

Frederick County Government Comprehensive Energy Plan April 2021

Since 2009, Frederick County has been charting a course to address energy conservation and increase the use of renewable energy sources. The purpose of these efforts is to achieve monetary savings and create environmental benefits by reducing the County's carbon footprint.

This Comprehensive Energy Plan continues these efforts and replaces the 2010 Comprehensive Energy Plan for the Frederick County Government. This plan establishes a four-year plan for FY 2020-2023 to increase the County's energy efficiency as well as increase the use of renewable energy sources.

In general, this plan recommends:

- Optimizing equipment operation to increase energy efficiency in buildings, vehicle fleet, water and sewer utilities, and solid waste facilities.
- Continuing to implement and seeking opportunities for energy conservation and converting older equipment to more efficient versions.
- Increasing the substitution of renewable energy forms for purchased non-renewable fuels and electricity, with preference given to fuels and energy produced within Maryland, when life-cycle analyses show these actions are financially sustainable and are in the best interests of the County.
- Improving the tracking and management of energy data.

The approach to this plan is a change from the previous plan. Due to rapid changes in technology and budget constraints, it is unrealistic to make plans for more than five years in the future as there is no guarantee such plans will be practical as conditions change. This plan is a short-term, action-oriented plan that has a high likelihood of being executed, while keeping long-term objectives in sight.

In addition to providing an action plan, this document also provides an adaptive management process. The Division of Public Works (DPW), the Division of Water and Sewer Utilities (DWSU), and the Division of Solid Waste and Recycling (DSWR) have been making energy efficiency and renewable energy gains. This plan incorporates a process to more formally document progress and evaluate action taken. There is a regular reporting schedule that will provide accountability. More importantly, once action is taken, managers will have an opportunity to evaluate progress and technological advancements, and make adjustments based on conditions as they evolve.

This plan was created by a team including: Mike Marschner, Deputy Chief Administrative Officer; Chuck Nipe, Division of Public Works Director; Kevin Demosky, Division of Utilities and Solid Waste Management Director; David Ennis, Public Works Department Head, Highway and Facility Maintenance; Shannon Moore, Office of the County Executive Sustainability and Environmental Resources (OSER) Manager; and Dawn Ashbacher, OSER Sustainability Program Manager. Team meetings were held in 2019.

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There were some additions to the team in 2020. In March 2020, Kevin Demosky retired. Mark Schweitzer was officially added to the team after he was appointed interim head of the Division of Utilities and Solid Waste Management (DUSWM). He had worked on the plan previously with Mr. Demosky. In March 2020, the County also focused its efforts on responding to the coronavirus pandemic so work to finalize the Comprehensive Energy Plan was delayed.

In June 2020, Pat Hannah, Fleet Services Director retired. In August 2020, Jeremy Endlich started as the new Fleet Services Director. He reviewed the Fleet goals in the plan and made some revisions.

In September 2020, the Division of Utilities and Solid Waste Management (DUSWM) was divided into two divisions, the Division of Water and Sewer Utilities (DWSU) and the Division of Solid Waste and Recycling (DSWR). Some references to the DUSWM are included for historical accuracy.

In December 2020, Mike Marschner retired.

In January 2021, Phillip Harris, Director of the Division of Solid Waste and Recycling, was formally introduced to the plan and provided his input.

I. Background

Frederick County's efforts have focused on actions to reduce the demand for energy by being more energy efficient and conserving energy, and to be strategic in procuring and producing an energy supply to meet the County's projected future energy consumption.

2010 Comprehensive Energy Plan

In March of 2007 the Board of County Commissioners adopted a Strategic Plan for 2007-2011 that included a strategic goal to adopt a comprehensive energy plan for Frederick County Government. On September 16, 2010, the Board of County Commissioners adopted a Comprehensive Energy Plan (CEP) for Frederick County Government as guidance to County operating departments. The plan set goals for a 15-year period.

The recommendations in the 2010 Comprehensive Energy Plan included a combination of a) energy conservation, b) conversion to renewable fuel sources and c) generation of renewable energy. The plan focused on the following sectors of County government energy consumption: buildings, fleet, and the Division of Utilities and Solid Waste (DUSWM) facilities.

The implementation of the 2010 plan was hampered by shifting priorities. For example, a key component of the plan was to utilize a Frederick and Carroll municipal waste-to-energy project to generate more than enough energy to cover the County's calculated baseline electric consumption at the time. In 2014, the County decided not to pursue the construction of the waste-to-energy project. Also, the Management Services Division was assigned the lead role for 2010 Comprehensive Energy Plan project. This division, including several staff positions dedicated to the plan, was subsequently eliminated, which left a void in the management of the CEP. To the credit of County staff, efforts continued and components of the 2010 CEP were implemented. However, progress was not well-documented.

The following describes the County's efforts to address energy conservation and renewable fuel sources.

II. Efforts to Reduce County Government Energy Demand

Frederick County becomes a Maryland Smart Energy Community in 2013

The Maryland Energy Administration (MEA) has a Maryland Smart Energy Community (MSEC) Program. The purpose of the program is to encourage local Maryland governments to voluntarily adopt formal policies promoting energy efficiency, renewable energy development, and/or reduction of reliance on petroleum as a transportation fuel, and to implement projects to achieve the objectives of such policies. In return, local governments are eligible to apply for grant funding to implement projects.

In 2013, Frederick County Government became a MSEC Community and adopted goals by resolution for renewable energy and petroleum reduction. In 2014, Frederick County adopted goals for energy efficiency. The goals are as follows:

Energy efficiency: By FY 2017, to reduce per square foot electricity consumption by 15% relative to the FY 2012 baseline.

Renewable energy: By 2022, to reduce conventional centralized electricity generation serving a local government's buildings (using FY 2012 as the baseline year) by meeting 20% of those buildings' electricity demand with distributed, renewable energy generation.

Petroleum consumption: By 2016, to reduce on-road vehicle petroleum consumption by Frederick County Government's fleet vehicles by 20 percent, using FY 2011 as the baseline year.

As an MSEC community, Frederick County successfully competed for grants that funded five plug-in hybrid electric vehicles, energy efficient lighting projects at the Law Enforcement Center, Health Department, Courthouse, Citizens Care and Rehabilitation Center (CCRC), and Bell Court Senior Apartments, and the County cost-share for nine all-electric TransIT buses.

Fleet Services and TransIt have also installed electric vehicle chargers. For the plug-in electric vehicles, there is a dual head station at the Courthouse, a dual head station at DPW on Bourne Way, and a single head station at Winchester Hall. TransIT has nine chargers that are specifically for its buses.

Of all of the MSEC goals, the County has made the most progress on the renewable energy goal. It is estimated that with the solar electric array at Reichs Ford Road Site A Landfill (closed portion) starting in the summer of 2019, Frederick County will be using renewable energy to meet 16-17 percent of the FY 2012 baseline for Frederick County Government buildings' electricity demand (not including water and wastewater facilities).

Regarding the energy efficiency and petroleum consumption goals, the County has taken action. These accomplishments are detailed below. Lessons have been learned from collecting data about the importance of setting meaningful goals that can be measured adequately.

Other Accomplishments

Frederick County Government has also adopted best practices and accomplished more energy efficiency through its efforts. These efforts included roof replacements; heating, ventilation, and air condition (HVAC) replacements; use of a more efficient technology for HVAC systems; and lighting retrofits. Examples of these types of improvements are listed below.

Roof replacements: Roofs were replaced on the west wing of Winchester Hall and the Adult Detention Center. The material was changed from ethylene propylene diene monomer (EPDM) rubber to light gray thermoplastic polyolefin (TPO) resulting in an estimated savings of 110,000 kilowatt hour (kWh)/year.

HVAC systems: HVAC systems have been upgraded to more energy efficient models at the Senior Center, Courthouse, and Westview Fire Station.

Use of Variable Refrigerant Flow (VRF) HVAC Systems: At Extension Services and 340 Montevue Lane, HVAC units were replaced with variable refrigerant volume units. Instead of one large, noisy unit pumping out air to the whole building, a VRF HVAC system features several smaller air handlers that can be individually controlled and piped back to one system. The term variable refrigerant flow, or VRF, refers to the system's ability to control the amount of refrigerant flowing to each of these small air handlers based on demand. This reduces the overall energy consumption for the HVAC system.

Lighting upgrades: The Public Safety Training Facility site was improved with the replacement of exterior poles, wiring, controls and lights with for an estimated savings of 100, 468 KWh/year.

Exterior lighting upgrades: LED lighting at multiple sites including the Adult Detention Center (ADC), ADC Work Release, the Law Enforcement Center, 30 N. Market Street, the C. Burr Artz Library, and Citizens Care and Rehabilitation Center.

Interior lighting at the Courthouse Complex was also retrofitted with LED lights.

Frederick County has also established some best practices and policies to support energy efficiency. Some examples are included below.

Variable Frequency Drives (VFDs): The Division of Water and Sewer Utilities has adopted a practice of utilizing variable frequency drives for appropriate motors. A variable frequency drive is a type of motor controller that drives an electric motor by varying the frequency and voltage of its power supply. Energy efficiencies typically are realized because it allows a motor (or pump) to run at an optimal speed needed for the process. With the completion of the Ballenger-McKinney Enhanced Nutrient Removal Wastewater Treatment Plant in December 2014, various VFDs were installed in certain portions of the facility.

No Idling Policy--The County has a No Idling Policy. An idling car uses about 0.3 gallon of gasoline per hour and a big truck can use about one gallon of diesel fuel per hour when idling. Idling wastes fuel and increases engine wear and maintenance cost. The County's Idling Policy prohibits idling a vehicle engine except when idling is required to perform essential functions. Essential functions may be defined as the operation of tools or equipment for the safety of the operator or passengers during times of extreme weather.

Anti-idling technologies continue to evolve in all segments of the transportation industry. Many newer vehicles incorporate anti-idling technologies that shut the vehicle engine off when it comes to

a stop. Idling a car engine for more than 10 seconds will use a greater amount of fuel than shutting it off and restarting it. Larger vehicles such as trucks and buses are beginning to incorporate idle reduction technologies through the use of auxiliary power and/or heating units that eliminate the need to idle the vehicle's main engine to operate vital systems. These auxiliary units operate a small generator or battery powered component and/or small fuel fired heating units that consume far less energy than a truck or bus.

Vehicle Operator Policies and Procedures—The County's vehicle operator procedures include expectations for drivers to conserve energy, such as by combining trips and carpooling whenever possible. This policy also specifies that when traveling out of the county in a County vehicle, only vehicles with a highway fuel economy of 22 MPG or greater as listed in www.fueleconomy.gov may be used unless four or more people are traveling together. This restriction does not apply to a) transportation of vehicles for repairs, b) pickup or delivery of supplies that requires a heavier vehicle, c) travel across County lines when such travel is the most direct route between points within the county, d) when responding to a working incident outside the county as assigned by an employee's supervisor.)

Vehicle Fuel Conservation Plan--A fuel conservation plan started in 2008, intending to reduce fuel consumption by ten percent each year over two years. Overall fuel usage was monitored by Fleet Services every eight weeks. The fuel reduction usage was monitored up until 2018. Fuel usage was reduced by 21% between 2008 and 2010. In 2020, fuel usage was reduced by 12% from the 2008 baseline, even as the Frederick County fleet increased from 990 vehicles in 2008 to 1,280 in 2020.

Thermostat Settings in County Buildings: Frederick County Government has an administrative policy to provide standard operating procedures in maintaining a set point thermostat temperature during the heating and cooling seasons in County-owned and leased spaces as applicable.

Potomac Edison EmPower Maryland: Potomac Edison offers financial incentives for making energy efficiency improvements. DPW has utilized these incentives for lighting LED upgrades in the past and plans to continue to use them in the future. Examples of projects that received incentives include the Emmitsburg Community Center gym lighting, exterior lighting for Animal Control and the Animal Health Lab, and interior lighting for the C. Burr Artz Library and the Health Department.

III. Efforts to Economize Energy Supply and Increase Renewable Energy Sources

Another approach to save money and reduce the County's carbon footprint for environmental benefits is to be strategic in procuring and producing an energy supply to meet the County's projected future energy consumption.

Procurement

It is important to understand the sources of the County’s current electrical power from PJM Interconnection (PJM).¹ The current PJM_System Mix (of fuels) is predominantly natural gas and nuclear, with less than 25% from all types of coal. Table 1 below is a snap shot of the PJM fuel mix between January and August 2019. More than 38% of the power provided by the PJM Regional Transmission Operator (RTO) at that time was either nuclear or a renewable source (hydroelectric, wind and solar).

<u>Table 1</u>	
<u>Fuel</u>	<u>Percentage</u>
<u>Gas (Natural Gas and Other Gas)</u>	<u>36.02</u>
<u>Nuclear</u>	<u>33.50</u>
<u>Coal (Bituminous, Anthracite and Sub-Bituminous)</u>	<u>24.66</u>
<u>Wind</u>	<u>2.79</u>
<u>Hydroelectric</u>	<u>1.51</u>
<u>Other (e.g.: Biomass, Methane, Solid Waste, etc.)</u>	<u>1.17</u>
<u>Solar (Photovoltaic)</u>	<u>0.35</u>
TOTAL	100%

Understanding where the County’s current power is derived helps establish realistic goals and preferences for procuring an increasing amount of renewable electrical energy. For example, the County may want to initially focus on ways to reduce its dependence on the most carbon intensive sources of electric power, coal followed by natural gas, in procuring electricity.

New State RPS Requirements

Senate Bill 516, passed on April 8, 2019, established a new Renewable Portfolio Standard (RPS) for the State. The new RPS increases the amount of Tier 1 renewable sources, which includes solar photovoltaic (PV), from 25% to 40% in 2025 and to 50% by 2030. It is important to note that these new RPS requirements will not begin affecting the County until 2025 since current electric purchase

¹ The PJM (Pennsylvania, New Jersey Maryland) Interconnection LLC (PJM) is a United States- based regional transmission organization (RTO) that coordinates the movement of wholesale electricity. It is also part of the Eastern Interconnection power grid, which operates the electricity transmission system that serves various parts of Delaware, Maryland, Illinois, Kentucky, Indiana, Michigan, New Jersey, Ohio, Virginia, North Carolina, Pennsylvania, Virginia, West Virginia, Tennessee and the District of Columbia.

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contracts are grandfathered to the previous RPS that only requires 25% by 2025. Therefore, if the County decides to increase its purchase of renewable electric power before 2025, the County's energy Consultant Enel X would need to be directed to make those purchases to supplant certain existing contracts.

Renewable energy supply

Frederick County has implemented and is the process of implementing renewable energy projects. The County has pursued projects when life-cycle analyses show these actions are financially sustainable and are in the best interests of the County.

Solar Thermal Installation at the Adult Detention Center: In 2012, Frederick County completed a renewable energy demonstration project for solar hot water heating at the Adult Detention Center. The system has 57 solar tube collectors, and according to the installer, Solar Energy Services, has a capacity of 130 kW and is estimated to produce the equivalent of 159,432 kWh per year.

Landfill Gas to Energy Project: In January 2009, Frederick County teamed with the Northeast Maryland Waste Disposal Authority and its contractor DCO Energy (DCO), to build and operate and privately own a landfill gas-to-energy facility at the Reichs Ford Road Landfill. As part of the agreement, DCO purchased and installed a landfill gas collection system for the County. Operations began in 2010 and the facility generated approximately two megawatts (MW) of electricity, enough to power 1,200 homes. Energy was sold to the PJM grid. The County did not buy the power due to the cost. The facility ceased operation in June 2018 due to a lack of landfill gas.

Solar Electric Array at Reichs Ford Road Site A Landfill (closed portion): In the summer of 2019, a photovoltaic (PV) array generating approximately 3.7 million kilowatt hours was completed on the closed landfill to supply renewable electric power to some County government buildings through a virtual net metering arrangement with the electric company, Potomac Edison.

The landfill solar array is owned by TESLA and the County has negotiated a 20 year power purchase agreement (PPA) providing a fixed rate of \$0.066 per kWh. Although this rate is higher than current Washington Gas Light (WGL) Energy electricity purchase contracts, which are currently at \$0.051/kWh, the 20 year PPA is considered a hedge against future electrical purchase price increases. Under the PPA, the County is purchasing the Solar Renewable Energy Certificates (SREC) for the first six years of the PPA term. The County negotiated a fixed cost of \$22 per SREC for this first six-year period.

The PPA with TESLA also includes a buyout provision that allows the County to purchase the solar array (which would include the SREC generation attributes) at 6, 10, or 20 years. Therefore, at the end of the initial six-year period during which the County is purchasing the SRECs from the TESLA array, the County can exercise its right to purchase the array securing all of the SRECs generated indefinitely.

To prepare for this purchase, the County's Solid Waste Enterprise Fund could begin setting aside funding for this purchase at year six. Once under County ownership, electrical energy pricing could be restructured, if necessary, based on the value of equivalent renewable electricity being purchased by contract once those contracts are subject to the new State RPS.

Ballenger-McKinney Waste Water Treatment Plant Solar Array: This project is largely funded by a Maryland Department of the Environment (MDE) Water and Energy Infrastructure Grant, secured by

the DUSWM in 2017.² The project includes construction of a 3,528 module PV Array, with a One Mega Watt (MW) generation capacity adjacent to the Ballenger-McKinney Wastewater Treatment Plant (WWTP). This project will generate approximately 1.85 million kWh per year. The project also includes an on-site Battery Energy Storage System (BESS) providing some additional (limited) back-up power beyond the plant's two-line electric utility service. The BESS is able to supply up to 840 KW for start-up loads or a total of 1,776 kWh. The BESS will also smooth power delivery and potentially provide opportunities for peak (electrical demand) shaving.

The electricity generated by the solar array will supply approximately 17% of the plant's (2019) electrical usage. The Northeast Maryland Waste Disposal Authority (NMWDA) administered the grant and construction contract for the County. The project is anticipated to come online in 2021.

Feasibility of Adding More Solar Arrays

The County has also researched the feasibility of adding a solar array at more County facilities.

In 2010, five DUSWM facilities were considered for renewable (photovoltaic) energy projects under the Maryland Energy Administration's Sunburst Project. The facilities included were Reichs Ford Road Transfer Station, Reichs Ford Road leachate wastewater treatment plant (WWTP), New Design Road WTP, Ballenger Creek WWTP, and the Potomac River Pump Station. At that time, none of the projects were selected for grant funding.

In 2012, the Environmental Protection Agency's (EPA) Green Power Partnership Clean Energy Collaborative Procurement Initiative provided a group platform for deploying clean energy technologies across multiple government and educational organizations in the Washington DC, Virginia, Maryland area. Frederick County was one of the participating agencies and identified three sites for full analysis within this initiative: the Health Department Building, Adult Detention Center (ADC), and Catoctin Creek Nature Center. The results of the analysis showed that the ADC and Health Department arrays had the potential to contribute at the time about 5 percent each toward the remaining goal of increasing onsite energy production and a Catoctin Creek Park arrays could contribute about 1.5 percent.

In the near future, opportunities to cooperate on the purchase of power from utility size solar projects may outshine smaller projects on County buildings, or even larger projects the size of the landfill and Ballenger-McKinney solar arrays. Large energy purchasing cooperatives such as the Baltimore Regional Cooperative Purchasing Committee (BRCPC) or even smaller coops such as the Frederick Area Cooperative Team (FACT) could begin procuring long-term renewable electrical power from utility-size solar and wind generators to replace current contracts that expire in 2026. This concept is currently being discussed with the County's energy consultant Enel X. This action, in concert with two solar projects developed by the DUSWM, and the new Maryland RPS requirements, which will impact (County) energy contracts beginning in 2026, could allow the County (and other FACT members) to obtain almost all of their electricity from renewable sources.

In light of the recent changes to the Maryland RPS and the possibility of utility-size solar and wind projects being developed to meet the growing renewable energy demand of large and small cooperative purchasing entities, the County should consider delaying any additional County-owned solar project development until there is clear indication that utility size alternatives will not be available by 2026, when most of the County's existing electricity purchase contracts expire.

² The Maryland Board of Public Works approved the funding in November 2018. DWSU provides local funding for the balance of the project.

IV. Challenges with Goals and Data Collection

For the Maryland Smart Energy Community (MSEC) program, an energy consumption baseline was created for FY 2012 using data from the majority of County facilities. The Department of Public Works has continued to enter energy consumption data in a software platform called ENERGY STAR Portfolio Manager. OSER uses this data to analyze County electricity consumption.

Such a large pool of facilities makes it difficult to analyze impacts of efforts on facility consumption totals. Between FY 2012 – FY 2019, there were significant fluctuations. Further analysis showed that comparisons included older buildings with temporary lower use due to renovations or building sales, newer or remodeled and reoccupied buildings that then increased usage, and buildings for which electricity data is no longer available. Fluctuations are also likely the result of other significant factors, such as data not being normalized for weather and temperature variations. The impact of such significant factors on energy consumption can overshadow the impact of the projected energy savings from individual completed projects.

For example, the remodeling and repurposing of Montevue Home into the Public Works Bourne Building and the increased use of the Public Safety Training Building increased electricity consumption by more than a million kWh between 2012 and 2015. In FY15, the former home of Public Works at 118 N. Market Street showed low use because it was being renovated. Once the building was reoccupied, the electricity use in this building increased. In addition, the temporary transfer of the management of Citizens Care and Rehabilitation Center to a non-county property manager reduced consumption by more an a million kWh between 2012 and 2015. This facility, however, came back under County control and that significantly increased the County's total electricity consumption.

County energy saving projects will continue to have an impact, but it may be difficult to see these impacts in the yearly property consumption totals due to these other factors that can have more impact.

It would be helpful to review and analyze data collection and analysis methods. Data collection procedures should be reviewed to determine the most effective use of staff time to produce data that will help with management decisions. It may be better to use efficiency goals (e.g. kWh/sq ft) rather than overall electricity consumption totals or to analyze buildings by subgroup (e.g. libraries, fire stations, parks, etc.) rather than analyzing all of them in a large pool.

V. Action Plan

This plan focuses on the same sectors as the 2010 Comprehensive Energy Plan: buildings, fleet, Division of Water and Sewer Utilities, and the Division of Solid Waste and Recycling facilities. In addition, because data is essential to measuring progress, an action plan around data collection is also included. Taking into account the accomplishments, and current opportunities and constraints, the following four-year action plan is proposed for FY 2020-2023.

Division of Public Works

Division of Public Works								
	Action	Category	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Buildings	Fleet
1.1	Building Automation Systems (BAS) ¹	Operational	X	X	X	X	X	
1.2	Retro-commissioning ²	Design					X	
1.3	Control Systems Technician ²	Operational					X	
1.4	Asset Management Software	Operational	X				X	
1.5	Maintenance Standard review	Design	X	X	X	X	X	
1.6	Envision rating system	Design		X			X	
1.7	Maintain Portfolio Manager ³	Operational	X	X	X	X	X	
1.8	Facility Energy Audits ⁴	Operational	X	X	X	X	X	
2.1	Research benefits of telework & webinars	Operational			X			X
2.2	Compare vehicle size with needs	Operational			X	X		X
2.3	Develop fuel comparison FY 17 to FY 19	Operational			X			X
2.4	Research utilization of biodiesel fuel	Operational				X		X
2.5	Develop replacement program with alternative fuel vehicles (AFVs)	Operational				X		X
2.6	Develop repurposed vehicle comparison	Operational				X		

Footnotes:

1	Funding is set aside on a yearly basis to add BAS on a per building basis
2	Funding will need to be identified to schedule
3	OSER to utilize database maintained by DPW
4	Funding for the related Potomac Edison and Washington Gas programs has been re-authorized beyond December 31, 2020. The goal is planned assuming the programs offered are similar to those offered before December 31, 2020.

A. Buildings

- 1.1. Continue to standardize Building Automation Systems (BAS) as open architecture in 30 North Market Street, Westview Fire Station, Thurmont Library, and the Public Safety Training Facility.

The Office of Facility Maintenance (OFM) has been standardizing the BAS in County facilities with the goal of attaining one generic system in all occupied buildings. A networked automated Heating, Ventilation, and Air Conditioning (HVAC) control system provides OFM staff the ability to detect and address anomalies before they become problems, remotely monitor and adjust building temperature, and receive problem alerts, which is particularly important after power outages and storm events. OFM technicians are also able to change temperature settings to accommodate after-hours events and enhance occupant comfort without visiting the facility, which saves staff time and labor costs.

Presently there are a variety of BAS systems installed in County facilities. Some have proprietary software and hardware that require a manufacturer's vendor to service equipment and supply parts. OFM staff are unable to adjust programming points and replace or repair equipment. With non-proprietary and open architecture systems (where hardware and software specifications are public information), on the other hand, OFM is able to change set points and troubleshoot systems without calling a brand-specific contractor. The ability to utilize multiple vendors engenders cost savings because of more competitive rates

Standardization is being pursued with funding from the Maintenance Systemic Capital Improvements Program project account. Beginning in FY 2019, \$150,000 is being budgeted annually for this effort. The four buildings designated in the Action Item are projected to be complete within four years.

1.2. Retro-commissioning pilot project at 331 Montevue Lane

Commissioning (typically of HVAC) is the process of ensuring that commercial HVAC systems work as intended. Retro-commissioning applies to the HVAC system in an *existing* building. Similar to the commissioning in new construction, retro-commissioning involves a third-party consultant who evaluates, tests, and modifies an HVAC system to ensure proper air balance, temperature set points, and efficiency in its daily operations.

The Office of Highway Operations/Fleet facility at 331 Montevue Lane has a history of heating and cooling complaints. OFM has undertaken numerous adjustments and system changes over the years, making this building an ideal candidate for retro-commissioning. Funding for the pilot project must be identified before a time frame may be determined.

1.3. Establish in-house Control Systems Technician(s) position – Time frame dependent upon funding

The addition of a Control Systems Technician(s) to OFM will provide immediate support of the County's BAS system for hardware, software, and graphical applications. As OFM develops and enhances its institutional knowledge, these positions will reduce the County's dependence on contracted services.

1.4. Implement asset management software that communicates with Portfolio Manager

An integrated asset management system will provide an extensive database of County infrastructure that will enable staff to streamline preventative maintenance, track and control costs, and schedule/budget life-cycle replacement/upgrade of key building systems and equipment. Staff is currently exploring software packages and the procurement process. As implementation involves other County divisions, the time frame for software implementation is uncertain.

1.5. Review maintenance standards with an emphasis on energy conservation

OFM, in conjunction with the Office of Project Management, developed a list of standards for new construction and major renovation projects that require an engineered design. This list standardizes various building systems for all County facilities maintained by OFM. The standards are organized per the American Institute of Architects (AIA) standard specifications for building construction.

Many of the standards emanate from “lessons learned” and have been documented to ensure consistency in project management and minimize change orders. Others have been developed to facilitate infrastructure expansion, such as the requirement for a spare conduit that can accommodate future electrical and data needs.

- Building envelope - exterior skin of building, to include walls, windows, and doors;
- Roofing;
- Added insulation during roof replacements;
- Electrical - energy management systems, additional light-emitting diode (LED) lighting implementation;
- HVAC Seasonal Energy Efficiency Ratio (SEER) standards - SEER is an efficacy rating for HVAC systems (the more efficient the system, the higher the SEER rating)
- Future infrastructure needs relating to alternative fuel vehicles.

As the maintenance standards are reviewed and updated annually, this Action Item is expected to be complete in FY 2020.

- 1.6. Utilize American Society of Civil Engineer’s (ASCE) Envision rating system for comparison to Leadership in Energy and Environmental Design (LEED) certification on an upcoming Capital Improvements Program project

Envision is a rating system and best practice resource for sustainable building developed by the ASCE. This rating system was developed after the United States Green Building Council (USGBC) developed the LEED rating system. The Brunswick Library achieved a LEED Silver rating. As the Middletown Library (design FY 2021) will be built (construction anticipated FY 2023) per the same requirements as the Brunswick Library, a comparison (potentially FY 2025) of the two rating systems will be investigated.

- 1.7. Provide Energy Star data via Portfolio Manager to the Office of Sustainability and Environmental Resources (OSER)

The Environmental Protection Agency created Energy Star Portfolio Manager as an online tool to measure and track the energy and water consumption of buildings. OFM has been entering data into this data base since 2006. This information can be used to compare energy usage with like buildings throughout the country. OSER and OFM will prioritize energy-related projects utilizing the information provided by OFM. OSER will also use this information in applying for grants from state and federal agencies.

- 1.8. Facility Energy Audits

The Potomac Edison EmPower Maryland Small Business Direct Install (SBDI) programs offers energy audits to look at potential energy savings. Washington Gas offers incentive programs, too. DPW will engage Willdan and Washington Gas contractors, as appropriate, to perform audits for facilities.

B. Fleet

- 2.1 Research the benefits of the use of teleconferencing and webinars to reduce staff travel, complete in FY 2022.

A reduction in travel would conserve fuel, lower vehicle maintenance costs, improve productivity, and increase employee availability. The coronavirus pandemic has caused this recommendation to become a reality. With real-world data available, analyzing the cost savings between virtual and in-person meetings would demonstrate how investing in technology benefits the County.

2.2 Compare vehicle size with the requirements needed to perform tasks.

The dimension of some vehicle models has become smaller. However, models such as pickup trucks and SUVs have increased in overall dimension. As part of Fleet's yearly analysis, practical work needs and practices will be a factor in evaluating vehicle size. Fleet Services will continue to evaluate vehicle replacement each year to ensure the vehicle is of the proper size to accomplish the task and fulfill the end user's needs. Evaluating replacement vehicles each year is a continuous process.

2.3 Develop a fuel comparison from FY 2017 to FY 2019; complete in FY 2022

Fleet Services' initial fuel conservation initiative incorporated an FY 2007 baseline of fuel consumption. In view of the impacts of the 2008 Great Recession and many changes to the composition of the fleet, Fleet Services is currently performing a comparison between FY 2017 and FY 2019 to ascertain fleet recovery progress and the consequences of improved transportation technologies. The comparison, which will be completed during FY 2022, will also evaluate theoretical fuel mileage provided by the manufacturer and actual vehicle mileage documented by Fleet Services. The comparison will provide updated data that can be used to compare against alternative fuel vehicles as Frederick County investigates converting its fleet vehicles. Utilizing the most up to date data will be beneficial as alternative fuel vehicles are investigated.

- FY 17 Diesel fleet size vs. FY 19 Diesel fleet size
- FY 17 Diesel Fuel usage vs. FY 19 Diesel Fuel usage
- FY 17 Unleaded fleet size vs. FY 19 Unleaded fleet size
- FY 17 Unleaded Fuel usage vs. FY 19 Unleaded Fuel Usage

2.4 Research the utilization of biodiesel fuel, complete in FY2023

Biodiesel fuel is a blend of renewable resources such as soybean oil or algae mixed with diesel fuel. Generally, the mix ranges from five percent up to twenty percent. The cost of producing biodiesel is about the same as regular petroleum-based diesel. Some diesel fuels already contain about five percent soybean or vegetable oil. Benefits of using biodiesel include lower emission output, the use of a renewable resource, and reducing foreign oil dependence. Although there are several benefits of using biodiesel, there are concerns to consider the fuel tends to gel in colder temperatures. Also, there are concerns about the quality of biodiesel and the long-term effects the biodiesel has on diesel vehicles. Fleet will continue to research biodiesel to determine if it meets the needs of the County.

2.5 Develop a program to identify and replace appropriate vehicles with alternative fuel vehicles (AFVs), complete in FY 2023

The purpose of this goal is to develop a formal process to identify appropriate replacement vehicles, taking into account environmental and sustainability attributes. This initiative is a

work-in-progress. At present, the feasibility of incorporating AFVs into the fleet and work process is evaluated before every vehicle purchase.

AFVs were part of the initial energy conservation plan, and replacing conventional fuel vehicles with AFVs remains a goal; however, the additional cost of AFVs was a limiting factor during the fleet recovery effort. The purchase cost of most AFVs remains higher than conventional vehicles. Incorporating AFVs into the fleet must be accomplished deliberately, selecting the appropriate vehicle to perform the requisite function. Other considerations of paramount importance are the availability of fuels and infrastructure for fuel dispensation, including compressed natural gas, propane, and electric vehicle recharging; AFV infrastructure costs; and user convenience.

Fleet will continue to research light-duty all electric trucks and vans that are available and will be available in the near future. This will include evaluating the all-electric vehicle to a comparable internal combustion engine (ICE) vehicle based on purchase cost, life-cycle cost and capabilities to determine the best opportunities for the County.

2.6 Develop repurposed vehicle energy usage comparison and annual mileage, including financial benefits; complete in FY 2023.

The repurposing of law enforcement vehicles into administrative sedans began in FY 2014. To date, there are 37 cars in the repurposing program. The benefit of this program is more economic than environmental. Removing a law enforcement vehicle from emergency response at 125,000 miles and converting it to a less stressful administrative function enables Fleet Services to extend the car's useful life and reduces the expense of purchasing administrative vehicles.

A comparison will be conducted focusing in these areas: cost of savings by repurposing the vehicle instead of purchasing new, maintenance costs of the repurposed vehicle versus the replacement vehicle, and the miles per gallon of the repurposed vehicle with the class of vehicle it was to replace.

Division of Water and Sewer Utilities (DWSU)

	Action	Category	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Water	Wastewater
3.1	LED Lighting Fixture and Control Upgrades ¹	Design, Upgrade	X	X	X	X	X	X
3.2	Variable Frequency Drive (VFD) Upgrades ²	Design, Upgrade					X	X
3.3	Energy Efficient Motor Upgrades ²	Design, Upgrade					X	X
3.4	Pump Efficiency Upgrades ²	Design, Upgrade					X	X
3.5	Ultraviolet (UV) Disinfection Efficiency Upgrades ²	Design, Upgrade					X	X
3.6	Aeration System Upgrades ²	Design, Upgrade						X
3.7	Biosolids Anaerobic Digestion - Biogas Generation	Design, Upgrade						X
3.8	Water Conservation ³	Outreach, Operational					X	X
3.9	Inflow & Infiltration Reductions ³	Operational, Upgrade						X
3.10	Leak Detection Programs ³	Operational					X	
3.11	Operational Efficiencies ⁴	Operational					X	X
3.12	Capacity System Charge Monitoring ⁴	Operational					X	X
3.13	EPA Energy Star Tools, Portfolio Manager - UBM	Operational			X	X	X	X
3.14	Facility Energy Audits ¹	Operational	X	X	X	X	X	X

Footnotes:

¹ Funding for the related Potomac Edison and Washington Gas programs has been re-authorized beyond December 31, 2020, The goal is planned assuming the programs offered are similar to those offered before December 31, 2020.

² Actions that typically only occur when operation, maintenance, construction or renovation/renewal projects are identified (or present an opportunity) and appropriate funds are budgeted or available.

³ Measures to reduce water consumption, wastewater and water loss, which lead to reductions in energy use and result in savings by treating lower quantities of wastewater or delivering lower quantities of water.

⁴ Shifts energy usage away from peak demand times, which saves money and reduces peak loads.

3.1 LED Lighting Fixture and Control Upgrades

Lighting upgrades are accomplished through Potomac Edison EmPower Maryland Small Business Direct Install (SBDI) programs. The program covers up to 70% of program costs with Potomac Edison’s current vendor, Willdan, performing energy audits and installation of upgraded fixtures. Current focus is on upgrade of current lighting fixtures to energy efficient LED fixtures and motion activated sensors.

Other aspects of this category would include specifying energy efficient lighting and controls in renovations or new construction projects.

3.2 Variable Frequency Drive (VFD) Upgrades

A variable frequency drive (VFD) is a type of motor controller that drives an electric motor by varying the frequency and voltage of its power supply. Energy efficiencies typically are realized because it allows a motor (or pump) to run at an optimal speed needed for the process. The DWSU has a long history of designing facilities with VFD drives and will continue to specify their use in future projects. This equipment does wear out and has an obsolescence component, which requires replacement of existing units. In these situations, staff will

explore opportunities for additional energy efficiencies when possible. Future construction projects will specify the use of VFDs, where appropriate. It is important to note that a life-cycle cost analysis (equipment obsolescence) relative to VFDs' energy savings is not easily determined.

3.3 Energy Efficient Motor Upgrades

Where applicable, opportunities to utilize efficient electric motors will be explored whether this is through routine operational and maintenance replacement or construction projects.

3.4 Pump Efficiency Upgrades

Ensure pumps are sized appropriately and installed with VFDs (see above) to reasonably optimize varying flow conditions. Where applicable, opportunities to utilize efficient pumps will be explored whether this is through routine operational and maintenance replacement or construction projects.

3.5 Ultraviolet (UV) Disinfection Efficiency Upgrades

UV disinfection systems utilized at both water and wastewater facilities can be energy intensive. As systems are replaced or upgraded, opportunities to install more efficient units will be explored. Some systems have sensors with the capability to adjust lighting intensity to match only the level needed for disinfection. Operations staff will verify these systems are in use and operating as intended.

3.6 Aeration System Upgrades

Aeration systems in wastewater plants typically account for about half of the facility energy usage. Wastewater treatment plant construction or upgrade projects will consider the following design guidelines:

- Energy-efficient blowers
- Energy-efficient diffuser technologies (fine bubble diffusers)
- Improved control systems (dissolved oxygen monitors)

3.7 Biosolids Anaerobic Digestion

Biogas Generation: Sludge digestors can generate biogas which can be burned to produce energy or heat buildings at the facility. The use of anaerobic digestors is planned in the CIP for the Ballenger-McKinney WWTP when wastewater flows approach 10 MGD and the use of biogas will be investigated during the design process. This project currently is beyond the 4-year CEP period, but is mentioned since the project is triggered by growth, flow or a combination of both.

3.8 Water Conservation

Reducing demand for water through water conservation reduces the amount of water that needs to be treated and distributed. This has an effect on reducing the amount of wastewater requiring treatment. The Division of Water and Sewer Utilities currently has outreach programs in place to assist customers to identify leaks in their household plumbing, whether

it is a leaking fixture or toilet, or perhaps the service line itself. Additionally, it is important to note that the DWSU's volume charges are based on an inclined block rate structure, sometimes referred to as a conservation block structure, which increases the cost of water (per unit) as quarterly water usage increases above established thresholds (blocks).

3.9 Inflow & Infiltration (I&I) Reductions

Water, other than sanitary flow, that enters the sewage collection system is categorized as Inflow or Infiltration. Infiltration is clear water that gradually enters the wastewater system below ground through cracks and openings in sewer service lines and joints, public sewer mains, manholes, etc. Inflow is clear water that quickly enters the wastewater system after rainfall events from sources such as broken (uncapped) cleanouts, sump pumps (via building foundation drains and/or roof drain connections), faulty manhole cover, etc. Inflow tends to peak during precipitation events. I&I results in additional flow that needs to be pumped and treated. The DWSU currently has programs to identify and repair sources of I&I with the goal of reducing overall sanitary sewer flow volumes, which leads to reduced energy costs associated with this excess flow.

3.10 Leak Detection Programs

As with water conservation programs, leak detection programs reduce the amount of water (lost) that needs to be treated and distributed. The DWSU currently has contracts in place that augment staff in the performance of annual leak detection surveys within portions of the water distribution system in conjunction with mandated water loss audits.

3.11 Operational Efficiencies

The DWSU currently has a contract with Hatch Data to provide Energy Intelligence Services (EIS) for the Ballenger-McKinney WWTP and the New Design WTP, which have the two largest electrical demands among all of its accounts. As part of this service, these facilities have metering in place to allow real-time monitoring of electrical demand, which can be viewed through Hatch Data's energy profiling and analytics software. The software alerts staff when certain peak electrical thresholds are exceeded and historical analysis of past data can be used to correlate operational practices with peak usage. This information can be used to schedule or eliminate certain operational activities that contribute to electrical consumption peaks, which enable changes that can result in reduced electrical costs.

3.12 Capacity System Charge Monitoring

Capacity Charges are based on the highest amount of energy a customer is estimated to use or consumed during a month (or year in some locations). It is a fee to ensure that the electricity a customer may use is there when the customer needs to use the power. Enel X offers customer 'red day' notifications to predict peak day load dates that will be used to determine the system capacity charge for that account. By knowing when these dates may occur, staff may make operational decisions to help reduce electrical loads, which can lead to cost savings.

3.13 Energy Star Tools, Portfolio Manager

The DWSU currently has contracts in place with Enel X to provide Utility Bill Management (UBM) services. Electric bills are routed directly to Enel X that places monthly bill data (e.g., costs and electric usage) information for each account into the UBM software, which provides access to the data. The UBM software has the ability to export electrical data directly to the EPA Energy Star Portfolio Manager, which can be used to analyze energy efficiency for each facility.

3.14 Facility Energy Audits

The Potomac Edison EmPower Maryland Small Business Direct Install (SBDI) programs offers energy audits to look at potential energy savings through HVAC, motor, pump replacements, or lighting (which is a separate category above). The DWSU has engaged Willdan to perform audits for the facilities identified in Item 1, where the focus has been on lighting upgrades.

Division of Solid Waste and Recycling

	Action	Category	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)
4.1	LED Lighting Fixture and Control Upgrades ¹	Design, Upgrade	X	X		
4.2	Facility Energy Audits ¹	Operational	X	X		
Footnotes:						
¹ Funding for the related Potomac Edison and Washington Gas programs has been re-authorized beyond December 31, 2020, although the details are unknown as of March 1, 2021. The goal is planned assuming the programs offered are similar to those offered before December 31, 2020.						

4.1 LED Lighting Fixture and Control Upgrades

Lighting upgrades accomplished through Potomac Edison EmPower Maryland Small Business Direct Install (SBDI) programs. The program covers up to 70% of program costs with Potomac Edison’s current vendor, Willdan, performing energy audits and installation of upgraded fixtures. Current focus is on upgrade of current lighting fixtures to energy efficient LED fixtures and motion activated sensors. All cost-effective LED lighting upgrades are anticipated to be completed by FY 2021.

4.2 Facility Energy Audits

The Potomac Edison EmPower Maryland Small Business Direct Install (SBDI) programs offers energy audits to look at potential energy savings through HVAC, motor, pump replacements, or lighting (which is a separate category above). Willdan has performed audits for the facilities identified in Item 1, where the focus has been on lighting upgrades. These are anticipated to be completed by FY 2021.

Data as a Management Tool

5.1 Analyze data collection standard operating procedures and make recommendations

Data is critical to evaluating the County's progress towards increasing energy efficiency. As noted above, data collection is complicated. OSER staff will review current data collection operating procedures and make recommendations on a data reporting process as well as an effective and efficient management tool to guide further action.

5.2 Update Maryland Smart Energy Community (MSEC) goals—energy efficiency, renewable energy, and/or petroleum consumption

The original MSEC goals were set over five years ago. The Maryland Energy Administration recommends reviewing the goals every five years and set new goals if appropriate. Given the issues noted above with pooling all data in a sector for a baseline, the County may want to consider setting different goals for different areas. For example, for buildings, using a subset of buildings (e.g. libraries, fire stations, office, etc.) and then establishing an intensity goal like kWh/square foot. For fleet, the County could consider focusing on a class of vehicles, such as passenger vehicles.

5.3 Analyze Energy Star data to provide feedback on facilities to DPW

The Environmental Protection Agency created Energy Star Portfolio Manager as an online tool to measure and track the energy and water consumption of buildings. The Office of Facilities Maintenance has been entering data into this data base since 2006. This information can be used to compare energy usage with like buildings throughout the country. OSER and OFM will work together to utilize the information supplied to prioritize energy-related projects and to apply for grants to help to implement those projects.

5.4 Research best practices in tracking energy usage

Many other entities are tracking energy usage. OSER staff will research best practices to help make recommendations the County can use.

5.5 Research other resources that may be helpful in improving County facility energy efficiency and analyze related data to explore cost-effectiveness

OSER will analyze the cost, benefits, and feasibility of technology such as combined heat and power systems and microgrids that have the potential to both reduce energy usage and increase overall County resiliency. OSER will also research other resources, such as advanced design guidelines for new buildings, that may be helpful in reducing the overall carbon footprint of the County.

VI. Adaptive Management Process

In addition to providing an action plan, this document also provides an adaptive management process to more formally plan, implement, and document progress, and then evaluate and report on action taken. A regular reporting schedule has been developed that will provide accountability. More importantly, once action is taken, managers will have an opportunity to evaluate progress and technological advancements, and make adjustments based on conditions as they evolve.

The process includes an annual work plan prepared by each division. Two updates will be provided throughout the year to review progress—mid-year and year-end. OSER will be responsible for compiling the reports and preparing the final report. These reports will be presented to the County Executive. The anticipated reporting cycle is illustrated below, starting with an update on accomplishments through FY 2020. This schedule would continue through FY 2023. Modifications to the schedule may be made as the process evolves.

FY 2021

- July 31, 2020 Year-end report on accomplishments in FY 2020
- August 31, 2020 FY 2021 annual work plan due for July 2020 – June 2021
- September 30, 2020 FY 2020 accomplishments and FY 2021 annual work plan presented to County Executive
- February 28, 2021 FY 2021 mid-year progress report due
- July 31, 2021 Year-end report on accomplishments in FY 2021

FY 2022

- August 31, 2021 FY 2022 annual work plan due for July 2021 – June 2022
- September 30, 2021 FY 2021 accomplishments and FY 2022 annual work plan presented to County Executive
- February 28, 2022 FY 2022 mid-year progress report due
- July 31, 2022 Year-end report on accomplishments in FY 2022

FY 2023

- August 31, 2022 FY 2023 annual work plan due for July 2022 – June 2023
- September 30, 2022 FY 2022 accomplishments and FY 2023 annual work plan presented to County Executive
- February 28, 2023 FY 2023 mid-year progress report due
- July 31, 2023 Year-end report on accomplishments in FY 2023