-20 percent energy use reduction in a design – or the renewable supply option – may be very expensive. However, the insights learned while designing to low-energy buildings helps inform future projects as well.

STRATEGY 6 – PARTICIPATE IN, AND ACHIEVE THE GOAL OF THE DOE BETTER BUILDINGS CHALLENGE

In 2012 the County joined the Department of Energy's Better Buildings Challenge, pledging to reduce building energy intensity by twenty percent by the year 2020, from a 2009 baseline year. As of calendar 2014 the energy use per square foot of the County's facilities had improved 9 percent from the 2009 baseline. Because of the large role of County facilities in total County/APS emissions, achieving the 2020 BBC goal is essential to reach the 2020 greenhouse gas reduction goal.

The Better Buildings Challenge program offers technical resources helpful to County and Schools energy management, and some of these resources are applicable to broader community programming. In addition, the BBC provides motivation and a tangible goal for the near future.

STRATEGY 7 – PURSUE ENERGY EFFICIENCY THROUGH PROCUREMENT

The County and Schools, through capital projects and as a purchaser of goods and services, has the opportunity to support and stimulate our region's green economy. One way to do this is to incorporate good design and energy-efficient technologies and products into its procurement strategies. For example, the Arlington County Design Guidelines for Vertical Construction, compiled by Facilities Design and Construction in

DES, include specifications for energy-using equipment such as electric motors, boilers, air conditioning equipment and lighting. In addition, specification of energy-efficient (EnergyStar-labeled or better) appliances and electronic equipment are important for persistent gains in energy performance.

The County's recently-updated Environmentally Preferable Purchasing Policy specifies best practices in addition to the smart energy decision-making in purchases. The County and Schools should each raise awareness of energy- and environmentally-preferable purchasing for their day-to-day operations as well as major capital construction. These principles encompass decisions large and small – from use of recycled paper to purchases of green power and carbon offsets. More effective collaboration between the County and Schools (Strategy 8) can help advance this Strategy.

STRATEGY 8 – INCREASE COLLABORATION BETWEEN COUNTY AND SCHOOLS ON ENERGY MATTERS

County and Schools energy staff frequently work together on issues related to energy procurement, liaison with utilities, data sharing, and energy technology asset applications. However, to date there has been little coordination of resources for facility energy improvements between the APS and County portfolios. This is unfortunate because taxpayers often view the County and Schools as one entity, and the County and Schools share several joint-use facilities, including high schools, middle schools, and the garage over Interstate 66.

In addition, national and international protocols for GHG inventories, and the Community Energy Plan – and this COEP – do not make a distinction between the County and Schools. Improved coordination of facility energy management and planning could bring economies of scale in retrofits and investments in energy technologies. Opportunities for collaborative effort include deploying solar photovoltaic systems, widespread LED lighting retrofits in buildings, HVAC upgrades, building energy monitoring, and public transparency of energy data.

To achieve improved collaboration, the County and Schools should convene a quarterly workgroup composed of the respective energy managers as well as representatives from facility operations, fleet management, and information technology of both entities (see Objective 7). This group should work to identify opportunities for mutual assistance and cost savings. Participation by the respective Purchasing offices and other agencies should be encouraged as needed.

STRATEGY 9 – INCORPORATE ENVIRONMENTAL STEWARDSHIP BEST PRACTICES FOR OUTDOOR LIGHTING

New technologies and lighting designs enable far more efficient illumination than in the past. Overall illumination efficiency and effectiveness is determined in part by the technical light source, and partly by the fixture and lens that direct, shield, and scatter the light. Any illumination that does not fall in an intended direction is wasted, as is the energy used to create that light. Rethinking the County standard for streetlights to incorporate overall efficiency and effectiveness can reduce energy use per fixture.

The Street Lighting Master Plan currently under development should embrace industry best practices to meet safety, cost, and environmental goals, including dark sky objectives. The Street Lighting Master Plan will attempt to balance tradeoffs that may be necessary in the pursuit of these goals, while mindful of rapid advances in street lighting technologies and practices.

The International Dark-Sky Association (IDA) requires full cut-off fixtures which maximize the efficiency of outdoor lighting by directing all light down to the surface to be illuminated. Full cut-off LED fixtures are now standard retrofits for exterior lighting on County buildings, and should become standard in new construction and outdoor fixtures.

Transportation Engineering & Operations within DES is the lead agency for implementation of lighting the public right-of-way. Facilities Management (DES) is the lead for existing buildings. Facilities Design & Construction (DES) and the Department of Parks and Recreation have significant roles in new construction for County government. The Facilities & Operations Department is the lead agency for Arlington Public Schools.

STRATEGY 10 – CONDUCT WORKPLACE CAMPAIGNS TO ENCOURAGE EMPLOYEES TO ADOPT ENERGY CONSERVATION MEASURES AT WORK

The practices of people who occupy, operate, and maintain our buildings affect how much energy a facility consumes. Changes in employee behavior have been shown to cut resource use by up to ten percent from a typical building baseline. By educating and motivating employees to use energy resources wisely, the County and APS can reduce waste and generate savings.

The AIRE program has the lead role for County government, and Facilities & Operations serves that function in Schools. AIRE has had various employee engagement activities over the past ten years, notably the 'AIRE Captains' program. Energy staff in both County government and Schools have provided customized employee outreach with specific facilities and the staff who work in them, and these reviews will continue.

To further encourage smart energy behavior by increasing awareness, the County and Schools should offer an incentive program to reward employees who provide energy-saving ideas or recommendations that are acted upon. An example could be lights that are always on due to a faulty switch, or an exhaust fan that runs 24/7. The savings gained

and incentives offered do not have to be large; recognition of the energy whistleblowers raises provides employee engagement and raises energy literacy.

The use of 'dashboards' to provide at-a-glance information on energy use is under development as part of the energy management information system project. These dashboards can be used as part of worker awareness and education campaigns.

STRATEGY 11 – ANNUALLY ASSESS AND REPORT GREENHOUSE-GAS EMISSIONS FROM COUNTY AND APS OPERATIONS

The County will annually evaluate greenhouse-gas emissions from County and Schools operations, and report to the public as part of performance measurement reporting associated with the County budget. This information will also be made available to the public via the County's website.

In recent years GHG inventory protocols have become more consistent among national and international groups. The County currently uses the joint protocol of WRI/ICLEI/CDP[1]. These inventories will help to track actual emissions reductions against targets, evaluate the outcomes of investments to increase energy efficiency and reduce greenhouse-gas emissions, and inform adjustments to future goals as the County updates the Community Energy Plan element of the Comprehensive Plan.

The County will share information with its regional partners to help evaluate comparative performance and achievement of regional targets.

STRATEGY 12 – PERIODICALLY REVIEW OTHER LOCAL AND REGIONAL ENERGY PLANS TO ENSURE THAT ARLINGTON COUNTY REMAINS ABREAST OF BEST PRACTICES IN ENERGY MANAGEMENT AND GREENHOUSE GAS REDUCTION

Local governments across the country are embracing new technologies and reforms to achieve energy efficiency, reduce greenhouse gas emissions, and develop a green energy economy. Arlington County will continue to seek out best practices from other jurisdictions and share our successes with other localities.

County and Schools staff routinely participate in energy forums, workshops, and related activities of the Metropolitan Washington Council of Governments (MWCOG), and Northern Virginia Regional Commission (NVRC), and in energy-specific organizations such as Virginia Energy Purchasing Governmental Association (VEPGA) and Virginia Energy Efficiency Council (VAEEC). In addition, staff will continue to monitor activities of national groups such as ICLEI, National Association of State Energy Officials (NASEO), and the

[1] WRI is World Resources Institute. ICLEI and CDP are organizations now using acronyms as names. They were formerly known as International Council of Local Environmental Initiatives and Climate Disclosure Project, respectively.

(Arlington-based) Center for Climate and Energy Solutions (C2ES) for insight into matters relevant to the County and Schools.

Objective Two: Improve transportation energy productivity through fleet efficiency, fuel choices, and methods of reducing vehicle-miles traveled.

Arlington County seeks to reduce energy usage from private vehicles by increasing ridership on public transportation and by providing a range of sustainable transportation options. Arlington County also seeks to operate an energy-efficient fleet that incorporates the latest low- or no-emission vehicle technologies, and to optimize energy usage through practices that reduce idling, route vehicles efficiently, and avoid unnecessary trips.

STRATEGY 1 – PURSUE FUEL-EFFICIENT VEHICLES WHEN MAKING NEW PURCHASES

The County will seek -- subject to budget, operational, and maintenance limitations -- to utilize the most energy-efficient commercially viable vehicles for its fleet. Arlington County will also seek to deploy these vehicles in an energy-efficient manner through vehicle routing, idling, other operator practices, and employee training.

The County will continue its leadership in fleet efficiency, as demonstrated by its long history of hybrid-electric sedan purchases, biodiesel fuel, and exploration of hybrid-electric buses for the ART fleet.

STRATEGY 2 – PURSUE GASOLINE AND DIESEL SUBSTITUTES AND ALTERNATIVES

Electric vehicles are much more efficient than internal combustion engine-driven vehicles, due to the efficiency of electric motors. Electric vehicles also produce lower GHG emissions than petroleum-fueled vehicles, even including the emissions at electric generating plants. As the electric grid continues to lower GHG emissions, electric vehicles increase their GHG advantage for transportation.

At current prices, EV fuel cost is in the range of $0.03 - $0.04 per mile traveled, depending on vehicle used. In comparison, a 25 mpg sedan and a gasoline price of $2.50 per gallon yields a gas fuel cost of $0.10 per mile traveled. Electric vehicles are currently more expensive to purchase, but their prices are expected to continue falling as their market penetration grows.

For GHG emission reduction and operating cost savings, the County will pursue electric vehicles for high-mileage sedan use, with a goal of electric vehicles satisfying five percent

(5%) of the vehicle-miles traveled by (non-public safety) sedans by 2020. Achieving this goal will require collaboration with the agencies whose employees travel extensively across the County.

Compressed natural gas (CNG) is an affordable and relatively clean-burning alternative to diesel fuel for large vehicles and buses. Arlington Transit now operates a 100% CNG fleet. Criteria air pollutants – notably particulates ($PM_{2.5}$) – are generally lower from CNG than diesel, helping improve local air quality. The GHG emissions from CNG are only modestly better than diesel, due to the lower energy content of CNG and corresponding lower fuel efficiency, but CNG does contribute to reduced GHG emissions compared to 100% diesel.

The operating cost savings of CNG for high-mileage vehicles such as buses remain an attractive option for APS and the County, while also supporting reduced GHG emissions.

STRATEGY 3 – PROMOTE ALTERNATIVES TO PASSENGER VEHICLES FOR EMPLOYEE TRAVEL

The County and Schools provide incentives to employees to walk, bike, and use transit to get to work. Use of technology, including Skype, allows employees from different locations to participate in a meeting without traveling to another site. Increasing use of such virtual connections, as well as the ART bus for travel between the Trades Center and Courthouse Plaza, will help reduce VMT in the County and Schools fleets and reduced congestion on Arlington roads.

Objective Three: Make use of waste heat and process optimization for efficiency and resource recovery.

STRATEGY 1 – APPLY HEAT RECOVERY TECHNOLOGY

Reducing the occurrence of waste heat is the first objective of energy efficiency. Examples include using a more efficient lamp that produces more light and less heat for a fixed amount of input energy, or adding insulation to retain heat in a building, so that less energy input is needed for the same level of comfort.

However, true 100 percent efficiency is impossible, because whenever energy is used it is partially degraded, and the degraded energy is usually in the form of waste heat. Therefore, capturing and reusing waste heat for some other purpose is a valuable strategy for overall efficiency of a system or process.

The Central Library now uses a heat exchanger to capture heat given off from the new electric chillers there. That heat is reused to preheat water for domestic use and for the hot water reheat coils in the HVAC system. Some buildings have flat plate heat exchangers to precondition fresh ventilation air with the thermal energy in the air that being is exhausted.

Advances in *variable-refrigerant flow* (VRF) heat pump technology offer the ability to simultaneously heat one space (as on the north side of a building) and cool another space (on the south side of the building) simply through heat transfer. This technology improves the efficiency and effectiveness of heating and cooling a building.

County and Schools staff will continue to explore opportunities to harvest waste heat from processes for use in other applications. Opportunities to tie the HVAC needs of multiple buildings together offers the possibility of reducing the on/off cycling losses of heating and cooling equipment. The Justice Center has such an interconnection, with steam from the Jail boilers capable of providing domestic hot water and space heating in the Courts-Police building through a heat exchanger. This equipment is currently being tested to optimize how it is deployed.

STRATEGY 2 – CONSIDER COMBINED HEAT AND POWER AND DISTRICT ENERGY

District energy is the use of centralized heating (or cooling) equipment to provide heat or cooling to multiple buildings connected by underground pipes. Many colleges and universities use district energy systems for heating (and cooling) their campuses. District energy is used in some American cities, and district energy is widespread in northern European cities.

District energy can lower the operating cost of heating and cooling interconnected buildings due to (i) economies of scale, (ii) a diversity of heating and cooling loads across multiple buildings, and (iii) reducing the off-cycle losses of the heating and cooling equipment that is used. With diversity of heating and cooling loads across multiple buildings, a district energy system can reduce the total installed capacity of equipment, thereby lowering capital costs.

Combined heat and power is the use of a single fuel source (such as natural gas) to create electricity and capturing the significant 'waste' heat and putting that waste heat to work as space heating, water heating, or water cooling (through an absorption chiller). An on-site source of electric power can be particularly valuable at mission-critical facilities, in place of stand-by generators. A combined heat and power facility is often a good fit with a district energy system, providing the source of thermal energy as well as on-site electricity.

The County and Schools will evaluate opportunities for combined heat & power, and district energy generally, in areas with multiple public facilities when installing or replacing heating and cooling systems. An Integrated Energy Master Plan (IEMP) was completed for the Courthouse area for the County buildings that could constitute a 'campus' there. This Plan determined that an integrated district energy system was feasible, but not cost-effective relative to other County and APS projects and priorities. Similar IEMPs should be prepared whenever multiple buildings are proposed in close proximity to each other.

Although the economics of CHP and district energy may not be compelling today, the continued urbanization of Arlington and changing energy costs warrant continued evaluation of these options. These locally-generated ('distributed power') options have potential community resilience benefits in case of natural or man-made disasters (i.e. energy supply disruptions due to major storms or terrorism).

STRATEGY 3 – MAXIMIZE EFFICIENCY AND OPPORTUNITIES FOR RESOURCE RECOVERY AT THE WASTEWATER TREATMENT PLANT

The Arlington Water Pollution Control Plant (WPCP) is the County's single largest energy consumer. Cleaning over 20 million gallons of wastewater every day to meet EPA and DEQ water quality standards requires a tremendous amount of energy. Advances in technologies and best practices now suggest there are substantial opportunities for improved energy efficiency in the current WPCP process. Efficiency possibilities include right-sizing pumps and blowers, improved HVAC in plant buildings, and improved lighting throughout the plant campus. Modest attention to plant efficiency could achieve five percent energy savings without changes to the wastewater treatment process by 2020. Additional, larger gains in efficiency are likely with modest capital expenditures, such as

the use of smaller 'jockey blowers' in place of certain large blowers in place today. This plan sets a goal of a ten percent reduction in energy use at the WPCP by 2020.

Moreover, the wastewater treatment industry now has multiple examples of treatment plants becoming resource recovery facilities, generating electric power using solids and gases from the treatment process, and also producing marketable compost materials for reuse. Electric power produced on site decreases power purchase costs, and revenue from marketable products adds further financial stability to what has historically been a costly public service. The Solids Master Plan underway at the WPCP will examine these options for Arlington. Over the longer term, options for increased collection of food waste and fats, oils, and grease will be evaluated for enhanced resource recovery if the County pursues a digester-based electric power production facility.

Objective Four: Increase production and use of renewable energy

STRATEGY 1 – INSTALL SOLAR PHOTOVOLTAICS ON COUNTY AND APS FACILITIES

As of January 2016 the County and APS had 660 kW of solar photovoltaics (PV) installed on buildings, including the 497 kW system on Discovery Elementary School. In addition, the County has another 10 kW of distributed PV serving school and pedestrian crossing signs. These installations reduce peak power demand and electricity costs at Central Library and Wakefield High School, and the use of solar-powered crossing signals avoids costly trenching to provide electric power to remote locations. The completion of Discovery Elementary demonstrates the potent combination of strong building energy efficiency and solar PV to achieve a net-zero energy building.

The CEP calls for 160 MW of solar PV in Arlington by 2050. Since County government and APS consume about three percent of all the energy used in all buildings across Arlington County, it is reasonable to aim for the County and APS to provide at least three percent of the CEP's goal, or at least 5 MW of solar PV by 2050. Furthermore, an interim 2020 goal of 2 MW is achievable in light of the potential sites on public buildings.

The cost of solar PV is falling rapidly, making solar more attractive financially through direct purchase or through alternative financing arrangements such as power purchase agreements (PPAs). In the future, another potential financing mechanism could be 'community solar' if state law is changed. With community solar, multiple investors buy shares of a solar PV system located in a convenient location, such as the rooftop of a public building.

Solar is applicable to both new and existing buildings. The primary conditions determining a suitable site include (i) unshaded surface, (ii) size and orientation of roof, (iii) age and condition of roof, (iv.) amount of electricity use and price of electricity at the site. Pursuit of PPAs for suitable new and existing buildings can provide the facilities with clean power without capital expense. In fact, preliminary pricing suggests PPAs can provide solar electricity installed on County and Schools properties at lower prices than current utility rates, and PPA pricing is typically fixed for 20 years.

Solar PV can also play an important role in energy resilience when coupled with on-site batteries for energy storage. This is an area for further exploration by the County. The County and APS will continue to consider opportunities to apply renewable energy in new construction, retrofit construction and stand-alone energy projects.

AIRE staff have experience evaluating existing sites for solar potential with Facilities Management. AIRE will engage with Facilities Design & Construction and Parks on solar

opportunities at new facilities. Schools Facilities and Operations has experience evaluating existing schools sites for solar potential, and will continue to evaluate possibilities on new and existing properties.

STRATEGY 2 – INSTALL SOLAR THERMAL TECHNOLOGY ON COUNTY AND APS FACILITIES

Solar thermal energy can be used for domestic water heating and as a source of space heating. Facilities with high domestic hot water use are the strongest candidates for solar thermal; water efficiency measures such as low-flow showerheads can reduce domestic hot water use enough to render solar thermal unnecessary. Solar thermal systems can also support space heating, particularly with low-temperature water-source heat pumps. The County has a well-functioning solar domestic water heating system at Fire Station 2. Schools has solar thermal at Wakefield High School to support domestic hot water needs. Solar thermal is also used to preheat the domestic hot water at Discovery Elementary.

Potential applications of solar thermal systems will be evaluated by the County and Schools for new and existing buildings, based on energy needs and suitable space conditions at each facility. AIRE staff and Facilities Management staff are the lead for the County; the Facilities and Operations Department has the lead for Schools.

STRATEGY 3 – STEADILY INCREASE PURCHASES OF GREEN POWER

There is a substantial market for certified green power, consisting of the voluntary renewable energy credit (REC) market and the mandatory REC market created in states with renewable portfolio standards (RPS). Virginia currently lacks a mandatory RPS, which inhibits investments in renewables in the state.

Both the County and Schools participate in the voluntary market, purchasing certified green power from Dominion and other brokers. In 2005, the County began purchasing RECs equal to three percent of government electricity purchases. As prices for RECs have fallen, the County and Schools have increased purchases. In 2015 Schools and the County are buying RECs equivalent to 9 percent and 26 percent of their total electricity use, respectively. The cost of REC purchases is a small fraction of the annual savings accrued from improvements in energy efficiency.

Participating in the voluntary REC market serves multiple objectives – it sends a policy signal to electricity providers that clean power is valued, it helps prepare the County for a possible mandatory market, and purchasing green power lowers net GHG emissions. Some GHG emission inventory protocols do not allow certified green power to be subtracted from electricity purchases when calculating total GHG emissions from electricity. However, these protocols do specify that a second, "net" GHG emissions can be calculated after accounting for the green power purchases, as shown in Table 2. Today, Arlington is reporting its government operations emissions to CDP. At least one of CDP's

recommended protocols allows for this net GHG emissions calculation which reflects the choice made to provide an incentive for the market to create more low-carbon energy.

If a mandatory state or national RPS is enacted, the value of the County's renewable energy investments will generate revenue, and valuable solar RECs may be leveraged for larger volumes of wind-generated RECs, boosting the overall share of green power purchased by Arlington.

Nonetheless, County and Schools' REC purchases remain secondary to the primary goals of reducing total energy use and GHG emissions. Continued purchases will not only increase the County's use of renewable energy but will further stimulate the market to increase the availability of these resource choices.

Objective Five: Be a leader in early adoption and promotion of innovative technology

The County and Schools can reduce operational and community-level energy use while cutting operating costs and building a local green economy through support and early adoption of innovative energy technologies. Arlington County has consistently led local governments in testing and early adoption of new energy-saving and renewable-energy technologies for both buildings and vehicles. Embracing new technology has and will continue to be a critical strategy for meeting the County's ambitious energy goals.

STRATEGY 1 – PILOT AND DEPLOY NEW AND INNOVATIVE TECHNOLOGIES

One of the great megatrends today is the steady electrification of the economy and society. Electric drives, digital controls, and semiconductor technology permeate facilities and perform work once handled by steam, compressed air, and lower quality forms of energy. Thermal energy remains important and valuable, and capturing 'waste' heat for reuse (Objective Three, earlier) is essential, but the overall material trend in modern life is toward de-materialization (miniaturization) and electrification of services and processes. The County and Schools should act on opportunities to pilot and deploy new technology as suitable:

Variable-refrigerant flow (VRF) heat pumps provide heating and cooling more efficiently than conventional heat pumps, and usually with smaller impact on space utilization.

Energy Management Information Systems (EMIS) tie building sensors, energy meters, occupancy sensors, and environmental sensors into a common platform (dashboard) that enables at-a-glance business intelligence for facility and energy management.

Light-emitting diode (LED) luminaires and fixtures that provide lighting much more efficiently than old-fashioned filament or fluorescent lamps. LEDs can be customized and controlled digitally and remotely. LEDs are now available for virtually all colors in the visible spectrum, providing nuance for all applications.

Electric vehicles (EVs) electric-drive motors are much more efficient than internal combustion engines (ICE), and electric vehicles have fewer moving parts than ICE vehicles. The superior vehicle efficiency, combined with decarbonization of the electric grid, means EVs produce much less GHG emissions than fossil-fueled vehicles.

Energy storage using batteries or other means is fast becoming more affordable. Battery storage of electricity, whether from solar panels or grid power, allows facilities to actively manage energy supply as well as energy demand, providing opportunities to reduce peak

power charges. Energy storage also provides resilience for the facility in case of energy interruptions. In addition to battery storage of electricity, thermal energy storage can be cost-effective at times, whether as hot or chilled water.

Net-zero energy buildings (NZE) involve careful design viewing buildings as a system. Beyond LEED, beyond ENERGY STAR, a NZE or near-NZE building offers design and construction professionals a creative challenge for maximizing resource efficiency, resulting in noteworthy, iconic structures.

Objective Six: Pursue sustainable funding strategies

To complete the objectives and strategies in this plan and meet the County's energy targets, the County must make a commitment to pursuing multiple funding strategies. Grants, loans, and utility rebates provide essential seed money for up-front investments in energy-efficiency projects The County should also develop a long-term, sustainable framework for validating savings from energy-efficiency investments, and using a portion of savings to support future investments.

STRATEGY 1 – FUND CLEAN ENERGY AND RESOURCE EFFICIENCY PROJECTS IN THE CIP

Some energy conservation gains can be made through employee awareness and action. But the substantial energy efficiency, water efficiency, and renewable energy opportunities identified in this plan require some investment of capital for new technology and equipment.

The 10-year Capital Improvement Plans (CIP) for the County and Schools identifies spending needs across all agencies. A few of these projects are explicitly energy-related. Funding these projects is imperative to maintain momentum and built upon past successes. Continued strong investments in Maintenance Capital is vital to capture efficiency opportunities during equipment replacement, facility renovations, and building expansions for both Schools and the County.

The AIRE program, a General Fund activity, uses annual operating funds to complete a variety of energy efficiency upgrades in County facilities. Available funds are often constrained by other essential AIRE program objectives such as outreach and program services in the community. Consistent strong support for the AIRE program, including future expansion in revenue, will be vital to continue building upon the gains made thus far and achieving the goals presented here.

STRATEGY 2 – PURSUE GRANT FUNDING TO SUPPLEMENT COUNTY FUNDS FOR ENERGY EFFICIENCY AND GHG REDUCTION EFFORTS

Grant and cooperative agreement funding for energy efficiency, renewable energy, energy resilience, and greenhouse gas emission reductions is sometimes available from the state of Virginia and the U.S. government. Pursuit of these external funds should be considered for clearly identified objectives and mindful of the burdens that external funding can impose.

STRATEGY 3 - ESTABLISH A REVOLVING FUND THAT IS PAID BACK BY ENERGY SAVINGS

Energy conservation and efficiency and waste reduction save the County money. Energy production can also reduce County energy expenditures and even generate revenue. By quantifying, verifying and reinvesting these savings (and revenues) directly into the organizations where the activities take place, the County could provide strong incentives to continuously improve energy and resource management. By directly rewarding divisions for their efforts, the County could create additional opportunities and motivation for them to reinvest funds in projects that improve the efficiency and sustainability of their operations and facilities, consistent with this plan and County goals.

Arlington County will evaluate options for reinvesting in sustainable energy and climate-change mitigation projects. This could include creating separate accounts to track verified savings at the project and program level, giving agencies the opportunity to apply savings to new energy efficiency and climate-change mitigation projects as part of their annual budget proposals, and/or setting specific thresholds for reinvestment in future capital projects versus applying savings to offset operating costs.

Objective Seven: Institutionalize Energy Management

STRATEGY 1 – CREATE AN INTERDEPARTMENTAL WORKGROUP ON ENERGY

The AIRE staff frequently engage staff in other agencies and Schools to assist with energy opportunities and challenges. Over the past fifteen years various committees and informal groups have arisen to coordinate on these topics, but they have not been long-lasting and none is standing today.

To achieve the goals set forth here and track progress and challenges along the way, a standing workgroup should be created to bring staff from the County and Schools together on a quarterly basis. These meetings will establish a mechanism for sharing of idea, resources, needs, and challenges. In addition, this workgroup will establish an institutional memory for smoother transitions when there are staff changes. This committee should be established by the energy staff in the AIRE program, with participation from all energy-using departments as well as Schools. Maintaining an active workgroup will help institutionalize energy management, and underscore our commitment to continuous improvement.

This standing workgroup will help implement the Strategies outlined for the other Objectives, including the action plans for the various energy-using sectors, e.g., buildings, fleet, water utility. Individual membership and participation will not be inflexible, but participation by representatives of all the major energy-using sectors is essential.

STRATEGY 2 – INCENTIVIZE ENERGY-SMART BEHAVIOR AND IDEATION BY WORKERS

The County and Schools should offer 'on-the-spot' cash merit awards ($100-$250) to employees who offer energy-smart suggestions or ideas that are implemented by County or Schools. Workers are the eyes and ears of the workplace. They may see conditions or situations that warrant attention, but they may be reluctant to call attention to the condition or uncertain who to contact to remedy the waste. Loudoun County has used such a system to generate meaningful participation and thousands of dollars of annual savings from staff suggestions. This program could be promoted by the interdepartmental workgroup on energy and staffed by the AIRE team.

APPENDIX 1 – Energy Management Self-Assessment Matrix (part 1 of 2)
Arlington County's present practices are denoted with highlighting

ENERGY STAR® Energy Management Assessment Matrix

	Little or no evidence	Some elements	Fully implemented	Next Steps
Make Commitment to Continuous Improvement				
Energy Director	No central or organizational resource Decentralized management	Central or organizational resource not empowered	Empowered central or organizational leader with senior management support	Organizational support for energy director function
Energy Team	No company energy network	Informal organization	Active cross-functional team guiding energy program	Develop standing energy team for quarterly meetings & briefings
Energy Policy	No formal policy	Referenced in environmental or other policies	Formal stand-alone EE policy endorsed by senior mgmt.	The County Operations Energy Plan provides this.
Assess Performance and Opportunities				
Gather and Track Data	Little metering/no tracking	Local or partial metering/tracking/reporting	All facilities report for central consolidation/analysis	Continue, enhance
Normalize	Not addressed	Some unit measures or weather adjustments	All meaningful adjustments for organizational analysis	Continue, enhance
Establish baselines	No baselines	Various facility-established	Standardized organizational base year and metric established	Continue, enhance
Benchmark	Not addressed or only same site historical comparisons	Some internal comparisons among company sites	Regular internal & external comparisons & analyses	Continue, enhance
Analyze	Not addressed	Some attempt to identify and correct spikes	Profiles identifying trends, peaks, valleys & causes	Energy Management Info System works toward this
Technical assessments and audits	Not conducted	Internal facility reviews	Reviews by multi-functional team of professionals	County Operations Energy Plan goals work toward this
Set Performance Goals				
Determine scope	No quantifiable goals	Short term facility goals or nominal corporate goals	Short & long term facility and corporate goals	Continue, enhance
Estimate potential for improvement	No process in place	Specific projects based on limited vendor projections	Facility & organization defined based on experience	County Operations Energy Plan goals work toward this
Establish goals	Not addressed	Loosely defined or sporadically applied	Specific & quantifiable at various organizational levels	County Operations Energy Plan goals work toward this

APPENDIX 1 – Energy Management Self-Assessment Matrix (part 2 of 2)
Arlington County's present practices are denoted with highlighting

ENERGY STAR® Energy Management Assessment Matrix

	Little or no evidence	Some elements	Fully implemented	Next Steps
Create Action Plan				
Define technical steps and targets	Not addressed	Facility-level consideration as opportunities occur	Detailed multi-level targets with timelines to close gaps	County Operations Energy Plan goals work toward this
Determine roles and resources	Not addressed or done on ad hoc basis	Informal interested person competes for funding	Internal/external roles defined & funding identified	County Operations Energy Plan goals work toward this
Implement Action Plan				
Create a communication plan	Not addressed	Tools targeted for some groups used occasionally	All stakeholders are addressed on regular basis	COEP and EMIS help, AIRE team will make more routine
Raise awareness	No promotion of energy efficiency	Periodic references to energy initiatives	All levels of organization support energy goals	COEP and EMIS help, AIRE team will make more routine
Build capacity	Indirect training only	Some training for key individuals	Broad training/certification in technology & best practices	Capacity-building is underway across multiple agencies
Motivate	No or occasional contact with energy users and staff	Threats for non-performance or periodic reminders	Recognition, financial & performance incentives	County Operations Energy Plan goals work toward this
Track and monitor	No system for monitoring progress	Annual reviews by facilities	Regular reviews & updates of centralized system	Energy Management Info System works toward this
Evaluate Progress				
Measure results	No reviews	Historical comparisons	Compare usage & costs vs. goals, plans, competitors	Additional measurement and verification to be performed
Review action plan	No reviews	Informal check on progress	Revise plan based on results, feedback & business factors	Continue, enhance
Recognize Achievements				
Provide internal recognition	Not addressed	Identify successful projects	Acknowledge contributions of individuals, teams, facilities	Increase recognition of accomplishments across org.
Get external recognition	Not sought	Incidental or vendor acknowledgement	Government/third party highlighting achievements	Continue, enhance

APPENDIX 2 – Facility Energy Needs and Priorities, 2015 (part 1 of 3)

KEY:	
1	Priority near-term upgrade or improvement needed
2	Near- to medium-term upgrade should be considered
3	No need for change identified, but watch for
4	No change needed on horizon (or bldg vacancy)

Building	Priorities	Linear LEDs	Improved Lighting Controls	Specialty Lighting	Control Plug Loads	Building automation	Metering, Sub-metering	Building thermal envelope	Motors / VFDs	Tune-up / Retro-Comm	Cooling equip	Heating equip	Water heating	Specialty Equip	Solar PV	Solar thermal
Argus House	Linear LEDs	1	3	4	3	3	3	2	4	4	4	4	2	3	3	2
Arlington Arts	Cooling	3	3	1	3	3	1	3	4	3	1	4	4	2	4	4
Arlington Daycare	Linear LEDs	1	2	4	3	3	2	2	4	4	4	4	3	4	4	4
Arlington Mill	RetroComm	2	3	4	4	2	1	3	3	1	4	4	2	2	4	4
ART Facility	Roof	2	3	4	4	3	4	3	3	3	3	3	4	4	4	4
Aurora Hills Sr Ctr/Lib	Linear LEDs	1	3	4	4	2	1	2	3	3	2	2	4	4	2	2
Ballston Garage	Spclty lighting, EV charge	4	4	1	4	4	4	4	4	4	4	4	4	4	4	4
Barcroft Sports	HVAC	1	2	4	4	4	1	3	3	1	1	1	2	4	2	2
Carlin Hall	Linear LEDs	2	3	4	4	3	4	4	4	4	4	4	4	4	4	4
Central Library	Heating - boilers	1	3	4	3	4	1	3	2	3	4	1	1	4	3	4
Cherrydale Library	--	4	3	4	4	4	4	2	4	4	4	4	4	4	4	4
Clarendon House	*transition*	2	3	4	4	4	4	2	4	4	4	4	4	4	4	4
Courthouse (Courts/Police)	HVAC, LEDs, plug loads	1	3	2	1	3	1	3	2	2	1	1	3	3	4	4
CSW	HVAC, windows	1	3	4	2	3	1	1	2	2	1	1	3	3	4	3
Dawson Terrace	envelope on old part	2	3	4	4	4	3	2	4	4	2	2	4	4	3	4
DPW bays	demolition	3	2	3	4	4	3	3	4	4	4	4	4	4	4	4
Equipment Division	--	4	3	2	3	4	2	3	4	4	4	4	3	3	3	3
Fairlington	Linear LEDs	1	3	4	4	3	1	3	3	2	4	4	4	4	4	4
Fire Station 1	Linear LEDs	1	3	3	4	3	3	2	4	3	3	3	2	2	2	2
Fire Station 2	Linear LEDs	2	3	3	4	3	3	3	4	3	3	3	2	2	3	4
Fire Station 3	Linear LEDs	2	3	3	4	3	3	3	4	3	4	4	2	2	4	4

APPENDIX 2 – Facility Energy Needs and Priorities, 2015 (part 2 of 3)

KEY:	
1	Priority near-term upgrade or improvement needed
2	Near- to medium-term upgrade should be considered
3	No need for change identified, but watch for
4	No change needed on horizon (or bldg vacancy)

Building	Priorities	Linear LEDs	Improved Lighting Controls	Specialty Lighting	Control Plug Loads	Building automation	Metering, Sub-metering	Building thermal envelope	Motors / VFDs	Tune-up / Retro-Comm	Cooling equip	Heating equip	Water heating	Specialty Equip	Solar PV	Solar thermal
Fire Station 4	Linear LEDs	1	3	3	4	4	1	2	4	3	4	4	2	2	4	4
Fire Station 5	Linear LEDs	2	3	3	4	4	3	3	4	3	2	2	2	2	4	4
Fire Station 6	HVAC, envelop, LEDs	1	3	3	4	1	3	2	4	1	1	1	2	2	4	4
Fire Station 7	Linear LEDs	1	3	3	4	3	3	3	4	3	3	3	2	2	4	4
Fire Station 8	Linear LEDs	2	3	3	4	4	3	2	4	3	3	3	2	2	4	4
Fire Station 9	Linear LEDs	1	3	3	4	3	3	3	4	3	4	4	2	2	4	3
Fire Station 10	Linear LEDs	2	3	3	4	3	3	2	4	4	3	3	2	2	4	4
Fire Training	Linear LEDs; elec sp ht	1	2	2	4	3	1	3	4	4	4	4	3	2	1	4
Fort C.F. Smith -- main & barn	specialty LEDs	4	2	1	3	3	3	2	4	3	3	3	2	3	4	4
George Mason Ctr	--	2	2	4	4	4	3	3	4	4	4	4	4	4	4	4
Glen Carlyn Library	Linear LEDs	1	3	4	4	4	3	3	4	4	4	4	3	4	4	4
Greenhouse	thermal envelope	4	3	2	4	4	3	2	4	4	4	2	4	3	4	4
Gulf Branch	Linear LEDs	2	3	2	4	4	3	3	4	3	4	4	4	4	4	4
Gunston Bubble	--	4	3	2	4	4	3	3	4	4	4	4	4	3	4	4
Jail	Linear LEDs, HVAC	1	2	2	3	3	1	3	2	2	1	1	2	2	3	3
Lee Center	renovation	1	3	4	4	1	1	3	4	1	1	1	2	3	1	4
Long Branch Nature Center	thermal envelope	1	2	3	3	1	2	1	4	2	3	3	1	1	4	4
Lubber Run	thermal envelope	2	3	4	3	4	4	2	4	3	3	3	4	4	4	4
Madison Center	Linear LEDs	1	3	4	4	4	1	2	4	2	1	4	4	4	2	3
Motorola	--	2	3	4	4	2	4	3	4	3	3	3	4	4	4	4

APPENDIX 2 – Facility Energy Needs and Priorities, 2015 (part 3 of 3)

KEY:	
1	Priority near-term upgrade or improvement needed
2	Near- to medium-term upgrade should be considered
3	No need for change identified, but watch for
4	No change needed on horizon (or bldg vacancy)

Building	Priorities	Linear LEDs	Improved Lighting Controls	Specialty Lighting	Control Plug Loads	Building automation	Metering, Sub-metering	Building thermal envelope	Motors / VFDs	Tune-up / Retro-Comm	Cooling equip	Heating equip	Water heating	Specialty Equip	Solar PV	Solar thermal
NOC	optimization	4	3	4	4	4	2	4	4	3	4	4	4	3	4	4
Parks Operations	Linear LEDs, RetroCmmx	1	4	4	3	3	1	2	4	1	2	2	2	2	1	2
Police Impound Lot	Linear LEDs	1	3	3	4	4	3	3	4	3	2	2	4	4	4	4
RPC	Cooling, Linear LEDs, BAS	1	3	4	3	1	2	2	4	1	1	4	4	3	4	3
S Eads Warehouse	Roof, Linear LEDs	1	2	3	3	3	2	2	3	1	4	4	4	4	1	4
Sequoia	Linear LEDs, scheduling	1	4	4	3	1	1	3	1	2	4	4	4	3	2	4
Shirl Bus Station	Lighting, scheduling	2	2	3	4	3	1	3	4	3	2	2	4	4	4	4
Shirl Lib/Sign Thea	tune-up, Linear LEDs	1	3	3	4	2	1	3	3	1	2	2	3	3	4	4
Smartscape	--	3	3	4	4	4	4	2	4	4	4	4	4	4	4	4
Solid Waste/Traffic Eng	HVAC, Linear LEDs	1	3	4	3	1	1	2	3	1	2	1	2	4	2	2
Spectrum theater	HVAC, BAS	3	3	3	4	1	2	4	3	2	4	1	4	2	4	4
Sullivan House	--	1	3	4	4	3	3	2	4	4	4	4	4	4	1	2
Thomas Building	renovation	1	3	4	3	1	1	1	3	1	1	1	1	2	2	4
Trade Center Garage	--	4	3	4	4	2	3	4	4	4	4	4	4	4	4	4
Transportation Ops Warehouse	scheduling, spec. LEDs	2	2	4	3	1	2	3	4	2	4	3	4	4	2	4
Vehicle Wash	renovation	3	4	4	4	4	4	3	4	4	4	4	4	4	4	4
W/S/S Admin	tune-up, Linear LEDs	2	3	4	3	4	2	4	4	3	3	3	4	4	4	4
Walter Reed Com Center	--	2	3	4	3	2	2	2	3	2	2	2	3	4	4	4
Water Control Center	Linear LEDs	1	4	4	4	3	3	3	4	3	3	3	4	4	4	4
Water/Sewer/Warehouse TC6	Linear LEDs, envelope	1	2	3	4	2	2	3	3	2	3	2	4	4	2	4
Westover Library	envelope, Linear LEDs	2	4	4	4	2	3	2	3	2	4	2	4	4	4	4
WETA	HVAC, Linear LEDs	1	3	4	3	1	1	2	3	1	3	2	3	4	1	4
Woodmont Center	Linear LEDs	1	2	3	4	2	2	4	3	2	4	4	4	4	3	4

APPENDIX 3 – Electric Vehicle Charging Policy – March 2016

Policy direction:

- **County support for use of electric vehicles (EVs) in the County fleet and among residents and businesses;**
- **County facilitation and encouragement of the installation and use of EV charging infrastructure.**

Background – Electric Vehicles Support Key County Goals in Energy and Transportation

There are three fundamental strategies to reduce transportation energy use, operating costs, and emissions from vehicles:

a. Reduce vehicle miles traveled (VMT), by choosing alternatives to vehicle transportation such as bus, rail, bicycle, or walking;
b. Use more fuel efficient vehicles that use less energy per mile traveled; and
c. Use cleaner fuels.

Vehicles propelled by electric motors provide a clean alternative to petroleum-fueled vehicles for passenger and freight transportation in urban areas. *Electric motors are much more efficient than internal combustion engines, so much so that electric vehicles produce fewer greenhouse gas emissions than petroleum-fueled vehicles, even including thermal energy losses and associated greenhouse gases from fossil fuel-fired electric generating power plants*.

In addition, vehicular transportation in urban areas like Arlington often consists of short trips and stop-and-go traffic. Emissions from internal combustion engines are dirtiest when their engines are cold, and therefore short trips from cold starts produce much more pollution than comparable mileage in a longer cruising mode. Electric vehicles do not suffer inefficiency from cold starts, and are therefore that much more beneficial to local air quality in urban areas.

Electricity used in Virginia is produced by a mix of fuels including nuclear power, natural gas, coal and an increasing amount of renewable sources. Greenhouse gas emissions from electricity generation in Virginia are lower than the national average, further making electric vehicle transportation environmentally preferable compared to internal combustion engines.

For the economic and environmental reasons outlined herein, Arlington County supports increased use of electric vehicles for passenger and freight transportation. Arlington County also acknowledges this is a rapidly-changing environment with technological advances in vehicles and charging methods, and market dynamics that are difficult to predict. Where areas for support of EVSE (Electric Vehicle Supply Equipment) are outlined below, there shall be no prohibition against EVSE as long as all relevant safety and permitting requirements are met. Zoning shall allow parking spaces provided for EVSE to count as equivalent to parking spaces

APPENDIX 3 – Electric Vehicle Charging Policy – March 2016 (continued)

without EVSE, i.e., EVSE spaces count toward a property's total parking count. Accordingly, these policies are necessarily general to allow for further technological and market changes.

Acronyms and Definitions

Arlington Public Schools (APS)

Electric Vehicle (EV)

A passenger vehicle with primary source of propulsion provided by electric power. This includes 100% electric vehicles (e.g. Nissan Leaf, Tesla Model S) and plug-in hybrids (e.g. Toyota Prius, Chevrolet Volt).

Electric Vehicle Supply Equipment (EVSE)

The device(s) used for providing power to charge batteries in electric vehicles, including the necessary appurtenant infrastructure such as proper electrical conduit for power supply and method of collecting fees for service.

Greenhouse gas (GHG) emissions

Gases that trap heat in the atmosphere are called greenhouse gases. The primary human activity affecting the amount and rate of climate change is greenhouse gas emissions from the burning of fossil fuels. Carbon dioxide (CO_2) is the most abundant; the other main greenhouse gases are methane (CH_4), nitrous oxide (N_2O), and fluorinated gases.

Vehicle miles traveled (VMT)

APPENDIX 3 – Electric Vehicle Charging Policy – March 2016 (continued)

Five areas for policy development:

1. For County government fleet

Goal: By calendar year 2020, at least five percent (5%) of total annual VMT by County government sedans should occur in EVs[2]. For the purpose of this goal, emergency vehicles are not included in the total VMT of government vehicles.

Policy

To achieve this goal, purchase of EVs and provision for EV charging must be increased over current practice. Toward this end:

- Electric Vehicle Supply Equipment (EVSE) will be added to appropriate sites to facilitate EV use (e.g. Trades Center, Courthouse).
- The Equipment Bureau will include EVs in the purchasing options for vehicles.
- County staff will be provided training for the proper use of EVs and EVSE.
- The County will pursue fleet and EVSE options with Arlington Public Schools (APS) for their transportation needs.
- If additional light duty vehicles become commercially available as electric vehicles, this goal may be adjusted to include other non-emergency vehicles in the light duty fleet.

[2] Current annual VMT in non-emergency sedans is approximately 1.6 million miles.

APPENDIX 3 – Electric Vehicle Charging Policy – March 2016 (continued)

2. On public (County government and APS) land for public & private charging

Goal: Provide reasonable accommodation to EVSE on public land for public and private use where feasible and at reasonable cost.

Policy

- Facilitate greater public use of electric vehicles by providing access to EVSE in public parking at County government facilities, subject to reasonable cost and space availability. Such sites include parking at Central Library, Arlington Mill Community Center, Ballston Garage, Long Bridge Park, and APS locations. The parking beneath Courthouse Plaza is another site for EVSE serving either/both public and government fleet electric vehicles.

- Implementation of this policy does not necessarily require the County or APS to bear the cost of EVSE installation and service. Rather, the County shall seek opportunities for public-private partnerships, such as EVSE provided and maintained by a private vendor with fees paid to the County for parking (if any) and electricity use.[3] To this end, the County will undertake a study of the feasibility of a public-private partnership in Arlington's areas of interest and need.

- To further encourage the use of these EVSE facilities, Arlington County will provide information on the location of public EVSE through its website and other social/news/electronic media.

[3] Resale of electricity for electric vehicle charging is permitted by the Commonwealth of Virginia. See http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+56-1.2C1.

APPENDIX 3 – Electric Vehicle Charging Policy – March 2016 (continued)

3. On private property for private charging (e.g. single family homes, townhomes, apartments and condominiums)

Goal: To encourage and facilitate use of EVs, remove barriers to EVSE deployment on private property without compromising safety.

Policy

- In areas zoned to allow single family dwellings or townhomes with individually-owned garage spaces,[4] no policy is necessary to encourage or facilitate use of EVs. Residents who wish to use EVs can obtain EVSE installations on their properties for their use through existing permitting rules.

- In areas with zoning categories allowing for more intensive use on private property, such as apartments, or as may be subject to community ownership (e.g. condominiums), remove barriers through consideration of the following example ordinance:

Electric Vehicle Supply Equipment (EVSE) Policies for Multi-Unit Dwellings

A common interest development, including a community apartment, condominium, and cooperative development, may not prohibit or restrict the installation or use of EVSE in a homeowner's designated parking space. These entities may put reasonable restrictions on EVSE, but the policies may not significantly increase the cost of the EVSE or significantly decrease its efficiency or performance. If installation in the homeowner's designated parking space is not possible, with authorization, the homeowner may add EVSE in a common area for their use. The homeowner must obtain appropriate approvals from the common interest development association and agree in writing to comply with applicable architectural standards, engage a licensed installation contractor, provide a certificate of insurance, and pay for the electricity usage associated with the EVSE. Any application for approval should be processed by the common interest development association without willful avoidance or delay. The homeowner and each successive homeowner of the parking space equipped with EVSE is responsible for the cost of the installation, maintenance, repair, removal, or replacement of the station, as well as any resulting damage to the EVSE or surrounding area. The homeowner must also maintain a $1 million umbrella liability coverage policy and name the common interest development as an additional insured entity under the policy. If EVSE is installed in a common area for use by all members of the association, the common interest development must develop terms for use of the EVSE. (Reference Senate Bill 880, 2012, and California Civil Code 1353.9)

- For site plans not yet approved by the County, minimum EVSE requirements may be adopted as 4.1 site plan conditions. For parking facilities with more than 100 spaces, it is recommended that at least 1 in every 100 spaces should be EV-ready with space, electrical capacity, and conduit for a charging station[5].

- Explore opportunities to provide financial support to property-owners that want to install EVSEs on their property through mechanisms such as low-interest loans and technology demonstration grants. Seek to partner with utility companies and the private sector to fund the incentive programs.

[4] See Area 5 for homes with on-street, public parking

[5] Green building rating systems, including LEED and EarthCraft, have their own requirements for installation of EVSE to receive credits. See rating system documentation for the most up to date requirements.

APPENDIX 3 – Electric Vehicle Charging Policy – March 2016 (continued)

4. On private property for public charging (e.g. National Airport, commercial garages and parking lots, retail parking spaces and lots)

Goal: To encourage and facilitate use of EVs, remove barriers to EVSE deployment on private property without compromising safety.

Policy

- For site plans not yet approved by the County, minimum EVSE requirements may be adopted as 4.1 site plan conditions. For parking facilities with more than 100 spaces, it is recommended that at least 1 in every 100 spaces should be EV-ready with space, electrical capacity, and conduit for a charging station[6].

- To further encourage the use of these EVSE facilities, Arlington County will provide information on the location of public EVSE through its website and other social/news/electronic media.

- Explore opportunities to provide financial support to property-owners that want to install EVSEs on their property through mechanisms such as low-interest loans and technology demonstration grants. Seek to partner with utility companies and the private sector to fund the incentive programs.

[6] Green building rating systems, including LEED and EarthCraft, have their own requirements for installation of EVSE to receive credits. See rating system documentation for the most up to date requirements.

APPENDIX 3 – Electric Vehicle Charging Policy – March 2016 (continued)

5. Public right-of-way charging (e.g. curbside)

Policy

- The provision of EVSE in the public right-of-way, by either the County or a contractor to the County, requires further study. As the market for EVs matures and there is more local and regional experience with the installation and use on public and private land in parking lots and garages the County should undertake a study on the practicalities of deploying EVSE on street right-of-ways.

- At this time there will be no provision for installation of EVSE for charging in the public right-of-way for homes or businesses that do not have off street parking.

- Considerations to determine suitability for EVSE include:
    - Safety
    - Market demand
    - Competing demand for curb space
    - Access to appropriate electric power supply
    - Project feasibility

- Should right-of-way EVSE be suitable and desirable, this policy does not necessarily require the County to bear the cost of EVSE installation and service. Rather, the County should consider opportunities for public-private partnerships, such as EVSE provided and maintained by a private vendor with fees paid to the County for parking (if any) and electricity use. To this end, the County will undertake a study of the feasibility of a public-private partnership in Arlington's areas of interest and need.

APPENDIX 4 – Arlington County Green Building Policy

Subject/Topic: Policy for Integrated Facility Sustainability (Green Building Policy)
Topic Category: Green Buildings/Environmental Management/Sustainability
Department Lead: Office of the County Manager
Last Revised: November 30, 2009

Summary: All County buildings and public facilities construction will strive to incorporate the highest environmental performance standards using the LEED green building rating system as a guide. The Policy was developed to support Arlington's mission of sustainability and to support the County's overall greenhouse gas reduction goals.

Purpose:

- To demonstrate Arlington's commitment to environmental, economic, and social stewardship;
- To reduce costs through energy and water efficiency;
- To provide healthy indoor environments for staff and visitors;
- To contribute to the County's goals of protecting, conserving, and enhancing the region's environmental resources; and
- To set a community standard of sustainable building practices.

Scope: Applies to all County Departments and Agencies and their contractors responsible for financing, planning, designing, developing, constructing, managing, and decommissioning County owned and leased facilities and buildings.

Policy Detail: It shall be the policy of Arlington County to finance, plan, design, construct, manage, renovate, maintain, and decommission its facilities and buildings to be comprehensively sustainable. This applies to new construction and major renovation projects where the total project square footage meets the minimum criteria described below.

- The County will continue to use the most current version of the LEED green building rating system standards as developed by the USGBC. The specific LEED rating system to be used is determined by the scope of the project (new construction, core and shell, commercial interiors, etc.).

- County buildings shall be funded for at least the level of LEED Silver Certification. In order to address the specific critical environmental issues in the region as outlined by the Metropolitan Washington Council of Government's regional green building policy adopted in 2008, four (4) LEED points selected from the following LEED credits focused on the following areas should be included: Energy Optimization, Heat Islands, Renewable Energy, Construction Waste Management, and/or Stormwater Management.

- Silver Certification may be foregone if professional analysis demonstrates that a reallocation of funding would substantively improve the over-all environmental performance of the building (for example, to meet project-specific energy performance standards), even at the loss of LEED points.

APPENDIX 4 – Arlington County Green Building Policy (continued)

- County buildings shall be designed and built to meet Energy Star energy performance targets, or comparable targets where Energy Star benchmarking has not yet been established.

- Projects with residential components may use either LEED, EarthCraft Virginia, or Arlington's Green Home Choice rating systems to guide sustainable design and construction, as appropriate.

Exemptions to the Policy: For both construction and renovation, the following projects will strive to incorporate the highest environmental performance standards, but are exempt from the requirement to achieve LEED Silver certification:

- County owned buildings with less than 5,000 sq. ft GFA;
- Buildings leased by the County with less than 8,000 sq. ft. GFA or an initial lease term 8 years or less;
- Buildings without climate-control systems;
- Renovations that cost less than $1 million.

Each County project will be evaluated on a case-by-case basis. Unless the County Manager makes a written finding that the application of this policy to a particular building is not in the County's best interest (for example, because of time urgency or lack of funding), all other County buildings will be constructed in accordance with this Policy, using the LEED rating system most applicable to the specific project.

Related Information:

- US Green Building Council (link to www.usgbc.org)
- www.arlingtonva.us (search green buildings)

History/Background: The Workgroup on the Policy for Integrated Facility Sustainability was convened to develop a comprehensive policy for green building investments in buildings owned or leased by the County. The members represented DES, PRCR, AED, CPHD, and APS. The Policy became effective August 19, 2008.

Authored by: DES – Joan Kelsch
Approved: November 30, 2009