DATE: July 3, 2019

SUBJECT: Request to authorize advertisement of a public hearing on an update of the Community Energy Plan, one of 11 elements of the Arlington County Comprehensive Plan.

C. M. RECOMMENDATION:

Adopt the attached resolution to ratify the advertisement for a public hearing by the Planning Commission at its September 9, 2019 meeting and authorize the advertisement for a public hearing by the Arlington County Board at its September 21, 2019 meeting on the draft Community Energy Plan update.

ISSUES: This is a request for authorization to advertise for public hearings on the draft update of the Community Energy Plan. There are no outstanding issues.

SUMMARY: As one element of the Comprehensive Plan, the Community Energy Plan (CEP) is Arlington County’s highest-level policy guide for transforming energy generation, distribution, use, and storage in the community. Since the plan was first adopted in 2013, there have been significant changes affecting the energy sector related to decreases in energy cost, new state legislation, and global policies, necessitating the Plan’s update. New technologies emerged while existing technologies, such as solar photovoltaic (PV) systems and light-emitting diode (LED) bulbs recently have experienced dramatic price declines. At the state level, the Virginia Energy Plan was recently updated, and an important piece of legislation was passed – Senate Bill 966, also known as the Grid Transformation and Security Act – that has the potential to significantly change how Virginia governs electric utilities. On December 12, 2015, parties to the United Nations Framework Convention on Climate Change finalized the Paris Agreement to combat climate change and to accelerate and intensify the actions and investments needed for a more sustainable future. Similarly, the Intergovernmental Panel on Climate Change (IPCC) released a series of reports imploring all levels of government and people around the world to act now to combat the existential threat posed by climate change. These changes and others have formed the basis for this CEP update.
The update process began in 2018 with the Energy Committee of the Environment and Energy Conservation Commission (E2C2) reviewing the 2013 CEP and proposing changes. An extensive civic engagement process along with updates to the community energy use inventory and energy model by expert energy consultants led to the draft updated CEP (Attachment 1). In addition, the CEP website (https://environment.arlingtonva.us/energy/community-energy-plan-cep/) shows the edits to the May 24th version of the plan that resulted in the updated clean version provided in Attachment 1.

Based on the feedback received from the public, energy experts, and a June 25, 2019 County Board Work Session, important changes in the draft 2019 CEP include:

1. Changing the 2050 greenhouse gas emissions target to Carbon Neutral; the previous target was 3.0 metric tons CO$_2$e per capita per year (mt/capita/year) in the 2013 CEP. “Carbon Neutral” also known as “Carbon Neutrality” is another term used to describe reaching a “net zero metric tons emissions” target.
2. Adding two policies in the “Renewable Energy” chapter/goal area describing targets to achieve 100% renewable electricity for a) County Government operations by 2025, and b) the community by 2035.
3. Adding “energy equity” as a fourth lens through which staff will consider CEP implementation initiatives.
4. Replacing the “District Energy” chapter/goal area with a new “Resilience” chapter/goal area.
5. Including the use of contractual agreements to support the installation of additional solar PV systems outside of Arlington County.
6. Changing the “Transportation” chapter/goal area to reflect increased interest and projections in the electric vehicle market, and
7. Developing private- and public-sector support for programs that advance energy equity among underserved communities and using public-private partnerships as a mechanism for achieving this objective.

The draft 2019 CEP includes numerous updated policies to mirror the energy sector’s dynamic nature. Attachment 2 provides a summary comparing the adopted 2013 CEP to the draft 2019 CEP. The overall approach to the CEP update is to respond to the community’s primary request to make the CEP more ambitious and transformative, and showcase Arlington’s progressive leadership on myriad, complex energy issues now and into the future. As part of the County’s Comprehensive Plan, the CEP will continue to be an integral guide for addressing energy policies in coordination with other County policies.

**BACKGROUND:** The Community Energy Plan provides energy goals and policies for Arlington. In adopting the first CEP in 2013 as part of the County’s Comprehensive Plan, the County Board underscored how energy is a critical resource to be considered in all major Arlington planning efforts, while ensuring Arlington remains an innovative, competitive, resilient, and sustainable place to live, work, and do business. The CEP addresses all major aspects of energy generation, use, storage, and distribution in Arlington between now and the year 2050 and sets ambitious, yet achievable, goals in multiple areas.
The County and community have accomplished a great deal since creating the AIRE program in 2007 and adopting the CEP in 2013. For example, to help homeowners reduce their utility bills and improve the comfort of their homes, the County launched an incentive program for homeowners that generated nearly $10 in private investment for every dollar in public incentive in home energy efficiency. The program filled a void in energy incentives normally filled by utilities in other states, and it achieved community goals by saving energy, creating more comfortable homes while lowering homeowners’ utility bills, and reducing greenhouse gas emissions.

For Site Plan projects, the County’s Green Building Incentive Program offers developers the opportunity to request density in exchange for green building certification along with minimum energy efficiency standards, 10 years of energy reporting, and post-occupancy performance certification. The program has been an effective tool for reducing the environmental impacts of large buildings on the community. This incentive program, which has evolved as the marketplace has changed, is needed in Arlington to encourage developers to incorporate higher levels of energy efficiency into new buildings and to ensure buildings operate efficiently to meet CEP goals.

To further incentivize property owners to reduce buildings’ environmental impacts, Arlington became the first jurisdiction in the Commonwealth to develop and launch a Commercial Property Assessed Clean Energy (C-PACE) program. The goal is to incentivize property owners to improve the energy and water efficiency of existing buildings, including rental apartments. The program is also designed to improve the energy and water efficiency for new commercial construction. The C-PACE program in Arlington was created to address multiple property owners’ issues that have limited the number of energy upgrades to buildings, especially in the existing building stock. Some property owners chose not to upgrade their buildings because the paybacks on the proposed energy conservation measures outstripped the length of their commercial loans. Other property owners decided against installing building improvements since the owners did not know how long they were going to own the buildings and did not want to make investments that would not be paid off in time for sale of the buildings. These and other concerns are addressed in the innovative C-PACE program, which is a financing tool usable for both existing buildings and new construction.

In addition to addressing property owners’ financial concerns about energy projects, another important element of CEP implementation is to educate the public about energy efficiency and actions people can take to increase energy efficiency. Given the often-changing nature of the energy sector, it is hard for the average individual to keep up with all the available options and be able to make an educated decision when purchasing something that uses energy. This chasm between information need and availability causes some to forgo upgrades until it is too late, at which time the person often chooses a product they are familiar with, know and trust, instead of selecting a newer, more energy-efficient product that could save the person money. The AIRE Team, in partnership with the Arlington Public Library, launched the first-of-its-kind Energy Lending Library program in 2016, with the goals of increasing energy awareness and encouraging residents to make their homes more energy efficient. Anyone with an Arlington County library card can borrow free energy efficiency tools from their local library, along with the information needed to identify and act on energy efficiency opportunities. These tools
include a thermal camera, a sampler kit of 10 different LED lightbulbs, an energy meter to manage home electricity use, and Do-It-Yourself energy retrofit books. The initiative was so popular that additional thermal cameras and bulb boxes were added to the inventory to reduce patrons’ wait times and meet the high demand. Such innovation will invariably improve individuals’ lives while helping the community reach the CEP goals.

Transportation is another dynamic element in the CEP. The County’s Master Transportation Plan emphasizes multimodal transportation, and the CEP embraces the same concept. It is important for the transportation infrastructure to be enhanced in ways that allow individuals to reduce their vehicle miles travelled and carbon footprint by using alternative means of transport. It allows people to stop using their vehicles to commute to/from work, run errands, and buy groceries and instead ride a bus or Metro, walk, bicycle or use other ways to travel from one location to another. However, there are instances when a vehicle is needed. The CEP encourages individuals to use more fuel-efficient vehicles in those circumstances, such as electric vehicles (EVs). A greater number of vehicle manufacturers are increasing their EV product lines, and the forecast is bright for more EV options and lower vehicle prices ahead. Draft changes in the 2019 CEP recognize these shifts in the transportation sector and chart a path forward for the Arlington community to thrive in such an environment.

Since the 2013 CEP adoption, two district energy feasibility studies provided the County with additional details on how district energy could be added to Arlington’s energy infrastructure. District energy implementation could have benefited users with greater efficiencies, lower greenhouse gas emissions, and improved resiliency. However, the studies conducted in Arlington’s Pentagon City/Crystal City and Courthouse neighborhoods could not make the economic case to move forward with district energy implementation. The improvements in the electric grid’s cleanliness, improvements in other technologies that could be used to heat and cool buildings, and the multiple needs clamoring for Arlington’s limited capital dollars all led to a decision to not create a public-sector district energy system at that time.

During recent years, numerous storms have impacted our region and the country, emphasizing the need for a more robust, resilient energy infrastructure. Power outages have a ripple effect in residents’ lives, resulting in spoiled food, lost wages, and reduced commercial productivity. The technological changes since 2013, along with the recognition that our energy grid will continue to be adversely impacted by future storms, have resulted in the 2013 CEP district energy goal area to become a goal area focused on resiliency. This shift in emphasis broadens the goal area scope to include not just district energy, but multiple distributed energy options becoming increasingly available, such as the combined use of battery storage and solar PV systems. Increasing Arlington’s resiliency through increased use of emerging technologies and additional programming will serve to protect citizens and businesses from service interruptions caused by severe weather and unforeseen disruptions.

Another CEP goal area experiencing dramatic change is renewable energy. Solar panel prices (Figure 1) have plummeted during the last five years while panel efficiencies have greatly improved. More communities are seeing a rapid growth in solar PV system installations. The very successful Arlington Solar and EV Charging Co-op program, run by Solar United Neighbors in partnership with EcoAction Arlington and the AIRE Team, has nearly tripled the
number of solar PV systems on Arlington households in a short amount of time. The co-op program’s goals of making it easier and less expensive for homeowners to add solar PV to their homes have resonated throughout our community, resulting in the significant uptake since the adoption of the 2013 CEP.

In addition, the increased use of contractual agreements around the country has further increased renewable energy’s growth nationwide. As proposed in the draft 2019 CEP, Arlington aims to take advantage of this growing market sector to further reduce our community’s greenhouse gas emissions; increase demand for additional, large solar PV installations outside of Arlington’s borders; and further drive down the price for energy for all.

DISCUSSION:

The draft 2019 CEP depicts a transformative energy sector scenario out to the year 2050. Suggested changes to the 2013 CEP reflect the community’s general sentiment to make the CEP bolder and to reach our ambitious targets sooner rather than later. Energy industry experts keenly aware of the recent history, industry trends, and projected outlooks also guided the process of updating the CEP. Striking a balance between being a set of aspirational goals and policies and mapping a realistic vision that can be implemented, the draft 2019 CEP strives to meet multiple interests.

Figure 1 – Price History Solar Panel Costs

1 H1 and H2 refer to the first and second halves of the respective calendar years
This updated plan answers the call from global, national, statewide, and local leaders for communities to do their part to address climate change. County staff have viewed energy decisions through three primary lenses: energy security, economic competitiveness, and environmental commitment. Energy security measures address reliability and pricing of the energy supply, to improve the community’s ability to respond in the event of unexpected disruptions in energy systems. The County’s economic competitiveness will be enhanced through lower energy costs, reduced risk of energy disruptions, and improved resilience when outages do occur. Environmental commitment is demonstrated by reducing energy waste and the associated consequences for land, air, and water resources. Partnerships will allow the community to efficiently address the needs of today’s generation and future generations.

Arlington’s community leaders point to today’s climate science reports as a need for people to take action and for a stronger, bolder CEP. The recent Intergovernmental Panel on Climate Change (IPCC) Special Report paints a bleak picture if the world does not swiftly pivot to more efficient uses and cleaner generation of energy. The draft 2019 CEP keeps Arlington among the climate change mitigation leaders in the United States. It is important to note that Virginia is a Dillon Rule state, that is, local governments have limited authority, and can pass ordinances only in areas where the General Assembly has granted clear authority. A more aspirational 2050 target of zero metric tons of CO$_2$e per capita per year simultaneously pushes the limits local jurisdictions have in Dillon Rule states, and assumes numerous technological advancements and disruptions take place. The updated approach to reach the community’s renewable energy goals endeavors to take advantage of contracts signed by leaders in the public and private sectors in the form of virtual power purchase agreements (VPPAs). These agreements would help Arlington increase the amount of solar PV systems in the market and reduce the electric grid’s impact on Arlington’s carbon footprint.

The Draft 2019 CEP Update

Through the draft 2019 CEP, the Arlington community will continue to lead by example. The discussion below outlines the CEP’s six goal areas and related policies.

1. Buildings: Improving the energy efficiency in residential and non-residential buildings is an important piece to the complex, multivariate CEP. Buildings currently use approximately sixty percent of all energy in Arlington. The plan has three building-related policies that emphasize the importance of increasing the energy efficiency and improving the operations and maintenance of existing and new buildings. In addition, the policies note how important it is to weave energy efficiency considerations into projects early in the design process and to keep those ideals intact until the project is finished. The last point of emphasis is that Arlington wants to ensure that people all along the socioeconomic spectrum have access to tools and services that address energy matters and improve their lives. The draft 2019 CEP places an even greater importance on energy equity and affordable living than the current plan does.

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2. Resilience: In the draft 2019 CEP the shift to **resilience** expands the scope of the former district energy goal area to show how our community can use a variety of technologies and resources to keep the power on in Arlington buildings and homes during a widespread power outage, or to quickly get the power back on if a building or home loses power. Resilience is scalable – the draft 2019 CEP shows how resiliency can be addressed at the parcel, community, or regional level. Property owners can install back-up generators to provide power as needed. Larger, multiuser microgrids can include multiple sources of energy that can be operated in a controlled, coordinated way, and the microgrid can connect and disconnect from the main power grid to enable it to operate in both grid-connected and island modes. Regional resiliency planning is complicated but not impossible. Regionalism is a practical approach when planning mitigation and adaptation efforts.

3. Renewable Energy: In addition to reducing overall energy use through increased energy efficiency of buildings, the draft 2019 CEP advocates increased use of renewable energy within Arlington County and outside Arlington’s borders. Since there is limited space within Arlington’s 26-square miles for solar PV system installation, it is important to take advantage of solar PV installation interest beyond Arlington. Approximately one-quarter of Arlington’s energy use is in low-density, residential neighborhoods. Homeowners in these neighborhoods have taken advantage of the Arlington Solar and EV Charging Co-op to cost-effectively add new technologies to their home and help the community reach its CEP goals. As an additional benefit, solar PV systems installed throughout the County generate electricity largely coincident with maximum summer cooling demand. This reduces the stress on the energy grid by reducing the summer peak electricity demand, thus making the overall energy grid more secure.

4. Transportation: Through its Master Transportation Plan (MTP), General Land Use Plan, and other elements of the Comprehensive Plan, Arlington has been very successful in reducing individual vehicle miles traveled through transit-oriented land use and innovative transportation planning. The CEP supports the implementation of the County’s MTP, which calls for enhancing public transit in areas targeted for concentrated development; developing walkable mixed-use neighborhoods; and working with employers to encourage cycling, walking, public transit, and vehicle pooling. In addition, the draft 2019 CEP embraces the electrification of the transportation sector and encourages an enhanced infrastructure for electric vehicles (e.g., charging stations) and incentives to facilitate the purchase of more EVs.

5. County Government Actions: Since the 2013 CEP adoption, the AIRE Team has worked with colleagues to integrate the CEP’s goals and policies into County policies, processes, and private sector projects, and to set ambitious yet achievable targets for energy use reductions in County operations. Energy security and resilience is vital for County operations, and the lessons learned from efficiency and reliability efforts in County operations will provide useful insights for community activity. Another key policy in this goal area strives to increase the number of partnerships with the private sector, universities, and other stakeholders. Multiple actors and voices aiming toward common goals increases efficiency and helps the community reach its goals in a timelier fashion.

6. Education and Human Behavior: Installing new technologies is not enough. To achieve the Community Energy Plan’s ambitious economic competitiveness, energy security, and
environmental commitment goals, Arlington County must engage and enable everyone in the community to take personal action to reduce energy waste. This goal area emphasizes the importance of informing the community how energy is being used, sharing lessons learned from those who have successfully implemented energy-related projects, and recognizing those extraordinary efforts.

**CEP Implementation Framework:** The Community Energy Plan provides energy goals and policies for Arlington while a related document, the CEP Implementation Framework, was approved by the County Board in 2013 as an administrative guide for staff implementation of the Community Energy Plan. The complementary CEP Implementation Framework offers a set of rational strategies and tools to be implemented over time to help the community reach established energy goals. Since the CEP Implementation Framework strategies and tools span the private, public, and non-profit sectors and address all CEP goal areas, CEP implementation will continue to require coordination and partnerships among numerous stakeholders.

It is anticipated the CEP Implementation Framework will undergo administrative changes after the County Board adopts the 2019 CEP. While the AIRE Team is already working with numerous stakeholders to begin the process of updating the CEP Implementation Framework, the current goal is to finalize the 2019 CEP, with a final CEP Implementation Framework update to follow thereafter. Staff will account for the updated CEP goals and polices when revising the implementation framework to reflect the County Board’s direction at the September meeting.

**PUBLIC ENGAGEMENT:**

*Level of Engagement:* The CEP update process has used the “Involve” level of engagement. Staff have used multiple opportunities to educate the community on the CEP goals and policies, solicit feedback on ways to improve the CEP and its implementation, and explain how comments and concerns played a role in revising the CEP. The updating process began in earnest in 2018 with the Energy Committee of the Environment and Energy Conservation Commission (E2C2) reviewing and proposing changes to the 2013 CEP. Since then, outreach has broadened to include individuals well-versed in the energy sector as well as the rest of the Arlington community.

*Outreach Methods:* In addition to the monthly, public Energy Committee meetings that have yielded a wealth of comments, staff included a link on the [Community Energy Plan website](#) which anyone could use to provide the AIRE Team with comments, questions, and/or concerns about the CEP. Community forums are an additional, important part of the County’s CEP update process as they help frame Arlington County’s dynamic energy future, ranging from renewable energy to next-generation energy efficiency, renewables at the local and utility scale, distributed generation models that combine microgrids, fuel cells, storage and demand response, electrification of transportation, and how to connect Arlington’s power grid with economic development, education and jobs. An enthusiastic crowd of approximately 80 regional energy stakeholders from the private sector, technical, academic, commercial, utility, environmental, government, non-profit and other markets provided valuable insights on November 5, 2018, at the Arlington George Mason University campus. After the draft 2019 CEP was made public on May 24, 2019, a follow-up energy forum involving approximately 50 stakeholders took place on
May 30, 2019. The objectives were to help educate the community on the proposed changes to the 2013 CEP and to get the group’s feedback on those proposed changes. In addition, the County held community events such as an Open House (June 4, 2019) which included approximately 50 members of the general public, many of whom were not involved in the November 2018 or May 2019 forums, and an online virtual forum (June 12, 2019). Those events provided the community an opportunity to learn more about the draft 2019 CEP, ask AIRE Team questions about the CEP and various implementation initiatives, and provide feedback on the draft 2019 CEP.

Prior to the May 24th draft 2019 CEP public release, the AIRE Team asked for additional feedback from multiple departments in County Government and Arlington Public Schools. An effective way to implement the CEP is to have the AIRE Team as the County’s lead CEP implementation group, and to have the energy plan goals and policies integrated into each County employee’s everyday activities. Seeking feedback on the draft 2019 CEP helps the County eventually reach that ambitious end-state.

Furthermore, the AIRE Team will present the draft 2019 CEP at more than 20 commission and community group meetings from May through September 2019. These meetings will be opportunities to further educate these groups about the CEP goals and policies, answer questions about the draft 2019 CEP, and gather feedback on ways to improve the plan.

Community Feedback: Comments leading up to the June 25, 2019 County Board Work Session on the CEP update centered primarily around the 2050 target for greenhouse gas emissions and the draft 2019 CEP’s goals for renewable energy. In general, the community wanted the 2019 CEP to be a bolder, more ambitious version of the 2013 CEP. For example, instead of changing the 2050 headline target to 1.0 metric ton CO$_2$e per capita per year (mt/capita/year) from the 2013 CEP target of 3.0 mt, the majority of comments on that topic advocate for zero metric tons of emissions by 2050. For renewable energy, most of the comments encourage Arlington to commit to transitioning to 100% renewable electricity community-wide by 2035.

County Board guidance on the draft 2019 CEP Update: Staff presented on the draft 2019 CEP update as well as other proposed changes to the 2013 CEP at a June 25, 2019 County Board Work Session (“work session”).

The feedback staff received during the work session was largely supportive of the draft changes to 2013 CEP. In addition, the County Board members provided guidance on three specific questions related to the draft 2019 CEP update:

1. Should the 2050 greenhouse gas emissions rate goal be one metric ton (mt) CO$_2$e/capita/year or zero mt CO$_2$e/capita/year?
2. Should the 2019 CEP include two new policies indicating by when the County government operations and the community should reach the goal of 100% renewable electricity?
3. Should the 2019 CEP add “Energy Equity” as a fourth concept to consider while implementing the CEP (in addition to the current three concepts of a) economic competitiveness, b) energy security, and c) environmental commitment)?
2050 Greenhouse Emissions Goal:

During the past year staff discussed with the Environment and Energy Conservation Commission’s Energy Committee potential ways to improve the 2013 CEP. In addition, other individuals knowledgeable about the CEP’s development and energy sector and the public have provided feedback on what they would like to see in an updated CEP. Staff took that information and worked with energy experts to create a 2016 Community Greenhouse Gas Emissions Inventory and an updated energy model. That process led to a recommendation presented to the County Board of the community achieving an ambitious greenhouse gas emissions rate of one mt CO$_2$e/capita/year by 2050.

During its work session deliberations, the County Board members noted the importance of acting now to address climate change while keeping in mind the other important CEP goals. The work session concluded with County Board guidance to staff to show in the 2019 CEP that the community should aspire to becoming Carbon Neutral by 2050. The path to Carbon Neutral is described in the CEP, and includes transformative changes in the electricity market, in energy efficiency buildings, in the deployment of renewable energy, and continued reductions in vehicle-miles of travel and electrification of the vehicle market. In addition, getting to Carbon Neutral will require the use of carbon sequestration, carbon offsets, and other means of compensating for any fossil fuel use that remains in place in 2050. Staff revised the May 24, 2019 draft CEP update to reflect this guidance. The May 24th draft CEP’s and the current draft CEP’s path to 2050 are shown in Figure 2.
Figure 2: Path to 2050 (latest version, reflecting County Board guidance)

New Renewable Energy Policies:

During this CEP update’s civic engagement process, and especially after the May 24th draft CEP was released to the public, staff heard from multiple stakeholders the desire for Arlington to pursue more ambitious renewable energy targets. After revisiting the energy model assumptions and conducting additional research, staff recommended to the County Board two new renewable energy policies:

1. Government operations will achieve 50% Renewable Electricity by 2022, and 100% Renewable Electricity by 2025.
2. The community will achieve 100% Renewable Electricity by 2035.

County Board members endorsed both of those changes, and the revised draft CEP update now includes those new policies. The updated energy model and “wedge graph” on p. 10 also reflect those assumption changes.
Energy Equity:

While implementing the CEP during the past five years, staff have developed and implemented initiatives while viewing those efforts through three primary lenses: 1) Economic competitiveness, 2) Energy security, and 3) Environmental commitment. There are inherent financial challenges to increase energy efficiency in the buildings and transportation sectors and to add renewable energy to Arlington properties. Given those challenges, there is a need to ensure everyone within Arlington can access the technologies and realize the benefits related to energy sector improvements. Staff recommended to the County Board including “energy equity” as a fourth lens through which staff view current and new CEP implementation initiatives.

The County Board recognized the need to ensure everyone can access the energy upgrades and participate in energy programs and endorsed the addition of energy equity as the fourth concept for staff to consider while moving forward in CEP implementation. Energy equity has been added to the latest version of the CEP update as the fourth CEP implementation consideration.

**FISCAL IMPACT:** There is no fiscal impact from adopting an update to the Community Energy Plan. Actions to implement the plan will require future funding to advance certain individual projects and initiatives. Such funding will be discussed and determined through the regular annual budgeting and Capital Improvement Program (CIP) development processes.
RESOLUTION TO RATIFY AND AUTHORIZE ADVERTISEMENT FOR PUBLIC HEARINGS AT THE SEPTEMBER 9, 2019, PLANNING COMMISSION AND THE SEPTEMBER 21, 2019, COUNTY BOARD MEETING TO CONSIDER ADOPTION OF AN UPDATE TO THE COMMUNITY ENERGY PLAN.

The County Board of Arlington hereby resolves to ratify and authorize advertisement of public hearings by the Planning Commission on September 9, 2019, and the County Board on September 21, 2019, to consider the adoption of an update to the Community Energy Plan (Attachment 1).
ATTACHMENT 1

Draft 2019 CEP
## ATTACHMENT 2

### COMPARATIVE CHART OF CHANGES (2013 CEP TO 2019 CEP)

<table>
<thead>
<tr>
<th>Sector</th>
<th>CEP 2013</th>
<th>CEP 2019</th>
<th>Reasoning/Basis</th>
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</table>
| Headline Target | 3.0 mt CO₂e/person-year                       | **NEW** Carbon Neutrality by 2050            | • Technology advancements  
• Increase in solar panel efficiency  
• Power Purchase Agreement options  
• Electrification of transportation  
• Increased energy efficiency program funding and programming in the Commonwealth  
• Persistent shift toward the use of cleaner fuel sources |
| Buildings    | **Goal 1:** Increase the energy and operational efficiency of all buildings | No change                                    |                                                                                 |
| Buildings    | **Policy 1 (P1.1):** By 2050, residential buildings should use 55% less energy on average (per square foot) as compared to 2007 levels of energy use (63 kBTU per square foot). Milestones include:  
  o **2020:** 5% less on average than 2007 levels  
  o **2030:** 25% less on average than 2007 levels  
  o **2040:** 40% less on average than 2007 levels | **REVISED Policy 1.1:** By 2050, total building energy usage in Arlington should be, at a minimum, 38% lower than in the 2016 baseline year (despite growth in number of households and corresponding economic activity).  
• Energy codes becoming more stringent increases renovated buildings’ energy efficiency  
• 4% of the existing building stock is renovated annually  
• Green Home Choice program results in over 40% energy efficiency improvement in new construction  
• Expanded investment in energy efficiency programs  
• Land use approaches that promote energy efficiency |
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| **Buildings** | *Policy 2 (P1.2):* By 2050, the non-residential building stock should use 60% less energy on average (per square foot) as compared to 2007 levels of energy use (98 kBTU per square foot). Milestones include:  
  - **2020:** 5% less on average than 2007 levels  
  - **2030:** 25% less on average than 2007 levels  
  - **2040:** 45% less on average than 2007 levels  
*Policy 3 (P1.3):* Reduce the amount of carbon produced from energy use from buildings, using source energy as the standard measure | **NEW Policy 1.2:** Promote and incentivize new buildings to be designed, constructed, and operated more efficiently than is required by code. |  |
| **District Energy (NEW changed to “Resilience”)** | **Goal 2:** Increase local energy supply and distribution efficiency in Arlington using district energy. | **NEW Goal 2:** Ensure Arlington’s energy resilience. | **Priority of resilience**  
**Energy Sector shift from District Energy to “Distributed Energy Resources” models**  
**Greater flexibility** |
| **District Energy (changed to “Resilience”)** | *Policy 1(P2.1):* Facilitate the installation and use of district energy in areas with the highest probability for district energy (DE). Have at least 450 megawatts³ (MW) of District Energy and 104 MW of Combined Heat and Power⁴ (CHP) by 2050.  
*Policy 2 (P2.2):* Plan and build infrastructure in appropriate locations to facilitate district energy | **NEW Policy 2.1:** Seek opportunities to develop or facilitate projects that make Arlington’s energy infrastructure more resilient. | **Align with “Resilience”**  
**Increased flexibility**  
**Technology options, including but not limited to combined heat & power, microgrids, fuel cells, storage, renewables**  
**Increased adaptability as technology expands/improves** |

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³ Peak connected load of buildings measured over a given calendar year  
⁴ Design electrical capacity of cogeneration equipment. This could also include the development of combined cooling heat and power (CCHP).
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<thead>
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</thead>
<tbody>
<tr>
<td>Renewable Energy</td>
<td><strong>Goal 3:</strong> Increase locally generated energy supply through the use of renewable energy options</td>
<td><strong>REVISED Goal 3:</strong> Increase locally generated and procured energy supply using renewable energy options.</td>
<td>NEW Policy 2.3: As part of Policy 2.2, assess microgrid (islanding) options for highest response, delivery and continuity of critical services.</td>
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<tr>
<td>Renewable Energy</td>
<td><strong>Policy 1 (P3.1):</strong> Become a solar leader with installation and use of 160 megawatts (MW) of solar electricity by 2050.</td>
<td><strong>REVISED Policy 3.1:</strong> Become a solar leader with installation and use of 160 megawatts (MW) of on-site solar electricity. By 2050 that on-site solar would supply about half of Arlington’s electricity usage.</td>
<td>NEW Policy 3.2: Optimize the use of renewable energy technologies in the public, private, and non-profit sectors, from a variety of on- and off-site sources, transactional options, cooperatives and diverse utility models.</td>
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| Renewable Energy  | **Policy 2 (P3.2):** Increase the use of renewable energy technologies in the public, private, and non-profit sectors. | **REVISED Policy 3.2:** | • Use on-site by residents and businesses  
• Substantial off-site RE (utility scale)  
• Local aggregation  
• Cross-jurisdictional aggregation and partnerships |
| Transportation    | **Goal 4:** Refine and expand transportation infrastructure and operations enhancements | **REVISED Goal 4:** Move more people with fewer greenhouse gas emissions. | NEW Policy 3.3: Government operations will achieve 50% Renewable Electricity by 2022, and 100% Renewable Electricity by 2025.  
NEW Policy 3.4: The community will achieve 100% Renewable Electricity by 2035.  
REVISED Policy 4.1: Reduce the amount of carbon produced from transportation to 0.5 mt CO₂e/capita/year by 2050. Milestones include (vs. 3.7 mt in 2007):  
• Promoting multimodal transportation  
• Switching to alternative fuels, and reducing fuel consumption and vehicle miles traveled  
• EVs make up a significant number of | • Focuses on electrification of transportation  
• Generality allows for anticipated pace and depth of change in emerging sector |
| Transportation    | **Policy 1 (P4.1):** Reduce the amount of carbon produced from transportation to 1.0 mt CO₂e/capita/year by 2050. Milestones include (vs. 3.7 mt in 2007):  
  1. 2020: 2.7 mt CO₂e/capita/year | **REVISED Policy 4.1:** Reduce the amount of carbon produced from transportation to 0.5 mt CO₂e/capita/year by 2050. Milestones include (vs. 3.7 mt in 2007):  
  1. 2020: 2.7 mt CO₂e/capita/year | |
<table>
<thead>
<tr>
<th>Sector</th>
<th>CEP 2013</th>
<th>CEP 2019</th>
<th>Reasoning/Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>NEW</strong></td>
<td><strong>NEW</strong></td>
<td>on-road passenger vehicles and light duty trucks/SUVs by 2050</td>
</tr>
<tr>
<td></td>
<td><strong>2030</strong>: 2.0 mt CO₂e/capita/year</td>
<td><strong>2030</strong>: 1.7 mt CO₂e/capita/year</td>
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<tr>
<td></td>
<td><strong>2040</strong>: 1.7 mt CO₂e/capita/year</td>
<td><strong>2040</strong>: 0.8 mt CO₂e/capita/year</td>
<td></td>
</tr>
</tbody>
</table>

**NEW Policy 4.2.** Give priority to reduction of VMT and increased use of alternative and public transportation (multimodalism).

**NEW Policy 4.3.** Coordinate with internal and external partners to track developments in electric vehicle (all uses) and charging infrastructure to produce a blueprint for a high-performance, cost-effective transition away from ICE (internal combustion engine) vehicles.

| County Government Activities | Goal 5: Integrate CEP goals into all County Government activities | REVISED Goal 5: Lead by example and integrate CEP goals into all County Government activities. | “Lead by example” covers government projects/policies that serve as proof of concepts and demonstration models for private sector, cross-agency, and non-profit entities |
|-----------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------|
| County Government Activities | **Policy 1 (P5.1):** Reduce County government CO₂ emissions by 76% by 2050, compared to 2007 levels, and improve energy security throughout County operations. Milestones include:  
  o **2020**: 25% below 2007 CO₂e level  
  o **2030**: 42% below 2007 CO₂e level  
  o **2040**: 59% below 2007 CO₂e level | REVISED **Policy 5.1:** Reduce County government CO₂e emissions by at least 88% by 2050, compared to 2007 levels, and improve energy security throughout County operations. Milestones include:  
  o **2020**: 33% below 2007 CO₂e level  
  o **2030**: 58% below 2007 CO₂e level  
  o **2040**: 71% below 2007 CO₂e level | Updates and adjusts emissions reductions targets to reflect technology developments and efficiencies |
<p>| County Government Activities | <strong>Policy 2 (P5.2):</strong> Integrate Community Energy Plan policies into County planning, policy development, and other activities | REVISED <strong>Policy 5.2:</strong> Integrate Community Energy Plan policies into County planning, policy development, internal standards, state legislative agendas, and other activities | Defines greater government role, expanded to include dynamic, leveraged partnerships |</p>
<table>
<thead>
<tr>
<th>Sector</th>
<th>CEP 2013</th>
<th>CEP 2019</th>
<th>Reasoning/Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy 3 (P5.3): Take advantage of CEP implementation to ensure Arlington’s long term economic competitiveness</td>
<td><strong>REVISED</strong> Policy 5.3: Ensure Arlington’s long-term economic competitiveness by collaborating and partnering with the private sector, universities, and other stakeholders</td>
<td><strong>NEW</strong> Policy 5.4: Diversify AIRE County- and Community-Facing Programs to implement a contemporized and adaptive portfolio, including Energy Equity programs.</td>
<td></td>
</tr>
<tr>
<td>Education and Behavioral Change</td>
<td>Goal 6: Advocate and support personal action through behavior changes and effective education</td>
<td><strong>REVISED</strong> Goal 6: Advocate and support residents and businesses acting to reduce their energy usage.</td>
<td>Defines that engagement extends from residents to include businesses</td>
</tr>
<tr>
<td>Goal Area Title: Education and Human Behavior</td>
<td><strong>REVISED</strong> Goal Area Title: Education and Behavioral Change.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education and Behavioral Change</td>
<td>Policy 1 (P6.1): Engage and empower individuals to reduce energy use</td>
<td>Policy 6.1 No change</td>
<td>Policy 6.2 amended for more active (less passive) language</td>
</tr>
<tr>
<td>Policy 2 (P6.2): Enhance level of professional expertise and work force in the community related to energy</td>
<td><strong>REVISED</strong> Policy 6.2: Increase the level of professional expertise and work force in the community related to energy</td>
<td></td>
<td>New Policies 6.3 and 6.4 open areas for performance-based engagement</td>
</tr>
<tr>
<td>Policy 3 (P6.3): Ensure recognition of extraordinary efforts made to help the community reach the CEP goals</td>
<td>Policy 6.3: No change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy 6.4: Partner with educational institutions to raise energy literacy in the community.</td>
<td><strong>NEW</strong> Policy 6.4: Partner with educational institutions to raise energy literacy in the community.</td>
<td></td>
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</tr>
<tr>
<td>Policy 6.5: Encourage building owners and managers to collaborate with the County through voluntary disclosure of energy usage (benchmarking).</td>
<td><strong>NEW</strong> Policy 6.5: Encourage building owners and managers to collaborate with the County through voluntary disclosure of energy usage (benchmarking).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy 6.6: Design and implement programs that address Energy Equity issues.</td>
<td><strong>NEW</strong> Policy 6.6: Design and implement programs that address Energy Equity issues.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sector</td>
<td>CEP 2013</td>
<td>CEP 2019</td>
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<tr>
<td></td>
<td></td>
<td><strong>including without limitation seniors, underserved, low-to-moderate income or disadvantaged communities, and challenges unique to the rental market.</strong></td>
<td></td>
</tr>
</tbody>
</table>
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Executive Summary

In 2013, Arlington County adopted a Community Energy Plan, as an element of the County’s Comprehensive Plan, (2013 CEP) to serve as both an integrated energy policy and climate action framework. The 2013 CEP’s Goals and Policies are consistent with the County’s innovative land use planning for transit-oriented design, preservation of green and open space, and economic development grounded in diverse markets and drivers as well as innovative technologies.

Markets, technologies, innovative systems and program design have revolutionized the energy sector over the five years since adoption of the 2013 CEP. For that reason, the 2019 Community Energy Plan (2019 CEP) is a living document that seeks to incorporate and deploy those rapidly-evolving sector developments, and to play forward the 2013 CEP to its highest and best use in Arlington County over the next five years.

Buildings account for over 60% of energy use within the County. Through its energy program - Arlington Initiative to Rethink Energy (AIRE) - the County has enjoyed an early leading role in building science, energy efficiency programming, establishment of a community solar cooperative, vehicle electrification and zero-emissions fuels, and expansion of policy and financing options for energy efficiency upgrades and renewables.

AIRE’s programs, activities, and partnerships save government, residents and businesses more than $4 million annually in avoided utility costs, through a diverse portfolio that includes a Commercial Green Building Program, Residential Green Home Choice, a government sites and facilities retrofit program, the Arlington Solar Cooperatives Program, and other electrification (transportation) and clean energy alliances. Through program implementation and existing partnerships, the County experienced a 24% reduction in emissions 2007-2016, despite a 10% increase in population. Government facilities reduced emissions during the same period by more than 11% despite an increase in the County’s physical footprint and services, e.g., a 17% growth in County facility square footage. Also, AIRE participates in established and expanding efforts to enhance the County’s local economic development, both as a magnet for energy-sector businesses and through the benefits new and existing businesses reap in an energy-advanced environment.

As noted above, during this same period the energy sector has experienced rapid evolution and dynamic advancements. Renewable energy has proliferated through a combination of increased efficiency and generation, affordability, expansion of financing and ownership models and, in Virginia, new legislation to advance energy conservation and security as well as funding and commitments to pilot land-based and offshore wind projects. Vehicle electrification is a rapidly growing market. “Energy Storage” systems have reached a level of diversity and sophistication that is capable of driving market uptake and reducing costs.

In addition, building science continues to expand and deliver higher-performing buildings. While the 2013 CEP recommended a District Energy model for Arlington’s urban corridors,

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1 More than 10 million square feet in high-performance, energy efficient, and low-emissions commercial building space to date.
contemporary energy markets and opportunities now recommend decentralized distributed energy systems using various options of energy generation and localized storage and distribution. The more diverse distributed energy approach allows for regional/local customization from a suite of mechanisms and strategies that includes energy efficiency, renewable energy resources, microgrids, storage, fuel cells, automated building performance systems, and demand-response protocols. This new model not only enhances reliability, consistency, and quality of energy resources to customers, but also offers resilience to emergencies, hazards, and climatic events.

Concurrent with rapid progress and expansion in the energy sector, scientists have tracked and recorded heightened global emissions and accelerated climate impacts. In response, governments have amended prior energy and climate actions plans to amplify and accelerate goals and expand strategies and measures. In 2017, the Commonwealth updated legislation enabling local jurisdictions to create viable Property Assessed Clean Energy (PACE) programs as a financing mechanism for energy efficiency upgrades to commercial buildings. In 2018, Virginia not only adopted a more aggressive Virginia Energy Plan, but also ratified SB 966 (Grid Transformation and Security Act) and earmarked substantial funding for energy-efficiency programs and projects over the next ten years. In the proliferation of adjusted goals and targets and heightened investment by governments, Arlington County’s leadership role has been challenged by other local governments’ energy initiatives and actions. AIRE invites this competition and actively promotes and represents the seminal role and capacity of local governments to promote and accelerate Virginia’s energy objectives and goals.

Consequently, the 2019 CEP is structured around new principal goals: 1) a 2050 emissions goal to achieve Carbon Neutrality, which is a change from the 2013 goal of 3.0 metric tons (mt) of CO₂e/capita/year); 2) an accelerated community renewable energy goal of 100% by 2035; 3) an accelerated government operations renewable energy goal of 50% by 2022 and 100% by 2025; and 4) addition of Equity as a focus area to inform design, investment and implementation of the 2019 CEP.

The 2019 CEP is a substantive update that integrates new models, strategies and technologies, adjusts relevant targets, and introduces the potential for emerging, innovative, and expanded, performance-based partnerships. Arlington County now has the opportunity to strategize and implement as a jurisdictional leader, regional collaborator, and statewide catalyst. Arlington can apply the 2019 CEP update as a roadmap for stretch-goals, increase its energy role as an incubator and pilot platform, revolutionize transportation again in the region, and embed social equity standards and goals into its power plan. The goal is to use new energy programs, policies and partnerships to secure economic competitiveness, resilience, and a new level of sustained desirability for residents, businesses, and visitors. The 2019 CEP is a platform for transformative thinking and dynamic implementation.
Chapter 1: Background

Arlington’s History of Energy and Environmental Leadership

For over twenty years, Arlington County has been at the forefront in responding to energy sector challenges and opportunities, and is recognized nationally for innovative land use planning, sustainability, and climate action.

Transit-oriented development around Metro corridors and high-quality transit service has been a foundational policy for the County for more than 50 years. These smart-growth principles stemmed from the County’s General Land Use Plan and led to the development of high-density, mixed-use communities around Metro stations, a strong focus on walkability, and implementation of a green building incentive program for the private sector. The CEP aims to layer intelligent energy planning onto the successful land use and transportation planning and implementation efforts.

“Green buildings,” which incorporate land use, building design, and construction strategies to reduce their environmental footprint and impacts, have been a growing trend since the 1990s.

In October 1999, the Arlington County Board adopted a Pilot Green Building Incentive initiative developed by individuals that would later form the County’s Arlington Initiative to Rethink Energy (AIRE) Program. Now in its 20th year, the Green Building Incentive Program grants bonus density and/or height exceptions to developers that construct high-performance buildings pursuant to the U.S. Green Building Council’s LEED® green building rating system and, more recently, Viridian's EarthCraft rating system. This voluntary program applies to site plan projects, including multi-family, affordable housing, hotel, office, and mixed-use development. The Columbia Pike Form Based Code includes green building commitments as well. Numerous builders have taken advantage of the incentives offered, providing Arlington residents and tenants with high quality, sustainable buildings. As of 2019, the program has certified more than 13 million square feet of commercial and multifamily construction, saving residents and building owners roughly $3 million per year in operational and utility costs. The program has been updated over time and encourages the building industry to achieve higher levels of energy efficiency and deploy a portfolio of construction and operational sustainability measures.

In 2007, the County launched the Arlington Initiative to Rethink Energy (AIRE) program. AIRE was created to reduce the energy-related costs and the carbon footprint of County government operations and to educate businesses and residents about improving energy performance while reducing greenhouse gas (GHG) emissions. The first specific goal for AIRE was to reduce Arlington County government’s carbon emissions by 10% by 2012, compared to 2000 levels.3 In addition, the County established multiple energy efficiency

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2 The US Green Building Council’s LEED® green building rating system is an internationally-recognized standard for Leadership in Energy and Environmental Design for building development and construction.

3 https://betterbuildingsinitiative.energy.gov/implementation-models/rethink-energy
programs for businesses and residents. Arlington also established itself as a regional leader in energy and climate action.

Additional goals for the program included: working with businesses and residents to reduce energy use; increase purchases of green power; complete a climate action plan for the community; and engage with other local and regional stakeholders toward these goals.⁴

By 2012, the GHG emissions from County government operations were 11.3 percent lower than 2000 levels, exceeding the AIRE goal of a 10 percent reduction. This was achieved through a combination of improved energy efficiency in buildings and streetlights, use of biodiesel in heavy vehicles, increased use of green power, and a reduction in GHG emissions from the electric grid.

The Community Energy Plan Project

On January 1, 2010 the Arlington County Board launched the Community Energy Plan (CEP) project, focused on community-wide greenhouse gas reductions.⁵

To develop the CEP, AIRE conducted numerous internal working sessions involving consultants and County staff, implemented a diverse schedule for public facilitation, engagement, and polling strategies, and recruited community leaders, energy industry specialists, and citizen groups to form a Community Energy and Sustainability Task Force (Task Force). Supported by public consensus, the Task Force approved the goals and policies outlined in the CEP, which were designed to drive the primary goal of reducing community-wide emissions from its then-current rate of 12.9 Mt CO₂e/capita/year to 3.0 Mt CO₂e/capita/year by 2050 (the standard then-adopted by Copenhagen, Denmark⁶).

The Arlington County Board unanimously adopted the CEP in 2013 as an element of the County’s Comprehensive Plan and to meet the County Board’s 2010 goal to produce and implement a community climate action plan.

As a Comprehensive Plan Element, the CEP is reviewed every five years to ensure the long-term document is current and relevant in a dynamic energy sector. This 2019 iteration is an update capturing a series of changes in markets, policies, and advancements in energy-related technology. The update also elevates and/or accelerates primary emissions and renewable energy goals from the original CEP and creates platforms for continuing progress in the sector. Arlington County’s continued ability to lead and innovate (as a leader in the energy sector and sustainability agent) requires a CEP that assimilates these bold changes, with dynamic capacity to incorporate future advancements.


⁶ The City of Copenhagen later adopted CPH 2025, a climate protocol developed to meet a goal of carbon neutrality by 2025.

https://kk.sites.itera.dk/apps/kk_pub2/index.asp?mode=detalje&id=983
Revising the 2050 Goal

For this update, staff and consultants constructed a new community energy model building upon energy use and emissions data from the County’s 2007, 2012, and 2016 GHG inventories. This model was informed by the analysis performed in 2010-2011 for the 2013 adopted CEP. However, the substantial changes in energy markets and technologies — and lessons learned from AIRE’s analyses of district energy since 2013 — pointed to a shift in priorities, including realigning distributed generation options, and increased focus on renewable energy, electrification (of transportation), policy and financing instruments, and strategic partnerships that leverage resources. This implementation pivot proved consistent with the Arlington County Board’s ultimate direction to elevate and/or accelerate the CEP’s foundational goals.

This model estimated energy use and emissions to 2050, based on current markets, technological innovations, and recent and expected federal and state policy initiatives. The model also used updated demographic and economic development forecasts for the Arlington community from County planners. To address flexibility and adaptability, consultants provided their expert view of emerging trends in technologies and markets to help gauge the expected pace of change in the near future.

A conceptual table that generally mapped primary (but not all) strategies driving the 2013 CEP goal of 3.0 mt CO₂e per capita has been modified to reflect the 2019 CEP amended goal of Carbon / Carbon Neutrality by 2050, see Figure 1 below.

As scientific evidence of human-caused climate change mounts, there is increased urgency to decarbonize more aggressively. Taking full advantage of the technologies, market opportunities, and distributed energy resources can produce deeper emissions reductions in the future. Deeper efficiency gains, utility-scale renewable energy, extensive electrification of transportation, and taking advantage of future opportunities can lead us to a goal of Carbon Neutrality. This 2019 CEP outlines both necessary and “reach” targets and policies for achieving the County’s Carbon Neutrality goal.
<table>
<thead>
<tr>
<th>Sector</th>
<th>Key Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric grid</td>
<td>• Persistent shift toward the use of cleaner fuel sources</td>
</tr>
<tr>
<td></td>
<td>• Efficiency of electricity generators</td>
</tr>
<tr>
<td></td>
<td>• Resulting CO$_2$e emissions rate</td>
</tr>
<tr>
<td>Buildings</td>
<td>• Future “reach” building codes</td>
</tr>
<tr>
<td></td>
<td>• Expanded investment in energy efficiency programs</td>
</tr>
<tr>
<td></td>
<td>• Reduced use of gas as an energy resources</td>
</tr>
<tr>
<td></td>
<td>• Diversification of utility programs and partners</td>
</tr>
<tr>
<td></td>
<td>• Future-facing land use approaches that promote energy efficiency</td>
</tr>
<tr>
<td>Transportation</td>
<td>• Substantial uptake in rates of multi-modalism</td>
</tr>
<tr>
<td></td>
<td>• Substantive reduction in VMT$^7$ per capita</td>
</tr>
<tr>
<td></td>
<td>• Fuel economy</td>
</tr>
<tr>
<td></td>
<td>• Saturation of vehicle market by EVs</td>
</tr>
<tr>
<td></td>
<td>• Supra-regional EV market (drive-through)</td>
</tr>
<tr>
<td>Renewable power (RE) (electricity)</td>
<td>• Use on-site by residents and businesses</td>
</tr>
<tr>
<td></td>
<td>• Substantial off-site RE (utility scale)</td>
</tr>
<tr>
<td></td>
<td>• Local aggregation</td>
</tr>
<tr>
<td></td>
<td>• Cross-jurisdictional aggregation and partnerships</td>
</tr>
</tbody>
</table>

Figure 1: Key factors for reducing community greenhouse gas emissions for Carbon Neutrality

$^7$ Vehicle Miles Travelled
<table>
<thead>
<tr>
<th>Locality or Country</th>
<th>Baseline Year</th>
<th>Target Year</th>
<th>Greenhouse Gas Emissions Reduction Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>2005</td>
<td>2025</td>
<td>26-28%</td>
</tr>
<tr>
<td>Denver</td>
<td>2005</td>
<td>2050</td>
<td>80%</td>
</tr>
<tr>
<td>Montgomery County, MD</td>
<td>2005</td>
<td>2050</td>
<td>80%</td>
</tr>
<tr>
<td>New York City</td>
<td>2005</td>
<td>2050</td>
<td>80%</td>
</tr>
<tr>
<td>Portland</td>
<td>1990</td>
<td>2050</td>
<td>80%</td>
</tr>
<tr>
<td>Prince George's County, MD</td>
<td>2008</td>
<td>2050</td>
<td>80%</td>
</tr>
<tr>
<td>Toronto</td>
<td>1990</td>
<td>2050</td>
<td>80%</td>
</tr>
<tr>
<td>Indianapolis</td>
<td></td>
<td>2050</td>
<td>Carbon Neutral</td>
</tr>
<tr>
<td>San Francisco</td>
<td>1990</td>
<td>2050</td>
<td>Carbon Neutral</td>
</tr>
<tr>
<td>Arlington County, VA</td>
<td>2007</td>
<td>2050</td>
<td>Carbon Neutral</td>
</tr>
<tr>
<td>London</td>
<td>N/A</td>
<td>2050</td>
<td>Zero Emissions</td>
</tr>
<tr>
<td>Seattle</td>
<td>2008</td>
<td>2050</td>
<td>Zero Net Core Emissions</td>
</tr>
<tr>
<td>Washington, D.C.</td>
<td>2006</td>
<td>2050</td>
<td>Carbon Neutrality</td>
</tr>
</tbody>
</table>

Figure 2: Greenhouse Gas Emissions (metric tons CO₂e) with baseline year provided. It's important to note that a community’s carbon footprint is the product of many factors, including energy prices and state and federal policies.
Chapter 2: Foundation for the Plan

Vision Statement

Arlington has assumed a strong leadership role in sustainability and energy innovation through programs, projects and policies that have reduced and optimized government and community use of essential resources, including energy. The 2019 CEP Update allows us not only to measure our progress and success since 2013, but to contemporize the Plan with the new markets, technologies, design and financing mechanisms, and partnerships that have emerged under the energy sector’s dynamic transformation over the past five years. This approach is necessary to ensure Arlington’s energy leadership and performance, and to prime the County for easy on-boarding of new developments that will continue to emerge from and for the energy sector.

Consequently, the fundamental goals of the Community Energy Plan have similarly evolved to:

- incorporate new strategies for the transition from fossil fuels-based energy resources
- promote use and availability of diverse renewable energy resources and models
- accelerate development of distributed, resilient energy systems, which offer blended options for energy efficiency, renewables, storage, automated building management, vehicle-to-grid behavioral changes, and other system elements and technologies
- harden key facilities and community resources against power outages and resulting reduction or interruption of vital community services
- stabilize energy rates and costs simultaneous with expanded energy resource and systems technologies
- integrate transportation as part of the energy grid (electrification of vehicles), with first-order focus on expanding multi-modalism
- leverage energy sector developments to support regional economic expansion
- seek new financing mechanisms that enhance energy equity and expand local sector opportunities
- expand public-private partnerships to amplify and optimize the local energy sector
- track and/or pilot alternative technologies, models, and transactional tools that can close any remaining delta to attain Carbon Neutrality

Ultimately, the Arlington Community Energy Plan is a blueprint to focus and guide efforts, policies, and actions toward a sustainable, desirable and competitive future. This CEP is a catalyst for new economic development and sustainable growth in Arlington. A growing number of businesses are focused on the energy sector, on both the supply and demand sides of the equation. Clean energy and innovations in efficiency are among the fastest growing economic sectors, and already serve as economic engines within and magnets for Arlington’s commercial, residential, and retail markets. Sustained implementation of the CEP will support smart development, lower operating costs, and enhance energy reliability.
Purpose and Execution of the Plan

The purpose of the CEP is to define Arlington’s energy goals and identify energy policies that will drive Arlington to remain economically competitive, environmentally committed, and strategically served by secure, consistent and reliable energy sources and programs that are equitably available to all constituents.

The County uses carbon dioxide equivalent (CO₂e) emissions as a proxy for overall energy productivity, as CO₂e reflects both the amount of energy consumed and the environmental burden from that energy use.

The baseline for Arlington’s CEP is calendar year 2007. That year, the community as a whole was responsible for generating 12.9 metric tons (mt) of CO₂e/capita/year. In 2013, Arlington County set a carbon emissions target of 3.0 mtCO₂e per capita per year by 2050. At that time, this 2050 goal matched emissions goals from world benchmark cities such as Copenhagen.

Dramatic improvements and opportunities since 2013 in technology, market and finance solutions, electrification, expansion and affordability of renewable energy, new energy efficiency models and technologies, code and policy changes, and other strategies have occurred, driven in great part by invention, commerce, and accelerated impacts from climate volatility. As a result, Copenhagen and other cities (see examples in Figure 2 above) have made bold modifications in their 2050 goals. Arlington County has joined this list of climate leaders and amended the 2019 CEP to reflect a 2050 goal of Carbon Neutrality.

The CEP was developed and adopted as the County’s comprehensive conceptual protocol in furtherance of energy, climate, and sustainability goals; but is operationalized through the Community Energy Plan Implementation Framework. More specifically, the CEP Implementation Framework lays out the strategies and tools the County will deploy to advance CEP and Comprehensive Plan objectives. Both the CEP and the CEP Implementation Framework are scheduled for updates on a five-year cycle, supplemented by administrative processes that allow for timely actions, as needed.

The CEP and CEP Implementation Framework are defined by the following terms:

Goals are the six primary areas around which the County will implement the Community Energy Plan and form the basis of the CEP and CEP Implementation Framework;

Policies are the statements of intent or commitments made by County leadership governing the implementation of the CEP-related projects. Policies are explained in detail in the CEP, whereas in the CEP Implementation Framework the policies are provided in summary format for context;

Strategies, explained in the CEP Implementation Framework, represent approaches for implementation of policy and should evolve over time as new tools emerge, new processes and models are designed, and

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8 This number was originally 13.4 mt CO₂e/capita/year but was adjusted due to GHG inventory methodology updates and improved data.
the benefits and risks associated with a concept change in response to changes internal or external to the County; and

**Tools** in the CEP Implementation Framework provide the mechanisms to carry out the strategies. Examples of existing and potential tools are explained in the text of the CEP Implementation Framework and a longer list of tools is summarized in Appendix B of the CEP Implementation Framework. However, neither list of tools is intended to be exhaustive or prescriptive; they are an illustrative set of examples of how the strategies could be accomplished. The tools described herein will require the application of resources—whether human or capital—to realize the CEP’s goals.
Chapter 3: Implementation Progress and Emerging Trends

This section details progress made to date toward the 2050 Carbon Neutrality CEP goal, as well as detailing the changing landscape in the energy sector.

Implementation

Arlington increased its emphasis on energy and climate matters with the 2007 launch of the AIRE program and adoption of the 2013 CEP. Since then, Arlington County, Arlington Public Schools, and the community have launched numerous initiatives and reached critical energy thresholds, including:

- Reduced community greenhouse gas emissions by 24% (2007-2016), even as population increased by 10%,
- Reduced energy consumption in buildings by 11% (2007-2016),
- Reduced energy consumption in transportation by 13% (2007-2016),
- Reduced energy intensity in County government buildings by 10% (2007-2017),
- Established the Commonwealth’s first local Commercial Property Assessed Clean Energy (PACE) Program,
- Generated approximately 13 Million square feet of LEED-certified commercial space under the County’s Green Building Incentive Program,
- Growth in ENERGYSTAR-labeled buildings from 6 in 2007 to 73 in 2018, now totaling 24 million square feet of commercial and institutional space,
- Established the County’s Solar Co-op. The 118 systems installed through solar co-ops have more than doubled the number of photovoltaic systems in Arlington,
- Completed Discovery Elementary School which is the first net-zero energy school in Virginia. Two more net-zero schools are under construction (Reed School and Alice West Fleet Elementary),
- Managed the Green Home Choice Program, resulting in an average 50% reduction in energy costs for 325 homes,
- Launched the Home Energy Rebates program that generated nearly $10 in private investment for every dollar in public incentive in home energy efficiency, and
- Earned the United States Green Building Council’s Leadership in Energy and Environmental Design (LEED) Platinum Community Certification (the first community in the nation to be certified Platinum).

In addition, County AIRE staff have established partnerships with:

- Arlington Public Libraries, to create the award-winning Energy Lending Library, helping library patrons cut their energy bills and make their homes more comfortable,
- Arlington County’s Facilities divisions, to design, build and maintain energy efficient buildings,
- Arlington County’s Facilities and Equipment Divisions, to support uptake in electric vehicles and the installation of electric vehicle charging infrastructure,
- Arlington County’s Housing Division, to ensure equitable, healthy, energy efficient housing options,
- Arlington Economic Development, to attain LEED Platinum Community certification (first in the country),
• Solid Waste Management, to aid in the development of the County’s Zero Waste Plan,
• The County Manager’s Office, as technical and strategic support in legislative and regulatory matters,
• As active representatives and participants at the regional, state and national levels, including but not limited to the Metropolitan Washington Council of Governments, Northern Virginia Regional Commission, the Net-Zero Coalition, Mid-Atlantic PACE Alliance, the Virginia Energy Efficiency Coalition, United States Green Building Coalition, Virginia Energy Purchasing Governmental Association, and the Virginia Energy Efficiency Advisory Committee,
• Arlington Public Schools, to build energy efficient and LEED certified schools striving for Net Zero Energy,
• George Mason University and Virginia Tech University, to support student development and energy initiatives, and
• Nonprofits EcoAction Arlington (formerly known as Arlingtonians for a Clean Environment) and Solar United Neighbors, to continue the support of the award-winning Energy Masters program and energy education in schools, and increase the number of Arlington solar PV systems.

The most recent greenhouse gas emissions inventory completed in 2018 shows that Arlington produced an estimated 9.1 mt CO₂e/capita in 2016. Some of this progress can be attributed to regional trends such as the reduced use of coal for electricity generation and more efficient electric power generation. The remainder of the emissions reductions can be attributed to local actions, including declining residential and commercial energy use. This shows that local programming for building energy efficiency and continued smart growth and transit-oriented design principles have been effective in reducing carbon emissions.

An Evolving Energy Sector
The mid- and long-term goals framed by the 2019 CEP Update reflect five years of rapid energy sector development, legislative action, policy statements, scientific findings, emerging technologies, and design innovations affecting the generation of energy resources as well as transmission and distribution models. Key changes that most influence Arlington County include:

• Arlington County’s ratification of the We’re Still In Resolution (June 20, 2017), confirmed the County’s direct adoption of the Paris Climate Accord;
• The Commonwealth’s 2018 Grid Transformation and Security Act (GTSA) authorizes funding for energy efficiency, sets aggressive goals for renewable energy installations, and provides a conceptual framework for grid reliability and cybersecurity;
• As of May 2019, the mayors of 94 cities signed the Net-Zero Carbon Buildings Declaration committing that all new buildings will operate at net-zero carbon by 2030⁹;
• The updated Virginia Energy Plan (October 1, 2018), which increases the Commonwealth’s commitment to energy efficiency under the GTSA, creates

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⁹ https://www.c40.org/cities
opportunities for new job creation and business opportunities, and improves consumer access to renewable energy;

- The October 2018 UN Intergovernmental Panel on Climate Change (IPCC) Report, finding that human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, and there is high confidence that global temperatures are likely to increase by 1.5°C between 2030 and 2052 if greenhouse gas levels continue to increase at the current rate;

- In November 2018, U.S. Global Climate Change Research Program (USGCRP) released Volume II of the Fourth National Climate Assessment (NCA4), which forecasts that without major reductions in greenhouse gas emissions, the increase in annual average global temperature relative to preindustrial times could reach 9°F (5°C) or more by the end of this century;

- New energy efficiency technologies continue to emerge, such LED lighting and ultra-efficient HVAC systems such as Variable Refrigerant Flow. These efficiency options and the falling cost of renewables has enabled the construction of more net-zero buildings;

- Public transit, bicycle and electrified scooter, Electric Vehicles, car sharing, and ride-hailing have gained rapid market penetration, and autonomous vehicles are being piloted to transform the transportation sector;

- Coal-based electricity generation has receded, renewable energy generation has increased, and overall, electricity generation has become cleaner;

- Compatibility and demand for distributed energy systems is increasing (microgrids, demand response, storage, energy efficiency and renewables blended models) to promote reliability, operability, and power supply security;

- New energy innovation and energy systems companies are locating in Arlington County (e.g., Fluence, OPOWER/Oracle, ConneDER, and others);

- As carbon footprints and energy use fall, there is increased emphasis on energy equity to ensure that access to energy upgrades, participation in energy programs, and the movement toward a clean, reliable and secure grid is also shared with low-to-moderate and disadvantaged communities;

- There are increasing opportunities for diverse, strong and active partnerships among the County, Investor-Owned Utilities, Virginia’s environmental and regulatory agencies, economic development agencies, and affordable housing entities;

- Utility models and transactional strategies have expanded;

- Other localities have adopted even more aggressive goals, such as Washington, D.C.’s plan for 100% renewable electricity by 2032; and

- Conversely, federal support for energy and climate programs has significantly declined in recent years. Examples include abandonment of the EPA’s Clean Power Plan, withdrawal at the nation-level from the Paris Climate Accord, and proposals to weaken Clean Air protocols and Corporate Average Fuel Economy (CAFE) standards for vehicles. In response, governments have amended prior energy and climate actions plans to
amplify and accelerate goals and expand strategies and measures.
Chapter 4: Current Conditions

Sources of Arlington’s Energy

Over one-third (38 percent) of the energy used in Arlington is in the form of electricity, the vast majority of which is produced outside the County and transmitted via the electric grid (see Figure 3) for use in buildings.

About 38 percent of the energy used in the County is supplied by gasoline and diesel for the cars, trucks, and buses used within County borders. The remaining 23 percent is from natural gas and heating oil, primarily used for space and water heating in homes, businesses, and other building types.

However, more than half of the energy used to generate, transmit, and distribute electricity is wasted before it even enters a house, apartment, or office (see Figure 4).

Figure 3: 2016 Arlington Energy Sources

Figure 4: Energy Losses During Generation and Transmission

This means that although electricity represents 36 percent of the energy used within the community, the total energy burden required for electricity (the “source energy”) is much larger, and in fact is over half of Arlington’s total source energy needs in 2016. Consistency, continuity, and quality of electrical power substantially impacts local economies, delivery of core services, and public health, safety and welfare.

Reducing energy use from the grid, using less natural gas in buildings, and increasing on-site solar makes businesses and homes less vulnerable to market and price volatility. In addition, dependence on energy supplies from distant sources carries the risk of short and long-term supply interruptions from storms and other natural and man-made disasters, with escalating, adverse effects on businesses and the County’s most vulnerable residents. Also, with information technology now at the core of business and security practices around the world, interruptions in electric power supply can be catastrophic for businesses and residents alike.

10 Reproduced with permission from “What You Need to Know About Energy, 2008” by the National Academy of Sciences, Courtesy of the National Academies Press, Washington, D.C.
More than 61% of Arlington’s energy use is connected to building sector consumption – distributed across commercial and multifamily buildings, single-family homes, workplaces, and shopping areas. The remainder (39%) is associated with transportation-related energy use, including vehicles, public transportation, signalization, and electric and hybrid vehicle charging infrastructure (see Figure 5).

Arlington’s built environment includes a rich variety of housing types and commercial spaces, further diversified by age and construction type. These differing building styles and uses will require different approaches to achieve improved energy performance.

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11 This assessment does not factor in Federal installations in Arlington such as the Pentagon or Ronald Reagan Washington National Airport.
Arlington is an urban county with award-winning transit-oriented development and innovative transportation demand management programs. As a result, less than 40 percent of its energy is used for transportation including personal and commercial vehicles, buses, and rail. A negligible amount is used for transportation infrastructure such as streetlights and traffic signals.

Energy use in transportation is primarily from personal vehicles, commercial fleets, rail, and bus transit. Of the energy use related to transportation, nearly half is from non-residents who commute to jobs in Arlington, travel through the County, or travel to one of the County’s numerous retail options.

Arlington’s smart growth planning – characterized by compact, transit-oriented development - has resulted in lower vehicle ownership by residents than in many other jurisdictions\(^\text{12}\), with a substantial portion of trips made by transit, walking and/or bicycling\(^\text{13}\).

However, despite careful planning and energy programming, Arlington’s energy density per capita (buildings and transportation) is about twice as high as modern European cities, revealing inefficiencies in the use of energy resources. This energy inefficiency costs Arlington residents and businesses about $280 million each year.

The Benefits of a Community Energy Plan

Economic Competitiveness

The energy sector is a dynamic economic engine that continues to drive new and continued employment. In 2017, it represented 6.5 million jobs in the U.S., adding 133,000 jobs over 2016 rates (a 2% increase) and accounted for 7% of all new jobs created in 2017.\(^\text{14}\) More specifically, Energy Efficiency employed 2.25 million Americans, adding 67,000 net jobs in 2017.

A closer analysis, though, reveals relatively flat (yet sustained) employment in energy efficiency upgrades installation, but roughly 63,000 new jobs in professional services. This suggests that current job growth and opportunity in Energy Efficiency is tracking the sector’s evolution and currently generating employment in building science, modeling/analytics, project design, financing, and other non-construction jobs.\(^\text{15}\)

The renewables markets employ nearly 800,000 workers, with greatest current growth in the solar (25.4%) and wind (16%) (2013) that same combined non-vehicular share of Arlington commuters was 35% (https://transportation.arlingtonva.us/performance-measures-2014/mobility/mode-share).

\(^{12}\) For 2015 (most recent year assessed), the national average of households without vehicles was 8.7%. By contrast, Arlington County’s share of households without a vehicle was 13.4%.


\(^{13}\) The 2015 combined average of commuters using public transit, walking, or biking equaled 8.6% of all commuters (https://www.bts.dot.gov/content/commute-mode-share-2015). For the most recent year assessed


\(^{15}\) Ibid.
industries from 2016 to 2017. Not surprisingly, over the same period, employment in energy storage surged 235%, supported by 55,000 separate jobs associated with grid modernization.  

In the Motor Vehicles sector, employment in the hybrid market has seen reductions, but job growth has increased in the fuel-efficiency and all-electric vehicle industries. At present, it is estimated that 26 percent of all employment under this sector (650,000 jobs) are engaged in optimizing fuel economy and efficiency or the transition to alternative-fuel vehicles.  

The CEP anticipates that Arlington County will seek out and build on partnerships to increase local incubation and piloting of new companies and technologies, develop opportunities for equity in these employment markets, and to create economic and employment opportunities through implementation of resilience, resource and grid diversity, electrification and the foundational platform of energy efficiency.

Implementation of the CEP will advance economic competitiveness at the local level in the form of cascading or “cross-elasticity” impacts, such as decreased energy costs to consumers and the increased local spending power derived from those savings, as well as public health savings from a cleaner environment (see below).

Another key positive impact from energy efficiency is the avoided significant construction and operational costs of flex-infrastructure - such as peaker plants - that would otherwise be necessary to serve peaks and fluctuations in energy demand. Avoided costs in the United States can be as high as $200/KW. For these and other reasons, energy efficiency is recognized as the least costly resource available to power utilities.

The CEP anticipates that Arlington County will seek out and build on partnerships to increase local incubation and piloting of new companies and technologies, develop opportunities for equity in these employment markets, and to create economic and employment opportunities through implementation of resilience, resource and grid diversity, electrification and the foundational platform of energy efficiency.

Environmental Commitment

Energy efficiency is a cheap, fast, and clean way to reduce greenhouse gas pollution in the near term. Critically, it is the most potent tool to reduce emissions at the most emissions-intensive source. In 2013, Americans avoided greenhouse gas emissions equivalent to the annual electricity use of over 58 million homes through choices they

18 USAID: Economic and Employment Impacts of Energy Efficiency,
made with energy-saving measures and energy-efficient homes.

While Arlington County’s key emissions policy for transportation is to continue to increase use of alternative and public forms of transportation and reduce VMT, a complete approach must address necessary vehicle trips. One of the most significant advancements in emissions reductions and air quality improvements since adoption of the original CEP is expanding electrification of transportation. Electric vehicles have experienced sharp market uptake in the passenger vehicle sector. In addition, research and development are transforming the medium- to heavy-vehicle market sectors. Simultaneously, electric vehicle charging infrastructure has improved and diversified to offer faster charging times and greater mileage-per-charge. These improvements directly respond to primary consumer insecurities and act to overcome market barriers. In addition, the coupling of electrification of transportation with renewable energy at the source has compounded the ability of communities and governments to meet more aggressive energy and air quality goals.

Additionally, energy efficiency, conservation and increased deployment of renewable energy resources results in improved air quality and healthier environments. For example, internal combustion engine passenger and heavy-duty vehicles are key sources of ambient ozone precursors (such as nitrogen oxides and hydrocarbons), particulate matter, and other smog-forming pollution. Studies claim that in the United States, particulates alone are responsible for up to 30,000 premature deaths each year.

Several more comprehensive analyses of the impact of alternative fuel vehicles on reduction of “criteria” pollutants have been conducted in the Southwest Region of the United States (see Table 1). Although climate zones in this region have a compounding effect on the overall generation of ambient ozone, the research is demonstrative of air quality improvements that can be upscaled or downscaled according to local climate and the share of local greenhouse gas emissions produced by transportation sources (39% in Maricopa County, Arizona vs. 36% in Arlington County).

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Table 1. Percent Reduction in Emissions in 2013 Compared to New Gasoline Vehicle

<table>
<thead>
<tr>
<th></th>
<th>Battery Electric Vehicle (BEV)</th>
<th>Plug-in Hybrid Electric Vehicle w/ 10-mile Electric Range (PHEV10)</th>
<th>Plug-in Hybrid Electric Vehicle w/ 40-mile Electric Range (PHEV40)</th>
<th>Compressed Natural Gas Vehicle (CNG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOC</td>
<td>99.5%</td>
<td>40.9%</td>
<td>63.7%</td>
<td>84.0%</td>
</tr>
<tr>
<td>NOx</td>
<td>76.1%</td>
<td>29.9%</td>
<td>48.3%</td>
<td>70.4%</td>
</tr>
<tr>
<td>PM10</td>
<td>44.8%</td>
<td>14.1%</td>
<td>25.6%</td>
<td>24.0%</td>
</tr>
<tr>
<td>PM2.5</td>
<td>59.9%</td>
<td>17.4%</td>
<td>34.0%</td>
<td>25.4%</td>
</tr>
<tr>
<td>SO2</td>
<td>93.0%</td>
<td>39.5%</td>
<td>55.0%</td>
<td>38.0%</td>
</tr>
<tr>
<td>CO</td>
<td>99.6%</td>
<td>17.1%</td>
<td>53.9%</td>
<td>0.4%</td>
</tr>
<tr>
<td>GHG</td>
<td>42.6%</td>
<td>28.3%</td>
<td>30.2%</td>
<td>19.2%</td>
</tr>
</tbody>
</table>

SWEEP: Southwest Energy Efficiency Project. September 2013 (Maricopa County)
**Energy Security**

Energy efficiency measures help improve the reliability of the local electric grid by lowering peak demand and reducing the need for additional generation and transmission assets. Energy efficiency also diversifies utility resource portfolios and can be a hedge against uncertainty associated with fluctuating fuel prices and other risk factors.

Investment in Arlington’s energy infrastructure and diversification of energy resources and models will secure reliability, consistency, and quality of our power supply. Options include local energy generation, energy through renewables or other distributed energy sources, investing in supplemental and/or backstop technology such as battery or other storage mechanisms, and creating customized microgrids that offer reliability against interruptions or inoperability.

Renewable energy, especially solar photovoltaics (PV), helps flatten the demand on the electric grid because the sun tends to shine brightest when electricity demand is the highest. This results in increased capacity for local power plants. Photovoltaics also reduce stress on the grid by generating electricity locally. Where demand and conditions support financial feasibility, storage is increasingly coupled with renewable solar energy systems to fill gaps, such as transfer during off-peak use and to increase reliability and consistency where current infrastructure is intermittently insufficient.

![Figure 6: Community Energy Plan goal areas](image)

**Energy Equity**

Energy Equity is the fair distribution of the burdens and benefits from energy production and consumption; including but not limited to how accessible and affordable the energy supply is across a population and sensitivity to its socio-economic complexity. Community energy
leadership is not limited to climate mitigation and adaptation. Instead it provides a suite of diverse benefits that range from simple comfort and energy cost-stabilization, to improved indoor air quality and healthier building environments, increased property value, and reliability and consistency of energy supply. These attributes are especially valuable to underserved populations, low-to-moderate income and/or disadvantaged communities, seniors, and the chronically ill or health-vulnerable.

Under the 2019 CEP, the County Board provided guidance that Arlington’s energy and climate strategy should incorporate Energy Equity not simply as a goal or policy, but as an established focus (along with Energy Security, Economic Competitiveness, and Environmental Commitment) informing the CEP in total.
Chapter 5: Approach

The goal of Carbon Neutrality by 2050 is ambitious, but not inconsistent with rapid improvements in infrastructure and the demonstrated trend of significant advances in operational and cost efficiency over the next 25 years (refer to Appendix B). Carbon neutrality will, however, require the County to take a comprehensive and continuously evolving approach including but not limited to:

- expansion of energy efficiency strategies and measures;
- distributed energy programs, such as renewables and energy storage;
- increased use of renewable energy resources;
- cross-market activity, such as electrification of transportation;
- research, tracking and, when possible, piloting new technologies;
- increased consolidation and partnership models that allow for economies of scale in new energy models, technologies, and transactions;
- increased innovative policies at the local level, as well as active participation in adoption of legislation by the Commonwealth, e.g., mandatory Renewable Portfolio Standard,
- County government implementation advancements; and
- broadening of energy literacy across all segments of the community.

Approach and Process

To better understand and address Arlington’s energy use, four primary goal areas are identified – buildings, distributed energy, renewables, and transportation – with supporting goal areas that deploy County government activities, increased partnerships and financing mechanisms, education and human behavior, and resilience planning. In 2013, Arlington County conducted a greenhouse gas inventory\(^1\) to quantify the community’s carbon footprint at the time. Inventories are traditionally used to model a customized roadmap that rolls up into an adopted CO\(_2\)e goal (typically plotted against a 2050 horizon). As a result of the design, technology, cross-market, and other advancements within the energy sector since 2013, Arlington’s current target CO\(_2\)e levels are shown in tabular format in Figure 7 or by the “wedge graph” (Figure 8).

<table>
<thead>
<tr>
<th>Year</th>
<th>Target per capita CO(_2)e emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>12.9 mt</td>
</tr>
<tr>
<td>(baseline)</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>7.5 mt</td>
</tr>
<tr>
<td>2030</td>
<td>4.3 mt</td>
</tr>
<tr>
<td>2040</td>
<td>2.0 mt</td>
</tr>
<tr>
<td>2050</td>
<td>Carbon Neutral</td>
</tr>
</tbody>
</table>

Figure 7: Arlington County Per Capita GHG Milestones

While the wedge graph represents the best-known approach at the time it was created, it should be updated periodically to account in an estimate for methane leakage but there is uncertainty how accurate this and other assumptions are.

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\(^1\) Greenhouse gas inventories are estimates of a community’s carbon footprint based on compendium of data and assumptions. They factor
for new information and new technologies. All elements of the plan must be addressed in some combination to achieve the transformational goal recommended by the CES Task Force and adopted by the County Board.

Figures 8 and 9 show the difference in the community’s GHG emissions goals in CEP 2013 and CEP 2019, with the addition of a cross-hatch layer in Figure 8 representing future opportunities that may act as a bridge to Carbon Neutrality by 2050. The remainder of this document details the goals, policies, and strategies within each goal area to attain Carbon Neutrality by 2050.

Arlington County Greenhouse Gas Emission Reductions from Business-As-Usual (MTCO2e)

Figure 8: Arlington County 2019 Wedge Graph
<table>
<thead>
<tr>
<th>Year</th>
<th>Target mt /person CO₂e 2013 CEP</th>
<th>Revised * Getting to 3.0 2019 CEP</th>
<th>Getting to Carbon Neutral 2019 CEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 actual</td>
<td>12.9</td>
<td>12.9</td>
<td>12.9</td>
</tr>
<tr>
<td>2012 actual</td>
<td>--</td>
<td>11.3</td>
<td>11.3</td>
</tr>
<tr>
<td>2016 actual</td>
<td>--</td>
<td>9.1</td>
<td>9.1</td>
</tr>
<tr>
<td>2020 goal</td>
<td>9.3</td>
<td>7.6</td>
<td>7.5</td>
</tr>
<tr>
<td>2030 goal</td>
<td>5.8</td>
<td>5.0</td>
<td>4.3</td>
</tr>
<tr>
<td>2040 goal</td>
<td>4.1</td>
<td>3.8</td>
<td>2.0</td>
</tr>
<tr>
<td>2050 goal</td>
<td>3.0</td>
<td>3.0</td>
<td>Carbon Neutral</td>
</tr>
</tbody>
</table>

* Per 2019 modeling with accelerated interim targets

Figure 9: Arlington County Per Capita GHG Projections
Chapter 6: Goals and Policies

Buildings

Goal 1 (G1): Increase the energy and operational efficiency of all buildings

Policy 1.1: By 2050, total building energy usage in Arlington should be, at a minimum, 38% lower than in the 2007 baseline year (despite growth in number of households and corresponding economic activity).

Policy 1.2: Promote and incentivize new buildings to be designed, constructed, and operated more efficiently than is required by code.

Policy 1.3: Pursue funding opportunities and partnerships for energy efficiency programs and projects that reflect regional needs and characteristics and promote significant local participation.

Policy 1.4: Advance energy equity to respond to underserved communities.

Buildings currently account for just over 60 percent of energy consumption in Arlington. Consequently, the County’s success in achieving greenhouse gas emissions goals is largely dependent upon policies, programs, and projects that substantially reduce or conserve energy consumption in new or existing properties across the building sector. Reduced energy usage in new and existing buildings is often the most cost-effective approach as well. Another direct benefit of reduced consumption is lower utility costs to businesses and residents, providing a variety of potential co-benefits through increased spending power. Moreover, as previously noted, building and energy efficiency upgrade technologies have advanced to demonstrate energy efficiency models that also improve indoor air quality.

Cutting building energy usage requires a three-pronged, complementary approach: reductions required by building code, voluntary energy efficiency improvements that go beyond code, and programs and project that reflect the region and are capable of stimulating regional interest and uptake.

Code establishes an efficiency “floor” to ensure a minimum level of performance, while programs that go beyond code push the market forward and generate innovative energy efficient technologies. AIRE manages several programs that provide non-financial incentives to encourage building owners to go beyond code, including the Green Building Density Incentive Program, and Green Home Choice, (excluding the former Residential Energy Efficiency Rebate Program).

As of 2018, the applicable building code for residential and non-residential buildings is the International Energy Conservation Code (IECC) 2012, which will ensure that new buildings – and major renovations, in the aggregate – are approximately 30% more efficient than the 2004 Virginia Building Code. Although future building codes will likely continue to improve energy efficiency requirements, more must be done to achieve Arlington’s greenhouse gas reduction goals.

The ideal time to install energy efficiency upgrades is when a building is being renovated. Typically, 2-4% of the nation’s building stock is renovated each year; and
current data suggests that in Arlington the rate may be even higher. Thus, by 2050 all or most of Arlington’s existing residential and non-residential buildings will likely have been either renovated or demolished. Coupled with continuing innovations in technology, building code upgrades will play a significant role in achieving multiple, primary CEP goals.

Energy efficiency improvements are achieved through careful design, selection, and installation of building envelope measures (such as insulation and air sealing), windows, lighting, and heating, ventilation, and air conditioning (HVAC) systems. At present, third-party programs funded through the Commonwealth are not modeled to regional interests and needs and, as a result, generate minimal uptake by the public. Carbon Neutrality by 2050 presumes the opportunity to participate and/or partner in the design and implementation of such programs on a local level. This approach has generated tangible, substantial energy efficiency outcomes in other states and jurisdictions with regulatory and financial frameworks for these collaborations.

There are also opportunities to reduce building energy use through external strategies, such as effective landscaping, tree planting, shading, site design, and other factors that reduce the urban heat island effect and building energy usage. For example, Arlington’s trees save over $1 million per year in avoided energy costs.²²

Each category or class of structures within the building stock requires a different approach. To this end, the County runs an array of programs designed to address the specific needs of the various building sectors. For example:

- The County’s Green Building Program incentivizes energy-efficient new commercial and multi-family residential buildings.
- The Commercial Property Assessed Clean Energy (C-PACE) program deploys a unique financing mechanism to encourage energy efficiency and renewables installations for new and existing commercial buildings.
- Energy efficiency in the affordable housing sector is complex, but the County leverages state incentives, expands potential partnerships (e.g., non-profit organizations, foundations), and is compatible with a diverse and flexible suite of financing models that integrate credit enhancements, incentives, and creative investment offerings.
- In the residential market, AIRE previously implemented successful incentive programs that generate substantial returns-on-investment and drives behavioral change through focused education.

Through deployment of renewable energy and demand-side management approaches, energy efficiency, building science, and current and emerging technologies, buildings can reduce demand and generate enough

²² https://environment.arlingtonva.us/i-tree-eco/
renewable energy to be a “net-zero” in energy consumption. Arlington County has already facilitated net-zero energy development, including Discovery Elementary School and other upcoming projects (including Alice West Fleet Elementary). The County will continue to advocate for net-zero projects to demonstrate the feasibility of net-zero energy concepts at scale.
Resilience

Goal 2 (G2): Ensure Arlington’s Energy Resilience

Policy 2.1: Seek opportunities to develop or facilitate projects that make Arlington’s energy infrastructure more resilient.

Policy 2.2: Design and produce an Energy Assurance Strategy that models sensitivities and solutions against pre- or post-hazard/event inoperability.

Policy 2.3: As part of Policy 2.2, assess microgrid (islanding) options for highest response, delivery and continuity of critical services.

A resilient, reliable, and secure energy infrastructure is critical to Arlington. The grid and other infrastructure are vulnerable to disruptions from extreme weather, deliberate attacks, climate change, load demand and grid sensitivity, and other influences or vulnerabilities. Outages, interruptions, and inoperability adversely impact both residents and businesses. Common and necessary services such as transportation and conveyance of goods and services are affected. Negative impacts are even more severe for seniors, disadvantaged communities and medical-needs residents. On a fundamental and pervasive scale, unreliability creates challenges to economic potential and public health and safety.

Site-specific conditions and opportunities will inform Arlington’s energy resilience planning. Critical facilities like hospitals, military bases, emergency operations centers, and other essential services (such as communications, transportation, and wastewater) are the highest priority. Presently, the primary focus in on continuity of government and emergency service and response operations, but this focus does not preclude the possibility of public-private partnerships and collaborative planning to ensure continuity of key business operations, urban core buildings and facilities, and even primary neighborhood retail providers.

Prior design and functional challenges to resiliency have been resolved through the emergence of distributed generation systems, including microgrids, battery storage, fuel cells, renewable energy resources, and building technologies. These systems are scalable and can be readily customized for community size and demand, vulnerabilities, and pre- and post-emergency planning. Consistent with other adaptive management systems, the investments in energy resilience are assessed through principles of risk mitigation and management calculations measured against the economic, social and environmental costs of inaction.

Arlington will evaluate numerous technologies and projects to enhance the community’s energy resilience. A few key examples are:

Local Energy Supply

Most buildings get their electricity from the electric grid, a vast network of power plants and communities connected by thousands of miles of wire with numerous points of potential failure, leaving the grid vulnerable to power outages. Localized generation that deploys renewable energy technologies, combined heat and power, and other distributed energy sources gains reliability through proximity. Localizing energy systems also provides for “islanding” of buildings or districts, so that power supply is not
vulnerable to cascading failures within a vast integrated grid system.

This 2019 CEP modeling assumes 20 Megawatts of combined heat & power (CHP) capacity at critical facilities in Arlington by 2050. Conventional gas-fired CHP carries a modest carbon emission penalty compared to grid power due to the mix of power on the electric grid, including nuclear baseload, renewables, and increasingly efficient natural gas-fired combined-cycle power plants. However, the resilience aspect of CHP remains an option in the toolbox for long-term energy security.

Energy Storage and Backup Generators

Pairing batteries or other energy storage options with solar photovoltaic systems can allow buildings or districts to operate when the grid is down. Another strategy to address grid outages is having a backup option to provide power when the grid is down. Many commercial buildings have backup generators for this purpose. In recent years, there has been an increase in sales of residential backup generators.

Microgrids

Microgrids provide a third way to stay critically-responsive during a grid outage. A microgrid is a local electricity distribution system that can operate while connected to the main grid or independently when it is disconnected from the grid. These systems can use local energy generation and/or energy storage to provide power when the grid is down. They make the most sense in critical facilities where 100% reliable power is a necessity. Arlington is home to several critical facilities such as Joint Base Fort Myer/Henderson Hall and the Virginia Hospital Center, both of which could benefit from an on-site microgrid.

Further, upscaling any such system to aggregate critical facilities and services and/or large-scale end-users promotes cost-effectiveness within the aligned investment.
Renewable Energy

**Goal 3 (G3): Increase locally-generated and procured energy supply using renewable energy options**

**Policy 3.1:** Become a solar leader with installation and use of 160 megawatts (MW) of on-site solar electricity. By 2050 that on-site solar would supply about half of Arlington’s electricity usage.

**Policy 3.2:** Optimize the use of renewable energy technologies in the public, private, and non-profit sectors, from a variety of on- and off-site sources, transactional options, cooperatives and diverse utility models.

**Policy 3.3:** Government operations will achieve 50% Renewable Electricity by 2022, and 100% Renewable Electricity by 2025.

**Policy 3.4:** The community will achieve 100% Renewable Electricity by 2035.

The use of renewable energy, particularly solar photovoltaics (solar electricity) and solar water heating (solar thermal) can reduce operating costs for businesses and homes and contribute zero greenhouse gas emissions. In addition, since solar photovoltaics (PV) generate electricity largely coincident with summer cooling demands, the use of solar PV helps reduce the summer peak demand for electricity. Renewables combined with energy efficiency measures can result in net zero energy or very low energy buildings, further reducing the strain on the grid.

When sufficiently aggregated, technology options such as solar photovoltaics and thermal energy storage, can shave peak electric demand and promote operability of power supply when demand is highest. In addition to horizontal rooftop systems, solar PV can also reduce peak electric demand when mounted on vertical south- and west-facing facades. Arlington’s buildings provide ample opportunities for mounting solar PV in a variety of configurations, both horizontal and vertical.

For sense of scale, 160 MW is equivalent to the peak power needs of about 40,000 households. However, much of the solar PV capacity is likely to be on larger, multistory buildings, where large roof and wall surfaces are available and unobstructed by trees and other shading.

Since the 2013 adoption of the CEP, contractual power purchase agreements (PPAs) for off-site renewable energy have emerged as an effective option for large energy users. In these arrangements, an energy user signs a contract to buy the energy output from solar and/or wind installation(s) on remote site(s). These ‘utility-scale’ projects deliver the electric power to the wholesale market on the electric grid, and the transaction is settled through a financial contract.

The modeling to meet the County’s Carbon Neutral by 2050 goal assumes Arlington residents, businesses and institutions satisfy 100% of their electricity needs that are not already met by on-site generation, through transactional options, utility models, and substantive efficiency increases forecast and
based upon current research and development.

While the cost of renewables continues to fall, government can play a crucial role in hastening their adoption, as reflected in Policy 3.3. In addition, local governments can facilitate financing options like Arlington’s Property Assessed Clean Energy (PACE) Program, local aggregation (e.g., such as Arlington’s Solar Co-Op), and cross-jurisdictional aggregation and partnerships.
Transportation

Goal 4 (G4): Move more people with fewer greenhouse gas emissions

Policy 4.1: Reduce the amount of carbon produced from transportation to 0.5 mt CO$_2$e/capita/year by 2050. Milestones include (vs. 3.7 mt in 2007):

- 2020: 2.7 mt CO$_2$e/capita/year
- 2030: 1.7 mt CO$_2$e/capita/year
- 2040: 0.8 mt CO$_2$e/capita/year

Policy 4.2. Give priority to reduction of VMT and increased use of alternative and public transportation (multimodalism).

Policy 4.3. Coordinate with internal and external partners to track developments in electric vehicle (all uses) and charging infrastructure to produce a blueprint for a high-performance, cost-effective transition away from ICE (internal combustion engine) vehicles.

Reducing Arlington’s transportation-related carbon emissions from 3.7 to 0.5 mt CO$_2$e/capita/year by 2050 represents an 88% decrease in CO$_2$ emissions from transportation sources. This may seem like an ambitious target, but if vehicles drove 8% less, were 75% more fuel efficient, and were predominantly electric vehicles (using mostly renewable energy) by 2050, the transportation contribution to the CEP strategic framework supports Arlington’s 2050 goals.

Arlington County has been and continues to be a national leader in transit-oriented development and increasing transportation efficiency. Many of the CEP transportation sector strategies and tools track closely with the County’s Master Transportation Plan (MTP).

The CEP acts in concert with the MTP by sharing a common vision: make Arlington a community that includes walkable, mixed-use neighborhoods that are well served by public transportation and bicycle/pedestrian facilities. Providing reliable multimodal transportation options allows improved quality of life for residents, employees and visitors who can spend more time at home, work, and play and less time traveling. The primary means by which the County will achieve this vision are by: 1) effectively blending Master Transportation Plan (MTP), General Land Use Plan, and Community Energy Plan implementation to reduce vehicle miles traveled, 2) advocating and encouraging improvements in vehicle fleet efficiency, and 3) supporting a shift toward improved vehicle fuels that have a lower carbon content.

Goal #2 of the MTP, Move More People Without More Traffic, seeks to reduce the number of single-occupant-vehicle trips by providing residents and workers with more travel choices, such as transit, walking, bicycling, carpooling, and telecommuting.

Consistent with the philosophy of “affordable living,” Arlington will remain mindful of the unique transportation needs of each portion of the population and ensure that all modes are truly accessible and equitable for all. For example, Arlington County and the District Department of Transportation offer discounted annual Capital Bikeshare memberships to their lower-income clients. Arlington is also incorporating multimodal infrastructure in both capital and maintenance projects to support all transportation modes.
The success of these measures is evidenced in Arlington embracing multimodalism, which comprises a robust share of non-vehicular trips. There remains, however, the need for strategies to address unavoidable, emissions-producing transportation.

For vehicular trips of necessity, the County advocates the use of fuel-efficient vehicles, such as plug-in hybrid or electric vehicles. Moreover, the County’s strategic objectives look to “fuelling” electrification of vehicles with renewable energy, e.g., homes, businesses, multifamily buildings, and government fleets that are powered by roof-top, on-site, or large-scale off-site solar systems. This approach demonstrates a critical change within the energy grid whereby the power delivery system is transitioning from a buildings-driven grid to a buildings-and-transportation-driven grid.

**Policy- and Market-Based Demands of Electrification**

Some economic studies predict that electric vehicles will comprise up to 70% of the vehicle purchase market by 2050. Mass changeover and “fuel-switching” across the transportation sector must, however, be accompanied by policy and market-based solutions to the impacts of change. Successful reinvention of a service economy this large demands proactive, deliberate thinking and planning that optimizes the Market Impact Factors (see text box)\(^24\), such as:

- Federal and state policies, such as the Corporate Average Fuel Economy (CAFE)

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\(^{24}\) Note that Arlington County is not in a position to exercise broad authority over these matters, but it can adopt policies and exercise influence in aggregation with other local governments and regional authorities.
standards, simultaneously drive environmental, economic, and social/public health goals. Current standards would nearly double vehicle fuel economy by 2025 to 47 miles per gallon for passenger vehicles and light trucks (combined). Conversely, present efforts to weaken CAFE protocols will increase emissions and impacts.

- Federal, State and local government incentives, rebates and subsidies, focused on EV vehicle ownership and charging infrastructure, to replicate tangible market penetration as evidenced in other countries.\(^{25}\)

- Importantly, Federal and State governments must develop reasonable means-based fees and taxes to recover government infrastructure funds currently raised through gas taxes.

- State and local jurisdictions can leverage respective resources to ensure and map a responsive electric vehicle charging infrastructure (EVSE) network, as a resource to alleviate range or location anxiety.

- Advanced technology and more vehicle model choices are rapidly entering the marketplace to accelerate demand, so that the market share can achieve a reasonable price-point for all vehicle purchasers.

- In addition, new purchase, lease, ride-share, and call-ride mechanisms should be developed that specifically address energy equity and market accessibility to low- and moderate-income communities.

- Also, reinvention of the employment sector that currently serves the internal combustion engine (ICE) model (e.g., oil industry jobs and ICE mechanics) is needed so that energy and environmental transformation concurrently offers new employment and wage opportunities.

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\(^{25}\) For example, in Oslo, 60% of EVSE installation is covered by grants, and in China large metropolitan areas such as Beijing and Shanghai are committed to specific charge-point goals and new building standards that require EVSE wire conduit installations. The City of San Francisco, has adopted a 10% floor on Level 2 charging spaces for all new building parking lots and garages.
County Government Activities

Goal 5 (G5): Lead by example and integrate CEP goals into all County Government activities

Policy 5.1: Reduce County government CO\textsubscript{2}e emissions by at least 88\% by 2050, compared to 2007 levels, and improve energy security throughout County operations. Milestones include:

- 2020: 33\% below 2007 CO\textsubscript{2}e level
- 2030: 58\% below 2007 CO\textsubscript{2}e level
- 2040: 71\% below 2007 CO\textsubscript{2}e level

Policy 5.2: Integrate Community Energy Plan policies into County planning, policy development, internal standards, state legislative agendas, and other activities

Policy 5.3: Ensure Arlington's long-term economic competitiveness by collaborating and partnering with the private sector, universities, and other stakeholders

Policy 5.4: Diversify AIRE County- and Community-Facing Programs to implement a contemporized and adaptive portfolio, including Energy Equity programs.

Arlington County recognizes the need to institutionalize the changes recommended in the CEP. Arlington County government operations use only about 4\% of the community's total energy use. However, County government should lead the way in CEP implementation by reducing operational costs and the carbon footprint of its facilities, fleet, and other operations. Doing so will require investment in energy programs, collaboration across all County departments, and strong partnerships throughout the community.

To ensure that County government is adequately implementing the CEP, all County departments look to incorporate energy considerations into policy development, project planning, and other processes. For instance, the annual budgeting process and the biennial Capital Improvement Program process should indicate how they relate to CEP implementation. In addition, the annual legislative agenda commonly reflects the energy priorities of the County and its commitment to implementing the CEP.

As an example of this cross-cutting approach, Arlington recently updated the Facility Sustainability Policy for public sites and facilities. The Policy specifies that County projects will strive to incorporate the highest environmental standards using LEED, Net Zero Energy, and EarthCraft Virginia green building standards for County facility renovation and new construction. The purpose of the updated Policy is to:

- reduce costs through energy and water efficiency,
- achieve high-performing, durable, and efficient buildings that are easy to operate and maintain,
• to invest in healthy indoor environments for staff and visitors, and
• to set a community standard for sustainable building practices.

The Policy includes a comprehensive list of Guiding Principles to clearly define Arlington’s sustainability priorities.

CEP implementation will dovetail with implementation of other elements of the County’s comprehensive plan such as the Master Transportation Plan, General Land Use Plan, Affordable Housing Master Plan, Public Spaces Master Plan, and Urban Forest Master Plan. For example: energy efficient affordable housing will both make living more affordable for its tenants and reduce the community’s emissions. Additionally, maintaining green space reduces the heat island effect, making buildings less expensive to cool.

In addition, the Commonwealth’s annual legislative agenda commonly generates proposed bills that may impact the energy priorities of the County and its commitment to implementing the CEP. The County is expanding partnerships with other jurisdictions and regional organizations to proactively address energy issues and consolidate the shared objectives, initiative and influence of local governments throughout Virginia.

Implementation of the CEP will result in more reliable energy supplies at more stable prices, which will position Arlington well for businesses in the future. In addition, numerous innovative companies are already working in the clean energy sector in Arlington. Implementation of the CEP will help define Arlington as a center of excellence in energy issues and attract firms consistent with Arlington’s vision for a healthy business environment for ‘smart jobs.’
Education and Human Behavior

Goal 6 (G6): Advocate and support residents and businesses acting to reduce their energy usage

Policy 6.1: Engage and empower individuals to reduce energy use

Policy 6.2: Increase the level of professional expertise and workforce in the community related to energy

Policy 6.3: Ensure recognition of extraordinary efforts made to help the community reach the CEP goals

Policy 6.4: Partner with educational institutions to raise energy literacy in the community

Policy 6.5: Encourage building owners and managers to collaborate with the County through voluntary disclosure of energy usage (benchmarking).

Policy 6.6: Design and implement programs that address Energy Equity issues, including without limitation seniors, underserved, low-to-moderate income or disadvantaged communities, and challenges unique to the rental market

To achieve the CEP’s ambitious energy and carbon emissions targets, Arlington County must engage, educate, incentivize and empower the community to take personal action to reduce energy usage. New technologies, more efficient buildings, cleaner sources of energy, and more efficient and cleaner sources of transportation continue to be made available, but individuals must embrace these new opportunities for Arlington to realize its full energy potential. To reach Arlington’s diverse population, education efforts will be needed using customized approaches and channels, including person-to-person contact, social and print media, events, and a variety of effective messaging.

Because the vast majority of buildings in the County are privately owned, education plays a crucial role in encouraging building owners and managers to make energy upgrades and improve behavior. Similarly, while the County continues to improve its transportation options, residents must increasingly take advantage of these options. Finally, in addition to the short-term energy savings, educational efforts will help yield longer-term benefits by helping build support for future energy policies and the CEP.

Residential buildings account for over one-quarter of building energy demand in Arlington. The County must ensure its residents are aware of the energy savings opportunities that are available to meet its ambitious targets and to help residents save on their energy bills. When institutionalized, behavioral changes and no- and low-cost improvements can have a sizable impact on energy usage.

Arlington’s business community and workforce should be prepared to meet a growing demand for energy improvements, and to do so our skilled workforce must be equipped to facilitate energy improvements. As such, the County must encourage adequate energy training for workers.
While Arlington’s energy and carbon dioxide goals are achievable with existing technologies, there is always opportunity for innovation. The County will continue to recognize those who are innovative and make outstanding efforts to address energy issues. Providing appropriate recognition for successful innovation and implementation will help to ensure that energy generation, transmission, storage, and use continue to be in the forefront of public understanding.

A voluntary energy benchmarking and building labeling program can inform tenants and prospective buyers about energy use and costs in commercial buildings. Such a program can help make tenants and building owners aware of how well a building is performing and the level of savings that are available.
**GLOSSARY OF TERMS**

The following is a summary of selected terms and abbreviations used in the Community Energy Plan; the list is not exhaustive. In some cases, terms are defined in the body of the text and may not be repeated here.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Pollutants</td>
<td>In addition to greenhouse gases, these include sulfur dioxide (SO$_2$), nitrogen oxide (NO$_x$), hydrogen chloride (HCl), hydrogen fluoride (HF), carbon monoxide (CC), and non-methane volatile organic compounds (NMVOC).</td>
</tr>
<tr>
<td>BEV</td>
<td>Battery electric vehicle, also known as an electric vehicle.</td>
</tr>
<tr>
<td>Btu</td>
<td>British thermal unit (BTU or Btu) is a unit of energy defined as the amount needed to heat one pound of water one-degree Fahrenheit. For the purposes of the Community Energy Plan, 1,000 Btus are labeled kBtu, while 1,000,000 Btus are labeled MM Btu.</td>
</tr>
<tr>
<td>Building Code</td>
<td>Legally required construction practices.</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>(CO$_2$) The most common greenhouse gas, carbon dioxide is produced in large amounts when fossil fuels are burned. Worldwide, over 70% of man-made greenhouse gas emissions are from the use of energy; in Arlington, over 98% of our GHG emissions are from the use of energy.</td>
</tr>
<tr>
<td>Carbon Dioxide Equivalent</td>
<td>Where the “e” in CO$_2$e is used to denote the term “equivalent”; Greenhouse effect of the other five greenhouse gases identified in the Kyoto Treaty expressed in equivalents of carbon dioxide. This unit of measure is used to allow the addition of or the comparison between gases that have different global warming potentials (GWPs). Since many greenhouse gases (GHGs) exist and their GWPs vary, the emissions are added in a common unit, CO$_2$e. To express GHG emissions in units of CO$_2$e, the quantity of a given GHG (expressed in units of mass) is multiplied by its GWP.</td>
</tr>
<tr>
<td>Carbon Neutral / Carbon Neutrality</td>
<td>Net zero carbon dioxide (CO$_2$) emissions are achieved when anthropogenic CO$_2$ emissions are balanced globally by anthropogenic CO$_2$ removals over a specified period. Net zero CO$_2$ emissions are also referred to as carbon neutrality.$^{26}$</td>
</tr>
<tr>
<td>CHP</td>
<td>See “Cogeneration.”</td>
</tr>
<tr>
<td>Clean and Renewable Energy</td>
<td>This phrase is used to indicate some combination of renewable energy and cogeneration (CHP) energy sources.</td>
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</tbody>
</table>

$^{26}$ https://www.ipcc.ch/sr15/chapter/glossary/
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>CO₂</td>
<td>See “Carbon dioxide”</td>
</tr>
<tr>
<td>CO₂e</td>
<td>See “Carbon dioxide equivalent”</td>
</tr>
<tr>
<td>Cogeneration</td>
<td>Generating electricity in such a way that most of the heat produced is also used purposely, such as space heating or generating chilled water. A common definition is that an average minimum overall fuel efficiency of 70% is expected. Peak efficiency would typically exceed 90%. Also known as “CHP.”</td>
</tr>
<tr>
<td>Combined Heat and Power</td>
<td>See “Cogeneration.”</td>
</tr>
<tr>
<td>Commercial Buildings</td>
<td>Non-residential buildings; often owned or operated by for-profit entities, including offices, retail stores, restaurants, and warehouses.</td>
</tr>
<tr>
<td>Community Energy Project</td>
<td>Project that led to the CES Task Force Report and now this Community Energy Plan that provides high-level goals and policies for energy generation, distribution, storage, and use in the greater Arlington community from now to the year 2050.</td>
</tr>
<tr>
<td>CNG</td>
<td>Compressed natural gas, an alternative transportation fuel.</td>
</tr>
<tr>
<td>Daylighting</td>
<td>Designing buildings to maximize the use of natural daylight to reduce the need for electricity.</td>
</tr>
<tr>
<td>Decarbonization</td>
<td>Decarbonization is framed around decreasing the ratio of carbon dioxide (CO₂) or all greenhouse gas emissions related to primary energy production. While full decarbonization means zero unabated (not captured by carbon sequestration or storage) CO₂ emissions from energy generation and industrial processes, decarbonization doesn’t imply zero emissions, as emissions can be balanced by carbon sequestration if adequate reductions or enhanced carbon sinks exist. To effectively communicate the scale of change needed, the term must be accompanied by a timeframe and rates of decarbonization.</td>
</tr>
<tr>
<td>DEE</td>
<td>See “District Energy Entity”</td>
</tr>
<tr>
<td>District Cooling</td>
<td>Cooling services delivered via district energy systems.</td>
</tr>
<tr>
<td>District Energy</td>
<td>Networks that deliver heating or cooling to energy consumers carried through the medium of chilled or hot water, or (in older systems) steam. Heating and cooling is transferred to the home or buildings via a heat exchanger.</td>
</tr>
<tr>
<td>District Energy Entity</td>
<td>While individual buildings that are customers in a district energy network are owned by property owners and developers, a District Energy Entity (DEE) would operate and maintain the district energy network, i.e., the horizontal infrastructure of district energy piping and equipment. The DEE can also wholly or partially own the district energy network and can be publicly owned, privately owned, or a public-private partnership.</td>
</tr>
<tr>
<td><strong>District Heating</strong></td>
<td>Heat services delivered via district energy systems.</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td><strong>Energy Equity</strong></td>
<td>To ensure that access to and the impact of energy upgrades, participation in energy programs, and the movement toward a clean, reliable and secure grid is equitable across all socioeconomic and racial and ethnic groups, including low-to-moderate income and disadvantaged communities.</td>
</tr>
<tr>
<td><strong>EU</strong></td>
<td>European Union</td>
</tr>
<tr>
<td><strong>EV</strong></td>
<td>Electric Vehicle</td>
</tr>
<tr>
<td><strong>Fossil Fuels</strong></td>
<td>Combustible material obtained from below ground and formed during a geological event. For purposes of the Community Energy Plan, examples of such fuels include coal, oil and natural gas.</td>
</tr>
<tr>
<td><strong>GHG</strong></td>
<td>See “Greenhouse Gases”</td>
</tr>
<tr>
<td><strong>Greenhouse Gases</strong></td>
<td>A greenhouse gas absorbs and re-radiates heat in the lower atmosphere, trapping heat on Earth that would otherwise be radiated to outer space. The main greenhouse gases are carbon dioxide (CO₂), methane (CH₄), chlorofluorocarbons (CFCs) and nitrous oxide (N₂O), sulphur hexafluoride (SF₆), hydrofluorocarbons (HFC) and perfluorinated carbons (PFC). The most abundant greenhouse gas is carbon dioxide (CO₂).</td>
</tr>
<tr>
<td><strong>Institutional Buildings</strong></td>
<td>Nonresidential buildings generally owned by public administration, education, public or private healthcare facilities and other not-for-profit entities.</td>
</tr>
<tr>
<td><strong>kBtu</strong></td>
<td>See “Btu”</td>
</tr>
<tr>
<td><strong>Kilowatt</strong></td>
<td>A unit of power equal to 1,000 watts.</td>
</tr>
<tr>
<td><strong>kW</strong></td>
<td>See “Kilowatt”</td>
</tr>
<tr>
<td><strong>Megawatt</strong></td>
<td>A unit of power equal to one million watts.</td>
</tr>
<tr>
<td><strong>Metric Ton</strong></td>
<td>Unit of weight equal to 1,000 kilograms. Often used in the Community Energy Plan as a measure of greenhouse gas emissions. 1 mt = 1.102 US ton.</td>
</tr>
<tr>
<td><strong>Microgrid</strong></td>
<td>A local electricity distribution system containing loads and distributed energy resources, such as distributed generators, storage devices, or controllable loads, that can be operated in a controlled, coordinated way. A microgrid can connect and disconnect from the main power grid to enable it to operate in both grid-connected or island-mode.</td>
</tr>
<tr>
<td><strong>mt</strong></td>
<td>See “Metric Ton”</td>
</tr>
<tr>
<td><strong>MW</strong></td>
<td>See “Megawatt”</td>
</tr>
<tr>
<td><strong>Net Zero Energy Building</strong></td>
<td>A building that produces enough energy on-site to meet its annual energy demand</td>
</tr>
<tr>
<td><strong>Per Capita</strong></td>
<td>For each person in the total population being considered; generally referred to as a resident.</td>
</tr>
<tr>
<td><strong>PHEV</strong></td>
<td>Plug-in hybrid electric vehicle, a hybrid electric vehicle whose battery can be recharged by plugging it into an external source of electric power, as well by its on-board engine and generator.</td>
</tr>
<tr>
<td><strong>PV</strong></td>
<td>See “Solar Photovoltaic Systems”</td>
</tr>
<tr>
<td><strong>Renewable energy</strong></td>
<td>Energy generated from sources that are naturally occurring and replenishable through natural forces over a short period of time, most commonly sun, wind, water and various animal and plant derived fuels.</td>
</tr>
<tr>
<td><strong>Resilience</strong></td>
<td>The ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions caused by deliberate attacks, accidents, climate change, or weather-related threats or incidents.</td>
</tr>
<tr>
<td><strong>Site Energy</strong></td>
<td>See “Source Energy”</td>
</tr>
<tr>
<td><strong>Solar Photovoltaic Systems</strong></td>
<td>Systems that directly convert sunlight into electricity either for use locally or for delivery to the electric grid.</td>
</tr>
<tr>
<td><strong>Solar Thermal (water heating) Systems</strong></td>
<td>Systems that directly convert sunlight into heat, generally for domestic hot water though they can also be used to produce space heating.</td>
</tr>
<tr>
<td><strong>Source Energy</strong></td>
<td>The total amount of raw fuel that is required to operate an energy-using device or facility. Source energy includes all transmission, delivery, and production losses, thereby enabling a complete assessment of energy efficiency in a building. On the other hand, “Site Energy” is the amount of heat and electricity consumed by a building as reflected in utility bills.</td>
</tr>
<tr>
<td><strong>Sustainability</strong></td>
<td>Meeting the needs of the present generation without compromising the ability of future generations to meet their own needs.</td>
</tr>
<tr>
<td><strong>TOD</strong></td>
<td>See “Transit-Oriented Development”</td>
</tr>
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</tr>
<tr>
<td><strong>Transit-Oriented Development</strong></td>
<td>Land development that considers transportation choices as a means of reducing oil and other energy use. Typically, it would combine public transit with walkable, mixed-use communities, and approaches to minimize the impact of individual vehicles and commuting.</td>
</tr>
<tr>
<td><strong>VMT</strong></td>
<td>Vehicle Miles Travelled</td>
</tr>
</tbody>
</table>
CREDITS

Arlington County thanks numerous individuals and organizations for contributing to the development of the original CEP and revising the CEP. This Plan could not have become a reality without the time and effort of numerous people. In addition to the stakeholders listed below for this CEP revision, Appendix A contains the individuals and groups that were instrumental in the CEP’s creation and 2013 adoption as an element of the County’s Comprehensive Plan.

Arlington County Board
Christian Dorsey, Chair
Libby Garvey, Vice-Chair
Katie Cristol, Member
Erik Gutshall, Member
Matt de Ferranti, Member

• Environment and Energy Conservation Commission (E2C2) Energy Committee members
• E2C2 members
• November 5, 2018 CEP Forum participants
• May 30, 2019 CEP Forum participants
• June 4, 2019 CEP Open House participants
APPENDIX A

INDIVIDUALS AND GROUPS INVOLVED IN CREATING CEP 2013

**Arlington County Board (2013)**

J. Walter Tejada, Chair  
Jay Fisette, Vice-Chair  
Libby Garvey, Member  
Mary Hynes, Member  
Christopher Zimmerman, Member

Barbara Donnellan – County Manager  
Stephen MacIsaac – County Attorney

**Community Energy and Sustainability Task Force & Community Energy Advisory Group**

<table>
<thead>
<tr>
<th><strong>Businesses:</strong></th>
<th><strong>Energy and Energy Technology Industry:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrew McGeorge*, Monday Properties, Senior Associate</td>
<td>Alexei Cowett+**, Energy Efficiency Specialist</td>
</tr>
<tr>
<td>Brian Coulter#, JBG, Chief Development Officer and Eileen Nacev+, Director of Sustainability</td>
<td>Deborah Johnson#, Dominion Virginia Power, Senior External Affairs Manager and Phillip Sandino+, Director - Customer Solutions</td>
</tr>
<tr>
<td>Kevin Shooshan+, The Shooshan Company, Development Manager</td>
<td>Martha Duggan, PV and Renewable Energy Specialist</td>
</tr>
<tr>
<td>Scott Brideau, Little Diversified Architectural Consulting, Studio Principal</td>
<td>Melissa Adams, Washington Gas, Division Head, Sustainability and Business Development</td>
</tr>
<tr>
<td>Tom Grumbly#, Lockheed Martin, Vice President for Civil &amp; Homeland Security, Washington Operations</td>
<td>Michael Chipley+, President, The PMC Group LLC</td>
</tr>
<tr>
<td>Scott McClinton#, Marriott International, General Manager, Crystal City Marriott</td>
<td>Scott Sklar, PV and Renewable Energy Specialist</td>
</tr>
<tr>
<td>Colleen Morgan, SRA International, Director of Sustainable Environmental &amp; Energy Resources</td>
<td></td>
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<tr>
<td>Chris Mallin, Turner Construction, Sustainability Director</td>
<td></td>
</tr>
<tr>
<td>Jim Cole#, Virginia Hospital Center, President and Chief Executive Officer and Carl Bahnlein+, Chief Operating Officer</td>
<td></td>
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<tr>
<td>Mitchell Schear#, Vornado/Charles E. Smith, President and Jonathan Gritz+, Sustainability Manager</td>
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<table>
<thead>
<tr>
<th><strong>Local, State and Federal Government:</strong></th>
<th><strong>Citizens:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbara Donnellan#, Arlington County, County Manager and Marsha Allgeier+, Deputy County Manager</td>
<td>Larry Finch#, Arlington Civic Federation, Chair of Environmental Affairs Committee and Joe Pelton+</td>
</tr>
<tr>
<td>Jay Fisette, Arlington County Board, Task Force Chair</td>
<td>Shannon Cunniff, Environment &amp; Energy Conservation Commission, Chair</td>
</tr>
<tr>
<td>Bradley Provancha, Pentagon, Deputy Director, Defense Facilities Directorate</td>
<td>Inta Malis, Planning Commission, Member</td>
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<table>
<thead>
<tr>
<th><strong>Nonprofits/Associations:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Annette Osso+, Virginia Sustainable Building Network, President</td>
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<tr>
<td>Brian Gordon, Apartment and Office Building Association (AOBA), Virginia Vice President of Government Affairs</td>
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<td>Phil Keating#, Arlington Chamber of Commerce, Chair and Michael Foster+</td>
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<td>Nina Janopaul, Arlington Partnership for Affordable Housing (APAH), Executive Director</td>
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<td>Eric Dobson+, NAIOP, Dir. - Government Relations and Communications</td>
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<td>Dean Amel, Arlingtonians for a Clean Environment, Honorary Board Member</td>
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Nat Bottigheimer#, Metropolitan Washington Area Transit Authority (WMATA), Assistant General Manager, Planning and Joint Development and Rachel Healy+, Sustainability Project Manager

* Also serving as a liaison to the Transportation Commission
** Also serving as a liaison to the Arlington Economic Development Commission
# Task Force only
+ Advisory Group only

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27 Formerly the Pew Center on Global Climate Change
Community Energy and Sustainability Task Force Liaisons

**Businesses/Business Improvement Districts (BIDs):**
- Ballston Partnership, Pamela Kahn, Executive Director
- Crystal City BID, Angela Fox, President/CEO
- E*TRADE Financial Account/CB Richard Ellis | Global Corporate Service, Patrick Andriuk, Senior Facilities Manager
- Main Event Caterers, Joel Thévoz, Chef / Partner
- NAIOP Northern Virginia, Eric Dobson, Director--Government Relations and Communications
- Rosslyn BID, Cecilia Cassidy, Executive Director
- Columbia Pike Revitalization Organization, Takis Karantonis, Executive Director

**Citizens:**
- Arlington County Green Party, Steve Davis, Member
- Historical Affairs and Landmark Review Board (HALRB), Isabel Kaldenbach, past chairman
- Housing Commission, Michelle Winters, Member

**Educational Institutions:**
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- Arlington Public Schools, Scarlet Jaldin, Student, Washington-Lee High School
- Arlington Public Schools, Thomas O’Neil, Member, Facilities Advisory Council
- Arlington Public Schools, Clarence Stukes, Assistant Superintendent, Facilities & Operation
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- George Mason University, Potomac Environmental Research and Education Center and Lenna Storm, Sustainability Manager
- Marymount University, Dr. Sherri Hughes, Provost
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*Former County Employee*
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The Nature Conservancy, Peter Hage, Director of Resources, Technology and Information Systems  
Virginia Sustainable Building Network, Annette Osso, Executive Director |
APPENDIX B

POST-2013 RENEWABLE ENERGY
Progression, Projections, and Potential

Progression

The U.S. Energy Information Administration (EIA) estimates that 23% of all new electricity generating capacity in the United States came from solar installations in 2018—second only to natural gas.

For historical context, in 1955 Hoffman Electronics-Semiconductor Division first introduced photovoltaic products with only a 2% efficiency, with an energy cost of $1,785/Watt (USD). Modern day solar panels have an average efficiency of 26-28% and an energy cost of $2.67 to $3.43/Watt (USD), although this still means that much of the sun’s solar radiation still goes to waste even under the most ideal circumstances.

In addition, while solar PV industry has experienced significant, rapid advancement over the past decade, the exponential growth envisioned by researchers, governments and the private sector is dependent upon the ability to produce downscaled renewable systems that operate at even greater conversion efficiency.

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28 https://sites.lafayette.edu/egrs352-sp14-pv/technology/history-of-pv-technology/


30 Since 2010, the solar PV cost/Watt has dropped 73%. By 2030, total installed costs could fall between 50% and 60% (and battery cell costs by even more), driven by optimization of manufacturing facilities, combined with better combinations and reduced use of materials. International Renewable Energy Agency (IRENA) Report, Electricity Storage and Renewables: Costs and Markets to 2030 (October 2017). Since 2012, solar panel efficiency has increased by roughly 35%.
Technology Projections

Since the creation of the first solar panels in 1954, silicon has been the primary material used in solar cells. The limited capacity of silicon to create usable energy, however, has generated investments in alternative materials.

In 1996 the National Renewable Energy Laboratory of the U.S. Department of Energy (NREL) launched the National Center for Photovoltaics (NCPV), which tracks the efficiency performance for the following range of existing and emerging photovoltaic technologies (plotted from 1988 to the present):

- Multijunction cells
- Single-junction gallium arsenide cells
- Crystalline silicon cells
- Thin-film technologies, e.g., perovskites
- Emerging photovoltaics

By way of example, two technologies have demonstrated significant efficiency improvements:

- Multijunction cells rely mainly on a design that layers existing silicon cells to magnify conductivity. In December 2018, the U.S. Department of Energy announced that through a public-private partnership (SpectroLab, a Boeing subsidiary), a multijunction cell has been produced that achieves more than 40% efficiency. According to SpectroLab, the highly efficient units allow for the use of fewer cells overall to achieve the same power output as conventional silicon cells. As a result, the technology may allow for lower PV system space requirements and installation costs, at $3 per watt, and electricity production costs of $0.08–$0.10 cents per kilowatt-hour.

- “Perovskite” (CaTIO3) is a naturally occurring mineral that displays a wide variety of useful properties, most importantly a high level of superconductivity. Equally important, a process has been developed that uses synthetic materials to mimic the crystal structure found in the naturally occurring mineral. Because perovskites can be synthetically produced, they are highly hold the potential to be both cheaper to produce and easier to work with than silicon. Like other thin-film technologies, perovskite solar cell “rolls” are flexible, lightweight, and semi-transparent; and can be incorporated into parts of buildings besides just the roof. Additionally, their lightweight nature means less physical stress on roofs, walls, or wherever they may be installed.

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32 http://www.worldwatch.org/node/4803
33 In the past 7 years alone, solar cells created with perovskites have gone from an efficiency rating of just 3.8% to 20.1%.
The current major limitation is the material’s decomposition rate. If this technical hurdle can be overcome and panel efficiency continues to escalate, perovskite solar cells are potentially a high-efficiency, low-cost solar technology, and could be a future replacement for traditional silicon solar panels.\textsuperscript{35}

\textsuperscript{35} \url{https://news.energysage.com/perovskite-solar-cells/}
Technological Potential and CEP Approach and Assumptions

Renewable energy (primarily solar photovoltaics or solar PV) plays a key role in modeling for Arlington County to meet its 2050 greenhouse gas (GHG) emissions reductions goals. In 2012, three studies were conducted that would either challenge or support a scenario of 160 MW of solar energy in Arlington by 2050:

- SAIC, in a report prepared for Arlington County to identify the technical feasibility of the 160 MW of solar recommended by the CEP Task Force, found “ample” roof area to generate 160 MW, based on review of GIS images of building roofs greater than 5,000 sf. Overall, the report identified nearly 13,000,000 sf of “suitable” roof area to accommodate 160 MW or more by 2050, without including any residential or small commercial properties, or non-horizontal orientations. Thirteen million square feet is less than two percent of the County area; and
- Northern Virginia Regional Commission (NVRC) conducted an analysis using a GIS-based, LIDAR-mapped Solar Capacity Decision-Support Tool, which arrived at a larger capacity of over 400 MW

Importantly, both studies were calculated at a then-standard efficiency rate of 17%-19% for solar modules/panels. Today, the range is a minimum of 21%, which certain panels offering up to 28%. As noted above, research and development are presently focused on pilot models that offer 40%-44% efficiency.

For purposes of the CEP and based on the prior studies and technology updates above, AIRE staff recommends retaining the estimate of 160 MW as a target for 2050.

The updated GHG inventory and energy intensity modeling informs a blended-sector and technology approach that recommends a 2050 emissions reduction target of Carbon Neutrality. This amended target reflects:

- Technological advancements to date
- Continuing pace and arc of technological advancements (elasticity), e.g., current advancements reasonably predict a doubling of solar efficiency by 2035
- Sector-based transitions such as electrification of transportation
- Best practices and consensus among comparable jurisdictions (not only regional)
- Market drivers
- A suite of measures and strategies that can operate in combination to fill gaps in individual performance with over-performance under other measures (flexibility, adaptability).