Arlington County
Community Energy Plan Implementation Framework
# Arlington County

## Community Energy Plan Implementation Framework

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Introduction

The Community Energy Plan Implementation Framework (CEP Implementation Framework) establishes the framework by which the County intends to implement the comprehensive, long-term Community Energy Plan (CEP). The CEP, which is the Energy element of the County’s Comprehensive Plan, describes the County’s broad energy goals and policies of a sustainable community over the next thirty to forty years. The CEP Implementation Framework complements the CEP by describing the strategies the County intends to execute to implement the CEP and tools that the County will consider utilizing to do so.

Many stakeholders were involved in creating the CEP Implementation Framework, as they were in developing the County’s Community Energy and Sustainability Task Force Report and CEP. Our vision is to distinguish Arlington and create the most desirable and competitive commercial, residential, and retail market in the region or country. The sustained implementation of this plan is intended to provide a competitive development environment, lower operating costs, enhanced energy reliability, and fewer service disruptions for customers. These points of view ensured the CEP and CEP Implementation Framework are guided by the principles of improving economic competitiveness, energy security, and environmental commitment. In many cases, the CEP and CEP Implementation Framework already reflect these principles in ways that are complementary and mutually reinforcing. The Implementation Framework is an important starting point to encourage future conversations between staff and a variety of stakeholders about the opportunities, costs, and benefits associated with CEP implementation. These conversations will drive future work plans that lead to discrete actions by the county, businesses, residents, and others that ultimately help us achieve this vision.

Since the CEP Implementation Framework strategies and tools span across private, public, and non-profit sectors and touches on the CEP goal areas, CEP implementation will take coordination and partnerships among stakeholders.

This document is best understood when read with the CEP document. The Implementation Framework has been organized into the same six goal areas as the CEP document to help the reader connect the dots between the County’s energy Goals, Policies, Strategies and Tools.

This document defines those four terms as follows:

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 are designed, and the benefits and risks associated with a concept change in response to changes internal or external to the County; and

Tools 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.

In some cases, new legislative or regulatory authority will be required. As a “Dillon’s Rule” state, Virginia must grant enabling authority before local legislation is allowed. Virginia may not have expressly given the authority to Arlington and other local jurisdictions to implement some of the CEP Implementation Framework recommendations. Staff will identify regulatory and/or legislative authority needed from the State to increase energy efficiency and reduce energy waste.

This document contains two types of tools: existing, which are currently available but in some cases could be expanded or updated, and potential, which are included as an illustrative set of examples of what could be used to help achieve the Community Energy Plan’s goals. Implementing each potential tool (or expanding or updating existing tools) will require further project planning by County staff in coordination with other stakeholders; these project plans will be developed as necessary as tools are judged to be viable and desirable.

Broadly, the County will follow a prioritization framework (see Figure 1) for the development and deployment of specific tools. This framework will help in funding and other decision-making related to strategies and tools.

Appendix C of this document provides detailed examples of how cities around the U.S. and internationally have developed and implemented the strategies and tools that Arlington may consider.

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**The CEP Prioritization Framework**

1. **Energy Efficiency – If you don’t need it, don’t use it**
   - Efficient buildings and vehicles
   - Urban design for transportation efficiency
   - Mixed use development for commuting efficiency

2. **Heat Recovery – If it’s already there, use it**
   - Use existing ‘waste heat’
   - Combined heat and power
   - Plan commercial sites to maximize use of ‘waste’ heat use

3. **Renewable Energy – If it makes sense, go carbon free**
   - Renewable electricity – solar electric (photovoltaic), wind
   - Renewable heat – solar thermal, biomass
   - Renewable heat & power – waste-to-energy, biomass

4. **Energy Distribution -- Where it makes sense, invest in areas of greatest energy density**
   - Flexible energy distribution (electric, gas, heating, cooling)
   - Multiple fuels and energy conversion technologies
   - Explore microgrid options

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Figure 1: Arlington’s Energy Planning Priorities
Goal 1 (G1): Increase the energy and operational efficiency of all buildings

Policy 1 (P1.1): By 2050, the residential building stock 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:

- **2020:** 5% less on average than 2007 levels
- **2030:** 25% less on average than 2007 levels
- **2040:** 40% less on average than 2007 levels

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

Residential and non-residential buildings currently use about three quarters of all energy in Arlington. 26% is consumed by residential homes and 53% is used by commercial buildings. The single largest improvement that can be made to ensure the County meets its greenhouse gas emission reduction goals will be to increase the overall energy efficiency in the construction and operation of buildings. Reducing energy use can also reduce utility costs for businesses and residents. Strategies to reduce energy use in buildings must address both the new and existing building stock to achieve the CEP’s goals of economic competitiveness, energy security, and reducing GHG emissions from this critical sector.

**Strategies**

**Strategy 1 (S1.1):** Take advantage of the renovation process to encourage building owners to significantly increase building energy efficiency

The majority of buildings in place today will still exist in 2050. It is critical that the existing building stock be made more efficient through energy specific retrofits or as part of planned renovations. Given current rates of renovation (generally, about 2-3% of buildings and homes are renovated each year) all of Arlington’s building stock will be expected to be either renovated or replaced by 2050.

Efficiency after renovation will come from a combination of efficient reconstruction, improved operation, and more efficient equipment including furnaces, chillers, water heaters, controls, appliances, computers, office equipment and lighting. In many cases, improved operations through controls, combined with equipment changes, can achieve the recommended targets without the need to significantly alter the envelope of the home or buildings. Occupant and contractor awareness and training should be key factors in renovation efficiencies.

**Strategy 2 (S1.2):** Encourage new buildings to be designed, constructed, and operated more energy efficiently

**Strategy 3 (S1.3):** Ensure compliance with energy efficiency code provisions
Improving Arlington’s economic competitiveness, energy security, and environmental commitment

New buildings must meet increasingly stringent energy efficiency standards. Incorporating high performance construction practices and energy efficiency equipment and materials into new construction within evolving building codes will help ensure that existing and new buildings meet stringent energy efficiency standards.

Although not yet adopted in Virginia, it is anticipated that by 2015, the state building code will incorporate the International Energy Construction Code 2012 (IECC), which significantly increases the energy efficiency requirements for construction. The 2012 IECC is a critical tool that will help ensure that new and renovated buildings achieve Arlington’s energy efficiency goals. The 2012 IECC will require more insulation, a tighter building envelope, tighter air ducts, better windows, and more efficient lighting than the 2009 code in both new and renovated homes and buildings.

Enforcement of the new code is critical to achieving building energy efficiency. Adequate enforcement will require comprehensive training of County building code officials. Developers, builders, architects, engineers, and other building industry professionals will need to be trained on the new requirements outlined in the code as well. The building permit and inspection process provides multiple opportunities for checking compliance with energy codes, but as energy technologies evolve, the technical complexity of efficiency codes can make compliance checks more difficult unless plan reviewers and field inspectors have the relevant training. Ensuring staff have the advanced knowledge to effectively ensure energy compliance is critical for achievement of the CEP goals.

In addition to an updated building code, other efforts are underway to support high performing buildings with ever greater emphasis on energy efficiency. The International Green Construction Code (IgCC) has been developed as an overlay to the existing building code, including the IECC. The IgCC is a holistic approach to construction and includes comprehensive sustainable components for high performing buildings. The IgCC can be used for existing and new construction. Many government agencies and private organizations provide standards and guidelines to help building owners achieve better-than-code energy performance. Arlington’s Green Home Choice program, Energy Star for Homes, Passive House, and net-zero standards and the National Association of Homebuilders National Green Building Program, all focus on making residential buildings 30% more efficient than current code. For commercial buildings, ASHRAE has developed the Advanced Energy Design Guides, which set targets of 30-50% better than ASHRAE 90.1, while the US Green Building Council’s LEED green building program includes standards that would exceed code efficiency by 30% or more.

**Strategy 4 (S1.4): Take advantage of incentives to reduce new and existing building energy usage**

Although many energy efficient components and construction methods are low- to no-cost, builders and owners seek resources to cover any additional up-front costs of more efficient equipment and materials. The County continues to analyze the market needs and provides access to incentives wherever possible. Some financial assistance is readily available through Energy Star’s tax rebates for energy efficient appliances, rebates for solar installations, and the County’s green building density incentive program. Other programs need to be developed. For example, a local Property-Assessed Clean Energy (PACE) financial incentive program would provide for financing of energy efficiency upgrades. This PACE loan would be repaid as a line item on the property tax bill over a number of years. Another potential incentive program could be developed to spur the building of numerous super-efficient...
residential housing units using Passive House or net-zero standards.

**Strategy 5 (S1.5): Ensure equitable access to and use of energy efficiency and incentives programs for all income levels**

It is vital that incentive programs for energy efficiency and clean energy are available to people at all income levels in the County. Incentives to encourage affordable housing developers to adopt energy efficiency technology are available through the Virginia Housing Development Authority (VHDA). New incentive programs will be continually evaluated and promoted for use in the County.

**Strategy 6 (S1.6): Use the special exception development process to create more energy-efficient buildings**

The County’s special exception development process provides a valuable opportunity for development teams and County staff to discuss technology advancements and the costs and benefits of creating more energy-efficient buildings. The Site Plan process and the use of incentive zoning tools can advance public goals for transportation, green buildings, and other public benefits. Voluntary agreements with developers can be used to gain improvements in the energy performance of new buildings that might not otherwise be pursued.

**Strategy 7 (S1.7): Promote widespread use and display of EPLs**

The County has already begun to install energy performance labels (EPLs) in public buildings. EPLs provide a means of rating individual buildings of any type on how efficient or inefficient they are in relation to the amount of energy needed to provide users with expected degrees of comfort and functionality. For existing buildings, EPLs attest to the energy performance of a building, and provide information that may increase demand for more efficient buildings, thereby helping to improve the energy efficiency of the building stock in the County. While the County has led by example in the public building sector, the next steps include working together with private sector building owners to get voluntary adoption of a private sector EPL.

**Strategy 8 (S1.8): Encourage the use of lower carbon fuels, both onsite and for electricity generation**

The amount of GHG attributable to a building is directly related to the types of fuel used to heat, cool, and power the building. The factors that contribute to a building’s carbon generation due to energy use include:

- The type of fuel(s) used to provide the building’s electricity, e.g., coal, natural gas, nuclear, and/or renewable energy; and
- How much of a fuel source’s total energy potential is actually used by the building for heating, cooling, and electricity.

In buildings, “site” energy is defined as the amount of heat and electricity consumed by a building as reflected in utility bills. “Source” energy represents the total amount of raw fuel that is required to operate the building and incorporates all transmission, delivery, and production losses involved in the process of generating and delivering the electricity to the building. Thus, source energy calculations provide a more complete assessment of a building’s energy costs and carbon emissions.

Reducing the carbon emissions associated with buildings can be achieved in several ways. Using lower carbon fuels at the power plant (switching from coal to natural gas, for example) reduces the overall carbon generated by electricity production across the grid. Generating power specifically for a building onsite with a combined heat and power (CHP) system...
nearly eliminates transmission losses and allows the use of residual heat for building heating and cooling. This can be established on an individual building basis or on a broader community basis by developing local DE systems. CHP and DE systems can operate using lower carbon fuels (e.g., natural gas, biofuels) thus reducing carbon emissions further.

Selecting building equipment (furnaces, boilers, etc.) based on energy efficiency and fuel source impacts carbon emissions from building operations. For example, buildings that heat and/or cool using natural gas generate fewer carbon emissions than buildings heating and cooling with electricity. Finally, renewable systems, such as solar photovoltaic arrays and solar thermal systems can generate carbon-free electricity and hot water onsite.

**Strategy 9 (S1.9): Steadily reduce energy intensity (i.e., increase energy efficiency) in County and Arlington Public Schools (APS) buildings and operations**

To fully realize the goals of the CEP, sharp reductions in GHG emissions from County operations will be required. It is essential for the County to methodically improve energy efficiency throughout its buildings and operations. This involves planning, data gathering, and investments in more efficient technologies and processes in building envelopes, building equipment, automatic control technologies, and continued improvements at water pumping and wastewater treatment facilities.

**Existing Tools**

**Better Buildings Challenge** – The Better Buildings Challenge, a U.S. Department of Energy (DOE) Presidential leadership initiative,1 aims to boost job creation through investments in energy efficiency to improve the energy performance of commercial and institutional buildings by 20% by 2020. The program will catalyze private sector investment through a series of incentives to upgrade offices, retail establishments, schools, municipal buildings, universities, hospitals, and other commercial buildings. Technical assistance and peer-to-peer collaboration and problem solving are key components of the program. Arlington County joined as a Partner in October 2012, to focus energy efficiency efforts on its own buildings and to encourage private building owners in the County to join as well.

**Community planning guidance** – Arlington involves the community in the development of various types of community planning guidance. Sector, Area, and Revitalization Plans are guidance documents that provide a refined vision for future development in specific areas of the County. These plans include details for street improvements and public spaces, urban design guidelines, and direction regarding private sector development in various levels of detail. Revitalization Plans typically emphasize the economic revitalization needs of an area and provide specific recommendations on economic and incentive tools for implementation. Neighborhood Conservation Plans are prepared and developed by organized citizen groups. These plans generally address issues of neighborhood land use and zoning, traffic management, capital improvements, parks, and community facilities, etc. These various community planning documents could be used to guide energy efficient development and infrastructure.

**Site plan development process** – Arlington’s special exception site plan process and the use of incentive zoning creates opportunities for development teams to talk with County staff about the short- and long-term advantages, costs, and benefits of creating more energy-efficient buildings. Through such

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1http://www4.eere.energy.gov/challenge/
things as the green building density incentive program, the site plan review process allows integration of CEP strategies into proposed projects. For example, the site plan condition “LEED Credits and Sustainable Design Elements” rewards builders who incorporate sustainable design principles and improved energy efficiency into their buildings. In addition to improving building energy efficiency, the site plan process provides an opportunity to discuss the benefits of and opportunities for installation of energy efficient 4-pipe hydronic heating and cooling systems that will be ready to connect to future district energy systems.

LEED green building bonus density incentive – Arlington County’s green building bonus density incentive program offers site plan developers the opportunity to incorporate additional density in a building in exchange for proven environmental improvements, including energy and water efficiency, site and landscape management, materials selection, solid waste management, and indoor air quality. The program uses the US Green Building Council’s LEED® (Leadership in Energy and Environmental Design™) Green Building Rating System to measure compliance. The program was recently updated to align with the greenhouse gas reduction goals outlined in the Community Energy Plan and now requires higher LEED scores and minimum energy efficiency modeling in order to receive the bonus density. Projects may also request a small amount of additional density in exchange for a commitment to achieve LEED for Existing Buildings Operations and Maintenance or ENERGY STAR building certification after occupancy.

Energy Star – EPA’s Energy Star program is a broad based program offering guidance on appliances, electronics, home construction and commercial construction to ensure energy efficiency. Energy Star also offers Portfolio Manager software to help building owners track energy use. Arlington uses Portfolio Manager to track its own buildings, and encourages the private sector to do the same. Buildings that achieve a specific level of energy efficiency as compared to other similar buildings earn the Energy Star label. In addition to recognizing high performing buildings, Energy Star’s program encourages continuous energy improvements in buildings.

Lighting retrofit rebates for commercial properties – The local utility has offered lighting rebates and a local nonprofit currently administers a similar program, to commercial customers for specific energy efficient lighting installations and retrofits. Such programs provide opportunities for customers to replace outdated and inefficient fixtures with new lighting technology to save energy and money.

The Local Energy Alliance Program (LEAP) – LEAP is a non-profit corporation that provides technical assistance, a financial incentive, and unique financing options to Arlington homeowners who improve the energy efficiency of their existing single family homes by at least 20%. LEAP coordinates the completion of an energy audit and works with property owners and residents to make specific energy improvements (insulation, weatherization, HVAC equipment, windows, air sealing, etc) to create more comfortable homes and affordable living.

Energy Performance Labels (EPLs) in County Buildings – EPLs are posted in 38 County buildings including offices, community centers, libraries, and fire stations. Each label reports the amount of energy the building uses and the building’s carbon footprint (lbs CO2 per sq. ft.) in comparison to averages for similar building types. The labels serve to educate the public about energy use in buildings and help motivate the building occupants to reduce energy use.

Training – Training can be useful in all sectors of the community, and should begin
with K-12 curriculum and working through college and university courses, as well as advanced continuing education for professionals. Training will help expand knowledge on new techniques, technologies, and programs to ensure high performance construction and improved energy efficiency. County plan reviewers and building inspectors should be trained as well to ensure expected energy performance.

**Potential Tools**

**Updated State Building Code** – The International Code Council has proposed an updated national model energy code known as the International Energy Conservation Code (IECC 2012). The proposed IECC 2012 raises energy efficiency standards by approximately 30% over the IECC 2006. The code achieves this goal by setting minimum requirements for energy efficiency in new buildings and additions/renovations in existing buildings. The code addresses improvements in building thermal envelope, lighting systems, air sealing, and heating and cooling systems. Arlington supports the adoption of the IECC 2012 by Virginia’s Board of Housing and Community Development.

**Building Energy Asset Rating** – In contrast to operational energy performance ratings, which are based on actual energy use, building energy asset ratings evaluate the energy efficiency of a building’s envelope and mechanical and electrical systems. This way, a building asset rating is independent of tenant behavior, building operating characteristics, and building management. The goal of asset ratings is to educate stakeholders and enable the real estate market to value energy performance in a manner that increases investments in energy efficiency. The U.S. Department of Energy is currently leading a national building energy asset rating process.²

**Financial incentive programs** – A variety of financial incentives are potential tools to increase investments in energy efficiency in buildings. These could include: tax incentives from local government for demonstrated energy efficient performance; rebates from utilities, state, and local government for purchase and use of energy-efficient technologies in buildings; use of Property-Assessed Clean Energy (PACE) financing, whereby private loans for investments in energy efficiency upgrades or renewable energy are repaid through a lien placed on the real property and collected with real property tax collections; and the use of a local multi-sector cooperative (one-stop shop) that might package financing, efficiency upgrades, and local workers to implement measures to improve building performance.

**Energy Performance Labels (EPLs) in private sector and Arlington Public Schools buildings** – As noted, 38 County buildings have EPLs. The use of EPLs in privately-owned properties has the potential to raise awareness and adds an element of healthy competition for management.

**Information Technology and ‘Smart’ Building Energy Management** – Building automation and related IT control systems continue to improve in their ability to manage energy use. Real-time feedback, submetering, and dashboards for both building operators and occupants provide exciting new opportunities for substantial reductions in building energy use by turning off systems when they are not needed. Improvements in IT have made these systems more cost-effective than ever before, and are scalable from individual sites to enterprise-wide applications. The

County plans to increase the use of these technologies in its own facilities, and can share lessons learned and best practices with the private sector. See additional tools in Appendix B.
Goal 2 (G2): Increase local energy supply and distribution efficiency in Arlington using District Energy (DE)

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 megawatts (MW) connected load of District Energy and 104 MW of Combined Heat and Power (CHP) by 2050.

Policy 2 (P2.2): Plan and build infrastructure in appropriate locations to facilitate district energy distribution and future connections

DE systems facilitate the efficient use of the heat from local CHP generation, greatly reducing the fuel waste normally associated with making electricity. Approximately 65% of the energy involved in electric generation and distribution is lost before it arrives at a home or commercial building. This contrasts with a 10% energy loss that occurs in the natural gas extraction and delivery system. Thus, valuable natural resources and fuel that has been paid for by the consumer is simply wasted in today’s energy marketplace.

As noted in Appendix C, DE systems support energy efficiency and GHG emissions reduction goals in two fundamental and interrelated ways. First, by aggregating heating and cooling supply to multiple buildings, they optimize thermal energy efficiency, by as much as 20% in some settings. (Efficiency can be further increased if the buildings connected to a DE system have diverse loads.) Second, the aggregation of buildings allows those that could otherwise not access lower-emission energy sources to do so on a more affordable basis.

By using pipes to carry a shared hot water resource that is created as a by-product of locally-created electricity, Arlington County strives to increase its overall energy system efficiency from 30% to 80% or better. District energy supports the vision of the CEP by reducing energy costs to customers, providing a more reliable, secure, and less volatile source of energy, and by reducing GHG emissions.

Strategies

Strategy 1 (S2.1): Create a District Energy Entity (DEE) to own a DE System

A DE system, like any other utility, requires a dedicated, reliable owner and operator. Long-term energy rate contracts between building owners and the providers of district energy help businesses reduce risk and improve energy price predictability. Before signing up for long term district energy contracts, potential customers want to know that they will be able to rely on the service promised by the DE system. The first step toward that end is to create the actual DE Entity (DEE).

DEE ownership structures vary worldwide. The four primary ownership options include:
1. **100% Publicly-owned**, where the DEE would be owned and operated by the County.

2. **Public-private partnership**, where the DEE would be jointly owned and operated by the County and a private company.

3. **Privately-owned**, whereby the DEE would be owned entirely by a private company operating under contract from the County to deliver DE services.

4. **Site-specific private company-owned**, where a special purpose company would provide DE services specifically for a single site or campus.

**Strategy 2 (S2.2): Build, operate and maintain DE systems as opportunities arise, and CHP systems as appropriate, in areas having the highest probability for DE**

In parallel to considering the best ownership structure for a DEE, Arlington County will also consider the feasibility of DE systems in priority areas. This will include thermal only systems which provide heating and/or cooling, as well as CHP systems that also generate electricity. Systems that include power generation are able to achieve much higher efficiencies, provide a more stable source of on-site energy generation, and generate greater CO₂ savings.

Priority areas are those with highest energy density—the more energy dense an area is, the more likely that DE is economically feasible. See Appendix A for a map of energy density of neighborhoods in Arlington.

Arlington defines “as opportunities arise” and “as appropriate” through the three lenses of the CEP. For a project to be an “opportunity” or “appropriate”, it should be an improvement over status quo in economics, CO₂ emissions, and/or energy security.

**Strategy 3 (S2.3): Encourage new and renovated buildings to have DE compatible systems in areas where DE has a high probability of success**

Arlington will encourage developers of new and renovated buildings in energy dense areas to install DE-compatible heating and cooling systems. To be district heating- and cooling-compatible, a building must have both hydronic heating and cooling systems. This has two benefits. First, it ensures that developers will be able to benefit from tying into future DE systems: lower costs, reduced energy usage and CO2 emissions, and more secure and resilient energy infrastructure. Second, DE-compatible heating and cooling systems help buildings improve their energy efficiency.

**Strategy 4 (S2.4): Establish a process and guidelines for buildings to connect to DE Systems in areas where DE has a high probability of success.**

Once a DEE and DE system(s) are in place, Arlington and/or the DE system should work to create a process and technical guidelines for buildings to connect to the DE system. Connection to a DE system can be difficult, time-consuming, or impossible for buildings that aren’t designed with DE in mind. Technical guidelines will help ensure that future buildings are able to tie into the system, allowing the DEE to bring in new customers more easily.

**Strategy 5 (S2.5): Develop a DE infrastructure plan to facilitate DE distribution and future connections**

**Strategy 6 (S2.6): Coordinate the installation of DE distribution pipes and related infrastructure as appropriate**

Implementation of DE is a logistically complicated process, and will require planning and coordination by the County. One particular challenge is the installation of
pipes to carry hot and cold water to customers. To this end, Arlington will develop a DE infrastructure plan. Additionally, the County may facilitate installation of DE pipes and related infrastructure as opportunities for coordination with other construction projects arise. Coordination can result in significant savings, since around 50% of the costs related to DE piping are associated with installation.

**Strategy 7 (S2.7): Link DE/CHP to streetcar lines and other transportation infrastructure as appropriate**

Arlington currently plans to install two streetcar segments, one in the Route 1 corridor and one running down Columbia Pike. Arlington will look into the feasibility and economic appeal of CHP systems providing power to these streetcars and other transportation infrastructure. Additionally, it may be possible to co-locate CHP plants and streetcar substations.

**Strategy 8 (S2.8): Revise the Arlington County Code to reflect CEP goals**

Certain policy directions pursued through the CEP may suggest revisions to the Arlington County Code for implementation. As with any other CEP implementation item, the County would work with stakeholders to ensure any changes would improve Arlington’s economic competitiveness, energy security, and environmental commitment.

**Existing Tools**

**Community planning guidance** – Arlington’s Community Planning documents, detailed in the buildings section, are guidance documents that provide a vision for future development in specific areas of the County. These plans include details for street improvements and public spaces, include urban design guidelines, and offer direction regarding private sector development. As Arlington looks at district energy implementation, these documents can provide vision, detail, and data to help better understand DE feasibility.

**Crystal City Integrated Energy Master Plan (CC IEMP)** – An IEMP is a comprehensive plan defining the energy efficiency of construction, energy distribution and energy supply to achieve economic, environmental and other goals. Typically an IEMP would cover at least 15 years into the future and would apply to a neighborhood within Arlington County.

The County has conducted an IEMP in Crystal City. A presentation summarizing the findings of the Crystal City IEMP can be found [here](#). These results will help inform decision-makers on the viability of district energy in the study area, through the lenses of economic competitiveness, GHG reductions, and energy reliability and security. The study also discusses the next steps for creating a business plan and eventually establishing a district energy system in Crystal City.

**EPA’s Combined Heat & Power Partnership** – Arlington is a member of the EPA’s CHP partnership, which is a voluntary program that works with energy users, the CHP industry, state and local governments, and other clean energy stakeholders to facilitate the development of new CHP projects and to promote their environmental and economic benefits. It provides a number of resources, including information on funding, federal incentives, and best practices.

**Potential Tools**

**County’s Horizontal Design Guidelines, district energy best practices, interoperability standards, and operations and maintenance plan** – A host of guidelines and plans must be created to send a signal to the private sector that a DE system will in fact become a reality. These resources will also provide certainty to developers and landowners regarding where the system will be installed. These documents and others...
related to the system will provide the underpinnings for the system’s creation and its operations and maintenance. Having these plans in place and being able to refer to them as other projects get underway in areas earmarked for DE can help optimize the process for DE infrastructure implementation.

**Integrated Energy Master Plans (IEMPs) for Rosslyn, Columbia Pike, Courthouse, etc.** – In addition to the Crystal City IEMP which was completed in 2012, the County will embark on IEMPs to understand the viability of district energy in other areas of interest.

While Crystal City is the most energy dense neighborhood in Arlington (energy density is a good indicator of DE viability, see Appendix A), Rosslyn is a close second and therefore a logical choice for the next IEMP. Columbia Pike is an attractive option because the planned streetcar is projected to bring redevelopment and growth along the corridor. The Courthouse area is home to a number of County buildings, so it may provide an opportunities for the county to “practice what it preaches” when it comes to district energy.

See additional tools in Appendix B.
Goal 3 (G3): Increase locally generated energy supply through the use of renewable energy options


Policy 2 (P3.2): Increase the use of renewable energy technologies in the public, private, and non-profit sectors.

The use of renewable energy, particularly solar photovoltaics (solar electricity) and solar water heating (solar thermal) can reduce operating costs for businesses and homes. Solar energy contributes zero GHG emissions. In addition, since solar photovoltaics generate electricity largely coincident with summer cooling demands, the use of solar PV helps reduce the summer peak demand for electricity. To eliminate the summer peak demand for power and reduce overall GHG emissions, the County aims to have 160 MW of solar PV installed in the County by 2050.

In addition, the County supports the use of various renewable energy technologies in residential settings, including solar thermal water and space heating systems, and increased use of daylighting in architecture. Small-scale wind power generation is generally not effective in Arlington, but advances in technology may make that more feasible, and the County will help remove barriers that may exist to its use.

Strategies

Strategy 1 (S3.1): Increase renewable energy generation through incentives

Although the price of solar and other renewable energy technologies continues to fall, the deployment of solar is often hampered by relatively long returns on investment. Federal and State tax credits and rebates have been available for solar installations, but these programs and incentives are intermittent. In other states, well-established state and/or local incentives have played an important role in the financial packaging of new renewable installations by reducing the risk of investment.

Arlington will promote existing Federal and state incentives, and join with others to advocate continuation or enhancement of these programs. In addition, Arlington will evaluate the costs and benefits of providing local grants or rebate funding for eligible renewable projects, to better leverage other programs. Furthermore, access to capital is often a restriction inhibiting investments in renewables. Arlington will pursue means to increase access to capital through emerging programs like Property-Assessed Clean Energy Financing.

Strategy 2 (S3.2): Eliminate regulatory and legislative barriers to increase renewable energy production

While not permitted in Virginia, in many states, Power Purchase Agreements (PPAs) have been essential to allow third-party investors to install and own large-scale solar photovoltaic systems on commercial, institutional, and government property. These 3rd party investors take advantage of Federal tax credits and accelerated depreciation to profit from these installations, while the host (property owner) benefits from stable electricity prices and lower-carbon energy. In addition, mandatory Renewable Portfolio Standards (RPS) in many states have been effective catalysts for cost-effective deployment of renewable energy projects, since the RPS creates a market for the environmental
attributes of the projects as well as the energy they generate.

Arlington will work with others to remove barriers to private investments.

**Strategy 3 (S3.3): Encourage the development industry to integrate renewable energy technologies and best practices into the development design process**

Renewable technologies, especially solar photovoltaics, should be integrated into the project design process early on as opposed to adding the use of such technologies as an afterthought. Examples of building-integrated photovoltaics (BIPV) include vertical windows with photovoltaic substrates, and electricity-generating solar shingles for rooftops. Arlington will help build awareness of BIPV and related advanced technology options within the building design community through educational events and collaboration with other organizations.

**Strategy 4 (S3.4): Partner with utilities to increase and optimize the use of renewable energy to create a more secure and reliable power grid**

The proper installation and operation of individual solar PV systems do not interfere with electric utility service to others. There may be questions about the long-term effect on electric grid system performance with widespread use of PV, since extensive solar PV in this region is untried. Dominion Virginia Power has introduced plans for substantial installations of solar PV on a variety of electric circuits to test system performance. Partnering with the utility on such projects is an important opportunity to advance the use of solar PV in Virginia.

**Strategy 5 (S3.5): Encourage solar hot water and other renewable technologies**

There is not general understanding of the benefits of solar and other renewable technologies, particularly concerning the weather-dependence of these energy sources. Arlington will promote understanding of the uses and limitations of solar and other renewables, so that users’ results match reasonable expectations. There are many practical lessons to be learned from existing solar hot water, solar PV, and small-scale wind projects in Arlington and other nearby locations. In addition, the County will stay abreast of emerging technologies and applications for solar and other renewable technologies, and share these insights with the public on a routine basis, along with information on any and all financial incentives that may be available.

**Existing Tools**

Financial incentives – Federal tax credits equal to 30% of the installed cost of solar, wind, and fuel cell technologies are available for residential and commercial properties until December 31, 2016. These tax credits are a substantial incentive for the use of solar and other renewable technologies, including solar thermal for water heating. Promotion of this financial incentive, and advocacy for its extension beyond 2016, are important tools for the County toward its renewable energy goals.

**Potential Tools**

Power Purchase Agreements – Solar Power Purchase Agreements (SPPAs) are not currently allowed in Virginia. An SPPA is “a financial arrangement in which a third-party developer owns, operates, and maintains the photovoltaic (PV) system, and a host customer agrees to site the system on its roof or elsewhere on its property and purchases the system’s electric output from the solar services provider for a predetermined period. This financial arrangement allows the host customer to receive stable, and sometimes lower cost electricity, while the solar services provider or another party acquires valuable financial benefits such as..."
tax credits and income generated from the sale of electricity to the host customer.”

Local financial incentives – State law gives localities the authority to exempt solar energy equipment from real property taxes. Staff will examine local incentive options carefully during implementation of the Community Energy Plan.

See additional tools in Appendix B.

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3http://www.epa.gov/greenpower/buygp/solarpower.htm
Goal 4 (G4): Refine and expand transportation infrastructure and operations enhancements

Policy 1 (P4.1): Reduce the amount of carbon produced from transportation to 1.0 mt CO\textsubscript{2}e/capita/year by 2050. Milestones include (vs. 3.7 mt in 2007):

- 2020: 2.7 mt CO\textsubscript{2}e/capita/year
- 2030: 2.0 mt CO\textsubscript{2}e/capita/year
- 2040: 1.7 mt CO\textsubscript{2}e/capita/year

Although Arlington County has been and continues to be a national leader in transit oriented development and increasing transportation efficiency, the County plans to further decrease energy use in its transportation sector to help reach its 2050 CEP goals. Many of the CEP transportation sector strategies and tools track closely to the approved County’s Master Transportation Plan (MTP). For instance, Goal #2 in 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, carpooling, walking, and bicycling.

Strategies

Strategy 1 (S4.1): Support MTP General Policies implementation: Reduce vehicle miles traveled by integrating transportation with land use, developing Complete Streets, and managing travel demand and transportation systems

The Arlington Master Transportation Plan (MTP) promotes effective travel and accessibility for the County’s residents, workers, and visitors through the year 2030. It provides a policy framework to guide the development of projects and programs, advance the County’s goals and objectives, and help direct investment. The MTP policies will affect how people travel, regardless of their mode of travel. As Arlington continues to grow, the MTP will play an important part in determining how the County will accommodate that growth.

The CEP embraces and supports the MTP’s General Policies. Implementing those MTP General Policies will help the County reach its CEP goals of strengthening the local economy, increasing energy supply security, and improving the County’s long-term environmental commitment.

Strategy 2 (S4.2): Continue to support alternatives to car ownership and use

In alliance with the Center for Clean Air Policy recommendations, the County plans to use a multi-pronged approach to reduce transportation-related GHG emissions. This approach includes supporting alternatives to car ownership and use. Arlington will continue to manage the modal share distribution by focusing on denser development in the Metro corridors, and as has been the case for the past twenty years, the County will implement strategies that support transit, bicycle and pedestrian activity. The County will also continue to develop Complete Streets, high-capacity transit corridors, and transit-oriented development.

Strategy 3 (S4.3): Support Federal and State efforts to increase vehicle fuel efficiency

In late August 2012, the federal government finalized critical standards that will increase fuel economy to the equivalent of 54.5 miles per gallon (mpg) for cars and light-duty
trucks by Model Year 2025. The historic standards issued by the U.S. Department of Transportation and the U.S. Environmental Protection Agency build on the success of the standards for cars and light trucks for Model Years 2011-2016. Those standards raised average fuel efficiency by 2016 to the equivalent of 35.5 mpg. Such changes help reduce GHG emissions, reduce vehicle owners’ vehicle fuel bills, and strengthen our national energy security. Arlington will continue to support these and other efforts at other levels of government to reduce the transportation sector’s impact on energy use.

**Strategy 4 (S4.4): Increase the fuel efficiency of County and Arlington Public Schools fleets**

Arlington will continue to exert its direct influence over the fuel efficiency of County vehicles, school buses, ART buses and taxicabs. Arlington was the first local government on the East Coast to purchase energy-efficient hybrid-electric vehicles. These vehicles are widely used by County staff for various work functions, and combine high-efficiency gasoline engines with an electric motor and rechargeable batteries to achieve high gas mileage. The County will continue to look for ways to increase the use of hybrid-electric and all-electric vehicles to help further increase its fleet’s overall vehicle fuel efficiency. Arlington will also identify and implement policies and programs to facilitate the community’s use of electric vehicles.

**Strategy 5 (S4.5): Reduce the carbon produced by County and Arlington Public Schools fleets**

The carbon emissions from fleet vehicles will be reduced through strategic decisions influencing (a) the purchase of fuel-efficient County and Arlington Public Schools vehicles, (b) the fuels used by these vehicles, (c) smart driver behavior using the vehicles, and (d) programs and policies that enable fewer vehicular trips, such as telecommuting for meetings and co-location of complementary activities.

**Strategy 6 (S4.6): Operate and maintain traffic infrastructure with an eye toward energy efficiency and vehicle fuel efficiency**

The evolution of technology for streetlighting, traffic signals, and automatic controls for these systems is making deep reductions in energy use possible. LED technology is now in use for streetlights and traffic signals, sharply reducing energy consumption per unit. In addition, LEDs can be dimmed for portions of the night (e.g., midnight to 5 am) to further reduce energy use. Modern traffic signal control technology also helps optimize vehicular traffic flow for safety and vehicle fuel economy (e.g., reduced idling).

**Strategy 7 (S4.7): Encourage the purchase and use of lower-carbon producing vehicles**

Through the development of incentives and by making it easier for citizens to identify lower-carbon producing vehicles, Arlington County will facilitate the purchase and use of vehicles that have a lower impact on carbon production. Examples of lower-carbon producing vehicles include hybrids, plug-in hybrids, electric vehicles, and those that run on compressed natural gas.

**Strategy 8 (S4.8): Increase the availability of reduced-carbon content vehicle fuels**

As part of a comprehensive Implementation Framework, the County recognizes that it must address transformation on numerous fronts. It is not enough to provide incentives so that people purchase low-carbon producing vehicles. To enable people to actually use those vehicles, the County must help ensure that the fuels are available to power the vehicles. For instance, the County can work with entrepreneurs to ensure that vehicle owners have easy access to fixed or mobile alternative vehicle fueling options.
Strategy 9 (S4.9): Work with regional organizations and individual jurisdictions in the DC Metro region to proactively address transportation issues

The Task Force Report recommended two GHG emission goals for 2050 – one goal set 3.0 metric tons per capita per year as a target. The Task Force added a secondary goal of 2.2 metric tons contingent upon the creation and successful implementation of a regional energy plan, particularly when it comes to creating synergy in the transportation sector. This further highlights the importance of addressing the transportation sector in order to achieve successful CEP implementation. Since a high percentage of single-occupancy vehicle traffic during peak periods comes from outside Arlington, the County should work with other jurisdictions to create regional demand-side management strategies.

Existing Tools

Bikeshare Transit Development Plan – The nation’s largest bikesharing system, Capital Bikeshare, launched in September 2010 with stations located in the District of Columbia, and in Arlington, Virginia. The system has over 1,670 bicycles that people can access and use 24 hours a day, 365 days a year. Capital Bikeshare adds another option to the transportation mix and thus helps to reduce transportation sector greenhouse gas emissions.

The Bikeshare Transit Development Plan explains how the system is slated to expand from FY13-FY18. Expansion will focus on building out the system in South Arlington, especially along Columbia Pike and in Shirlington.

Master Transportation Plan (MTP)

Implementation Plans for adopted elements – Arlington’s comprehensive Master Transportation Plan (MTP) provides general guidance for Arlington’s transportation system. The MTP includes a Goals and Policies document, a map which illustrates key existing transportation facilities and planned system improvements, and Implementation Plans providing detailed information for additional Modal Elements in the following areas: Transportation Demand and System Management, Transit, Streets, Parking and Curb Space Management, Pedestrians, and Bicycles.

Implementing the MTP will help the County reach its CEP greenhouse gas emissions goals. Instead of relying on relatively inefficient single occupancy vehicle transportation, the MTP encourages the use of environmentally sustainable modes, including bicycling, walking, transit, carpooling, and telecommuting.

Site plan conditions, e.g., Transportation Management Plan, Bicycle Storage Facilities – Arlington’s special exception process, detailed in the Buildings sections of this document, often results in numerous site plan conditions that address transportation issues, including the standard Transportation Management Plan and Bicycle Storage Facilities conditions. These two conditions explain what the developer will do to ensure that the project helps implement the MTP Goals and Policies.

Telecommuting and Hoteling –

Telecommuting is working from a remote location, often from home rather than commuting to and from an employer’s work site. Office hoteling is a system for assigning temporary office space to employees, instead of assigning permanent office space to each employee. Implementing these concepts may help reduce vehicle miles traveled and thus reduce transportation sector GHG emissions.

Taxi Ordinance requiring improving fuel economy – In June 2009 the County Board enacted an Arlington County Taxicab Ordinance. The Ordinance set a minimum Average Fuel-Efficiency Rating (mpg) for
New Taxicabs, with that minimum increasing over time. Also, by including in the County Manager’s review of taxicab certificate applications variables such as the Average Fuel-Efficiency Rating and an Applicant’s overall intended fleet sustainability, the County continues to make the entire taxicab fleet more fuel efficient.

**Transit Development Plan** – The Arlington Transit Development Plan (TDP) will guide the growth of transit and paratransit services provided by the County through Arlington Transit (ART), Specialized Transit for Arlington Residents (STAR), and by the Washington Metropolitan Area Transit Authority (WMATA) through Metrorail, Metrobus and MetroAccess. Transit minimizes growth in single occupant vehicle trips, promotes the use of all other modes of travel, and reduces GHG emissions from the transportation sector. Many measures are proposed to achieve a shift away from use of personal motor vehicles towards greater use of transit, carpooling, bicycling, and walking. Taxis and car-sharing also offer opportunities to reduce auto ownership and dependence.

**Potential Tools**

Promotion of transit options – Part of the Arlington Transit Development Plan’s (TDP) Six-Year Transit Service and Facility Plan provides a list of suggested improvements which, when implemented, will help promote greater use of transit. For example, the TDP recommends improving transit service levels, including service frequency, new service hours or service periods (e.g., midday service), days of service, and service productivity related changes. Also, recognizing that riders want transit service to be on time for arrivals and departures, the TDP recommends improving route running times to ensure high levels of on-time performance. In addition, ART’s RealTime Tools tell riders in real-time through their Smartphone or on-line when an ART bus will arrive. Expanding upon measures throughout the entire transit system will help improve service and encourage more people to use transit, reducing GHG emissions.

Regional coordination – Arlington is situated next to Washington, DC, enabling Arlington residents to travel relatively short distances for many of their trips. Despite Arlington’s attempts to improve its transit services, continued reductions in single-occupancy vehicle use during peak periods are needed to further reduce vehicle miles traveled (VMT) in Arlington. Since a high percentage of single occupancy vehicles traveling during peak periods originate outside Arlington, the County should continue to work with neighboring jurisdictions to create regional transportation strategies.

Arlington could play an integral role in collaborating with other jurisdictions to ensure common methodologies are used in transportation planning and GHG emissions inventory updates and regional demand-side management strategies are used.

See additional tools in Appendix B.
Goal 5 (G5): Integrate CEP goals into all 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:

- 2020: 25% below 2007 CO₂e level
- 2030: 42% below 2007 CO₂e level
- 2040: 59% below 2007 CO₂e level

Policy 2 (P5.2): Integrate Community Energy Plan policies into County planning, policy development, and other activities

Policy 3 (P5.3): Take advantage of CEP implementation to ensure Arlington’s long term economic competitiveness

For an effort as broad in scope as the CEP, it is essential for the entire Arlington County Government to be involved and committed to its execution. This involvement and commitment will be demonstrated by leading by example, that is, achieving energy efficiency, energy assurance, and GHG emission reduction targets for its own operations that are at least as rigorous as those set for the broader community. This requires the County to have a pool of suitably-qualified civic leaders, managers and workers with the skills to implement the CEP. In addition, CEP implementation will need cooperation and coordination across multiple County departments. The County will also continue to work closely with community leaders to ensure that CEP goals, strategies and tools align with stakeholders’ needs.

Strategies

Strategy 1 (S5.1): Propose state and federal regulatory and legislative remedies to achieve CEP goals

The CEP cannot be implemented or achieved in a vacuum. Energy systems have local, regional, and national dimensions, and some state and federal laws and policies present barriers to achieving this Plan’s goals. Amending laws and regulation at the state and federal levels may be necessary to assist in fulfilling CEP goals.

Strategy 2 (S5.2): Fund CEP Implementation

Implementing the CEP will require resources of staff, operating funds, and capital funds. Funding for implementation will be pursued through the General Fund for staff and operating costs, and through the Capital Improvement Program for long-term infrastructure investments. Additional funding sources may include federal and state grants, and capital funding through the Virginia Resource Authority. In every case, expenditures should be made on a sound economic cost-effectiveness basis for prudent stewardship of taxpayer funds.

Strategy 3 (S5.3): Work with regional organizations and individual jurisdictions in our metro region to proactively address energy issues

Many energy-related systems and infrastructure are regional in scale and operation, including: transportation networks of roadways, railways, other transit systems like buses; the electric grid; the natural gas distribution network; and, architects, engineers, and building construction trades typically operate in multiple jurisdictions across political boundaries. Transportation, land use, and other planning decisions in one location can affect conditions in neighboring locations. Therefore, cooperation and
coordination with regional bodies and individual jurisdictions is essential to maximize local results, avoid unnecessary duplication of effort, and avoid conflicts in efforts or policies. In addition, cooperation with others allows for added scale and influence, such as cooperative purchasing leading to economies of scale for products and services as diverse as fuels, solar installations, or vehicles.

**Strategy 4 (S5.4): Develop and coordinate financial incentive programs**

The County realizes that financial incentives and programs are central to this transformative CEP. There are many potential financial incentives and programs targeting a wide variety of technologies and energy sectors. It is imperative that an organized clearinghouse exist for clarity on available funds, programs, their purpose, and applicability.

In addition to federal, state, utility, and private-sector funding opportunities, some of these financial programs may be County-funded. One likely purpose of County-funded programming would be to leverage other, larger sources of funding. Alternatively, programs to fill gaps in other financial tools could be met with County resources.

**Strategy 5 (S5.5): Establish and track metrics to measure CEP progress**

The CEP consists of an overarching ‘headline goal’ – GHG emissions per capita – that is viewed through lenses of economic competitiveness, energy security, and environmental protection. In addition, the Plan includes several more specific goals for different energy sectors that contribute to achievement of the headline goal. It is essential that the County establish metrics to track progress toward these goals. Staff are identifying key indicators and metrics for progress towards energy use reduction, resilience, and energy-related economic competitiveness.

**Strategy 6 (S5.6): Retain existing and attract new businesses and jobs through CEP implementation**

There are a number of energy-related businesses in Arlington today. The implementation of the CEP represents an opportunity to expand energy-related business opportunities in Arlington, and make Arlington a noted clean energy industry location. Energy-related businesses include (but are not limited to): architectural design; mechanical, electrical, and plumbing consulting engineering firms; mechanical, electrical, and information technology services; home energy retrofit businesses; energy analysis and consulting; banking and finance; and solar and energy efficiency installation and services. These businesses include workers ranging from professionals with advanced degrees, to skilled field technicians and trades workers. Growth as an employment center in the clean energy field is consistent with Arlington’s emphasis on ‘brainpower’ as our economic engine.

**Strategy 7 (S5.7): Strengthen partnerships with colleges and universities to identify opportunities to reach CEP goals**

Work in the clean energy field requires strong secondary and higher education, as well as continuous training. The County will build upon its existing relationships with institutions of higher education in and around Arlington to help build expertise in a broad range of energy topics, including community energy planning. In addition, the County will strengthen its partnerships with secondary schools and technical institutes that prepare students for work, as well as local and regional employers to ensure that the workforce will be available to meet the needs of Arlington and the CEP.
Potential Tools

County operations energy plan – Staff will create a broad County Government Operations Energy Plan to improve energy security and reliability in County operations while decreasing energy consumption through efficiency and renewables in buildings, infrastructure, and vehicles. In addition, Arlington will create and implement County Government-wide policy guidance regarding the fuel efficiency of vehicle purchases and vehicle fuel choices, which will help transform the County and APS vehicle fleet. Implementation of this energy plan will continue Arlington’s history of leading by example while informing efforts for the broader community.

CEP budget – Implementing the CEP will require resources beyond what the County presently has for on-going programs. The AIRE program already supports the CEP with staff and programmatic activities, but the scope of the CEP will necessarily expand this effort to be successful.

Capital Improvement Plans (CIPs) – Implementing some CEP tools and strategies will require capital funding, particularly for district energy. Additional line items to the Capital Improvement Program will be identified as needed. The County will also identify existing sources of funds or will work to create other incentive programs to help defray additional project costs attributed to CEP tool implementation.

Financial incentive programs – As available, and to the extent authorized by law, County funds may be used for incentives for efficiency gains and deployment of renewable in the private sector. These could be in the form of rebates, tax exemptions, or grants. These funds are not readily available today, but consideration of these resource streams is an option for the future.

Regional energy planning – Establishing and improving local, regional, statewide and national relationships and partnerships can help the County implement the CEP and accelerate its success. The County should continue work with regional organizations and neighboring jurisdictions to advance coordination on energy and transportation planning. There are valuable economies of scale in coordination, and essential synergies from coordinated transportation planning.

See additional tools in Appendix B.
Goal 6 (G6): Advocate and support personal action through behavior changes and effective education

Policy 1 (P6.1): Engage and empower individuals to reduce energy use

Policy 2 (P6.2): Enhance level of professional expertise and work force in the community related to energy

Policy 3 (P6.3): Ensure recognition of extraordinary efforts made to help the community reach the CEP goals

One of the primary challenges for CEP implementation is that people generally do not pay attention to the importance of energy, its role in society, and how much energy they use each day. Thus, the overarching goal for effective energy education and engagement is to increase the general public’s energy awareness. Once people learn the basics of energy literacy, then further outreach can enable more sophisticated decision making about energy use.

Teaching and training all segments of the population is critical to the success of CEP implementation. While it is important to educate the general public, a successful education and engagement program will include outreach to energy and building industry professionals.

Strategies

Strategy 1 (S6.1): Raise personal energy literacy among all populations

To the average American, energy is usually something that is taken for granted. While many people can tell you approximately their vehicle’s MPG rating, they cannot tell you how many kilowatt-hours of electricity or therms of natural gas their homes used during the past month. Energy matters generally take a back seat to other issues that are on people’s minds.

Energy is inextricably linked to personal decisions regarding many long-term and day-to-day decisions involving home location, transportation choices, and appliance and equipment purchases and use. The County will use a variety of methods to help people recognize that how they use energy is something over which each person has control. Explaining technical matters in an understandable manner and answering questions frequently asked by the general public will go a long way toward getting people to notice that each person has the ability to make intelligent energy use decisions.

Strategy 2 (S6.2): Be a trusted and leading source of energy information

There are many ways by which people can be empowered to affect change, improve their finances, and help the community reach its CEP goals. The County can be a trusted and leading source of energy information and provide people with valuable details through print and electronic media. There can be a lot of confusion and misinformation in the world today. At a minimum, the County can facilitate the use of best practices and help people make the right decisions about energy by providing important, accurate, easily accessible energy-related information.

Strategy 3 (S6.3): Maintain and build partnerships

Similar to the County itself being a tested source for energy information, the County can effectively disseminate CEP messages and related information through
organizations already trusted by many stakeholder groups.

Arlington is a relatively diverse community. For instance, as of 2009, Arlington Public School’s student body of over 20,000 students came from 127 countries and spoke 105 different languages. With these different cultures come varied experiences and lenses through which people view and trust government. The County will build and maintain long-term partnerships with the numerous organizations and support groups that are known to Arlington’s diverse population to help educate and inform the community on energy topics. Plus, the County will use these relationships with other organizations to inform the County on peoples’ needs, e.g., what information do people need and want, what resources do they need to help the community reach its CEP goals.

**Strategy 4 (S6.4): Engage the public through electronic and print media**

The general public gets its information through many different means. Social media, which was barely discussed ten years ago, has become a primary source of information for some people in Arlington. The County will adapt and package its CEP information so that it is most accessible to the general public.

In January 2012, County Board Chair Mary Hynes launched Arlington County’s Participation, Leadership, and Civic Engagement (PLACE), which was a County government initiative to update the “Arlington Way” by expanding the ways in which our residents engage with each other and our government to enrich Arlington. Lessons learned from the PLACE initiative will help inform County staff on the most effective ways to package and distribute CEP information in order to effect change.

**Strategy 5 (S6.5): Collaborate with Arlington Public Schools and local colleges**

and universities to provide education to reduce energy use

Arlington County government staff will continue to work closely with staff from the Arlington Public Schools system to effectively implement the CEP within the school system. For example, County staff have shared information and resources with APS staff on the creation of energy performance labels and have provided assistance for Energy Star™ certification at several school facilities.

In addition to working with APS staff on a variety of matters related to facilities improvements and curriculum enhancements, County staff will continue to work with the Superintendent’s Advisory Committee on Sustainability as a way to spread CEP messages. That committee addresses issues relating to energy and environmental conservation within school operations and educational curriculum. County staff will work with the committee of parents, community members, students and staff to address issues and provide recommendations in energy and environment curriculum.

**Strategy 6 (S6.6): Partner with stakeholders to develop and provide energy training and courses.**

With a transformative, long-term community energy plan, Arlington will work with other organizations to help ensure there are professionals available to implement the program. Building effective partnerships with educational institutions and other stakeholders can lead to the creation of valuable courses, degree programs, and workforce development initiatives. For example, given the lack of local DE expertise, the County could work with any number of stakeholders to create a degree program that educates degree holders on how to design, building, maintain and operate a DE system.
Strategy 7 (S6.7): Partner with stakeholders to map workforce development

Arlington will work with stakeholders to develop a comprehensive approach to achieve broad community understanding and workforce restructuring related to the energy field. The effort should be sustained by a network of voluntary, academic and public and private professional resources, including non-governmental organizations, and trade and business associations. For example, the County will work closely with the Alexandria/Arlington Workforce Investment Board to advance energy-related workforce development programs and initiatives that achieve sustainable economic growth in the region.

Strategy 8 (S6.8): Encourage energy conservation and efficiency through recognition of success

The County will highlight energy efficiency and conservation success stories through thoughtful recognition programs. It is important to tell stories of successful projects and how people have effectively implemented the CEP. These lessons learned will provide proof of concept and can help kick-start others into beginning their own projects that improve their economic situation, reduce their environmental impact, and improve the community’s energy security.

Existing Tools

Recognition programs – Arlington’s AIRE team currently runs “Green Games”, a series of friendly competitions and trainings for businesses and residents to reduce their energy use and costs. Such programs raise energy awareness and result in energy savings, at minimal cost to the County.

Community Energy Plan and AIRE public websites – The CEP and AIRE programs run public websites, which are inexpensive and easy tools to disseminate information on energy savings tips, new programs, etc.

Social and print media – The CEP actively operates a blog, a Twitter account, and a Facebook account, all of which are used to interact with the public on energy matters. The CEP team will also make use of other media outlets, such as the County’s PLACE Space and local print media.

Community Events – Community groups in Arlington run a number of public events throughout the year. These gatherings provide opportunities for the CEP program to interact face-to-face with the public. In addition to taking advantage of existing options, the CEP team anticipates putting on its own events, such as energy workshops.

Potential Tools

Partnerships with workforce investment board, colleges and universities, and APS’s Career Center – Arlington County could partner together with workforce development groups, colleges and universities, and APS’s Career Center will help create a restructured workforce of qualified and trained professionals in multiple sectors, including construction, building operations, finance, planning, energy services, and law, to facilitate CEP implementation.

School curriculum and extracurricular activities – The County has the opportunity to leverage interest in the CEP to create in-depth, tailored energy courses and programs for a variety of audiences. Partnering with Arlington Public Schools (APS) could yield valuable curriculum to educate students in all grades on energy matters.

Arlingtonians for a Clean Environment (ACE) Energy Efficiency Education/Energy Masters program – ACE’s Energy Efficiency Education program promotes a more energy efficient and sustainable Arlington community, engaging professionally trained volunteers in...
retrofitting, weatherization, and water conservation techniques serving low-income apartment residents.
**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>
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<tbody>
<tr>
<td><strong>Air Pollutants</strong></td>
<td>In addition to greenhouse gases, these include sulfur dioxide (SO2), nitrogen oxide (NOx), hydrogen chloride (HCl), hydrogen fluoride (HF), carbon monoxide (CC), and non-methane volatile organic compounds (NMVOC).</td>
</tr>
<tr>
<td><strong>Btu</strong></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><strong>Building Code</strong></td>
<td>Legally required construction practices.</td>
</tr>
<tr>
<td><strong>Carbon Dioxide</strong></td>
<td>(CO2) 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><strong>Carbon Dioxide Equivalent</strong></td>
<td>Where the “e” in CO2e 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, CO2e. To express GHG emissions in units of CO2e, the quantity of a given GHG (expressed in units of mass) is multiplied by its GWP.</td>
</tr>
<tr>
<td><strong>CHP</strong></td>
<td>See “Cogeneration.”</td>
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<tr>
<td><strong>Clean and Renewable Energy</strong></td>
<td>This phrase is used to indicate some combination of renewable energy and cogeneration (CHP) energy sources.</td>
</tr>
<tr>
<td><strong>CO2</strong></td>
<td>See “Carbon dioxide”</td>
</tr>
<tr>
<td><strong>CO2e</strong></td>
<td>See “Carbon dioxide equivalent”</td>
</tr>
<tr>
<td><strong>Cogeneration</strong></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><strong>Combined Heat and Power</strong></td>
<td>See “Cogeneration.”</td>
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</tr>
<tr>
<td><strong>Commercial Buildings</strong></td>
<td>Non-residential buildings; often owned or operated by for-profit entities, including offices, retail stores, restaurants, and warehouses.</td>
</tr>
<tr>
<td><strong>Community Energy Project</strong></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><strong>Daylighting</strong></td>
<td>Designing buildings to maximize the use of natural daylight to reduce the need for electricity.</td>
</tr>
<tr>
<td><strong>DEE</strong></td>
<td>See “District Energy Entity”</td>
</tr>
<tr>
<td><strong>District Cooling</strong></td>
<td>Cooling services delivered via district energy systems.</td>
</tr>
<tr>
<td><strong>District Energy</strong></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><strong>District Energy Entity</strong></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><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>
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</table>
Greenhouse Gases
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 (CO\textsubscript{2}), methane (CH\textsubscript{4}), chlorofluorocarbons (CFCs) and nitrous oxide (N\textsubscript{2}O), sulphur hexafluoride (SF\textsubscript{6}), hydrofluorocarbons (HFC) and perfluorinated carbons (PFC). The most abundant greenhouse gas is carbon dioxide (CO\textsubscript{2}).

IECC

Institutional Buildings
Nonresidential buildings generally owned by public administration, education, public or private healthcare facilities and other not-for-profit entities.

kBtu
See “Btu”

Kilowatt
A unit of power equal to 1,000 watts.

kW
See “Kilowatt”

Megawatt
A unit of power equal to one million watts.

Metric Ton
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.

mt
See “Metric Ton”

MW
See “Megawatt”

Per Capita
For each person in the total population being considered; generally referred to as a resident.

PV
See “Solar Photovoltaic Systems”

Renewable energy
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.

Site Energy
See “Source Energy”

Solar Photovoltaic Systems
Systems that directly convert sunlight into electricity either for use locally or for delivery to the electric grid.

Solar Thermal (water heating) Systems
Systems that directly convert sunlight into heat, generally for domestic hot water though they can also be used to produce space heating.
| **Source Energy** | 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. |
| **Sustainability** | Meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. |
| **TOD** | See “Transit-Oriented Development” |
| **Transit-Oriented Development** | Land development that takes into account 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. |
Appendix A: Arlington Energy Density Map

Figure 3 below shows the energy density of select planning areas in Arlington, with darker colors representing more energy dense neighborhoods. Energy density is the amount of energy consumed, per acre, by buildings in the area in question.

Energy density is particularly helpful for understanding which neighborhoods may be good candidates for district energy; generally, district energy is more economical the more energy dense an area is.

Figure 3: Arlington County Energy Density, 2007
Appendix B: Tools Matrix

This appendix contains a list of tools that would help accomplish the Community Energy Plan’s goals, thereby making Arlington a more economically competitive, environmentally committed, and energy secure place to live, work, and play. This list of tools, as well as the tools listed in the preceding document, is not intended to be exhaustive nor prescriptive; they are an illustrative set of examples of how the CEP could be accomplished.

Guide to this appendix:

<table>
<thead>
<tr>
<th>Goal 1: Goal Statement</th>
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<tbody>
<tr>
<td>STRATEGY 1: text</td>
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<td>STRATEGY 2: text</td>
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<td>STRATEGY 3: text</td>
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<td>STRATEGY 4: text</td>
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<td>STRATEGY 5: text</td>
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<td>STRATEGY 6: text</td>
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<td>STRATEGY 7: text</td>
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<thead>
<tr>
<th>Goal statement</th>
<th>List of strategies</th>
<th>Relationship between tools and strategies</th>
<th>Start date</th>
<th>List of tools</th>
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Improving Arlington’s economic competitiveness, energy security, and environmental commitment
Goal 1: Increase the energy and operational efficiency of all buildings

**STRATEGY 1:** Take advantage of the renovation process to encourage buildings to reduce energy use by 30-40% on average compared to 2007 levels of energy use

**STRATEGY 2:** Encourage new buildings to be designed, constructed, and operated more energy efficiently

**STRATEGY 3:** Ensure compliance with energy efficiency code provisions

**STRATEGY 4:** Take advantage of incentives to reduce new and existing building energy usage

**STRATEGY 5:** Ensure equitable access to and use of energy efficiency and incentives programs for all income levels

**STRATEGY 6:** Use land use development process to create more energy-efficient buildings

**STRATEGY 7:** Promote widespread use and display of EPLs

**STRATEGY 8:** Encourage the use of lower carbon fuels, both on site and for electricity generation

**STRATEGY 9:** Steadily reduce energy intensity (i.e., increase energy efficiency) in County and APS buildings and operations

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<tr>
<td>Community planning guidance – provides information on the neighborhood level and guide future development.</td>
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<tr>
<td>Energy Performance Labels (EPLs) in County Buildings – EPLs are posted in 38 County buildings. Each label reports the amount of energy the building uses and the building's carbon footprint in comparison to averages for similar building types. The labels serve to educate the public about energy use in buildings and help motivate the building occupants to reduce energy use.</td>
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<tr>
<td>Site plan development process – Arlington’s special exception process, and use of incentive zoning, creates opportunities for project development teams to discuss the advantages, costs and benefits of creating more energy-efficient buildings.</td>
<td>X</td>
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<tr>
<td>Energy Star – a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping to save money and protect the environment through energy efficient products and practices.</td>
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<td>LEED green building bonus density incentive – a County incentive program for site plan projects incentivizing high performance buildings through energy efficiency requirements and LEED Silver certification (or higher).</td>
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<td>Short Term (Years 1-5)</td>
<td>Tools</td>
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<td><strong>Lighting retrofit rebates for commercial properties</strong> – provide opportunities for customers to replace outdated and inefficient fixtures with new lighting technology to save energy and money.</td>
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<td><strong>Local Energy Alliance Program (LEAP)</strong> – a non-profit corporation that provides financing and advice for home energy renovation, seeking improvements comparable to the Home Performance with Energy Star programs.</td>
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<td><strong>Training</strong> – educate owners, developers, architects, engineers, construction industry, etc. about energy efficient construction, equipment, etc. (including Passive House standard).</td>
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<td><strong>Updated State Building Code</strong> – support the adoption of the ICC 2012 Code.</td>
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<td><strong>Building Energy Asset Rating</strong> – in contrast to operational ratings, which are based on actual energy use, asset ratings evaluate the energy performance of the building based on the envelope and mechanical and electrical systems, irrespective of tenant behavior. The goal of asset ratings is to educate stakeholders and enable the real estate market to value energy performance, thereby increasing investments in energy efficiency.</td>
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<tr>
<td><strong>Financial incentive programs</strong> – take advantage of appropriate federal, state, and private financial incentive tools and mechanisms and develop new financial incentive programs (PACE, QECBs, etc.) to encourage energy efficiency.</td>
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<tr>
<td><strong>Energy Performance Labels (EPLs) in private sector and APS buildings</strong> – Arlington displays EPLs on most of its buildings. Promote the expansion of EPL displays to APS and the private sector.</td>
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<tr>
<td><strong>Information Technology and ‘Smart’ Building Energy Management</strong> – use of advanced building automation, submetering, and real-time data collection to more efficiently operate building energy technologies.</td>
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<tr>
<td>Energy Plan Reviewer and Inspector(s) – advanced technologies and building codes will only be effective if construction practices meet evolving codes. Development plan review with attention to energy aspects, and field inspection of energy efficiency practices are needed to ensure the realization of code objectives.</td>
<td>X</td>
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<td>Updated VHDA process – the Virginia Housing Development Authority (VHDA) offers developers of affordable multifamily housing more points in the competitive scoring process under the Qualified Application Plan (QAP) if they meet specific green building and energy standards.</td>
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<td>Form Based Code (FBC) enhancements – the FBC in place for development along Columbia Pike can be updated to incorporate energy targets and other sustainability measures, to ensure that new development achieves above-average energy performance.</td>
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<td>Transformative energy efficient construction – various standards and guidelines (such as Passive House, net zero, etc.) represent today’s highest energy standards to dramatically reduce energy consumption in buildings.</td>
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<td>Energy help desk – a “one stop shop” for energy information for residents and builders.</td>
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<tr>
<td>New/revised site plan condition(s) – the site plan process and the use of incentive zoning is a useful and important opportunity for project development teams and County staff to come up with mutually beneficial solutions to implement the CEP and improve the community’s economic competitiveness, energy security, and environmental commitment.</td>
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<tr>
<td>Energy upgrade money set aside for affordable housing – subsidize energy efficiency in affordable housing.</td>
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<tr>
<td>Leasing requirements for federal tenants – federal tenants have energy efficiency, energy security, and other CEP-related requirements for buildings in which they lease space. The CEP helps Arlington’s buildings meet those requirements.</td>
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<td>Permit fees – adjustable permit fees for energy efficient construction.</td>
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<tr>
<td><strong>Energy/green building store</strong> – <em>retail establishment offering energy efficient and green building supplies, appliances, finishes, etc.</em></td>
<td>X</td>
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</table>
Goal 2: Increase local energy supply and distribution efficiency in Arlington using District Energy (DE)

| STRATEGY 1: | Create a DE Entity (DEE) to establish and operate a DE System |
| STRATEGY 2: | Build, operate and maintain DE systems as opportunities arise, and CHP systems as appropriate, in areas having the highest probability for DE |
| STRATEGY 3: | Encourage new and renovated buildings to have DE compatible systems in areas where DE has a high probability of success |
| STRATEGY 4: | Establish a process and guidelines for buildings to connect to DE Systems in areas where DE has a high probability of success |
| STRATEGY 5: | Develop a DE infrastructure plan, in coordination with other County departments, to facilitate DE distribution and future connections |
| STRATEGY 6: | Coordinate the installation of DE distribution pipes and related infrastructure as appropriate |
| STRATEGY 7: | Link DE/CHP to streetcar lines and other transportation infrastructure as appropriate |
| STRATEGY 8: | Revise the Arlington County Code to reflect CEP goals |

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<tr>
<td>Community planning guidance – <em>provide information on the neighborhood level and guide future development.</em></td>
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<td>Crystal City Integrated Energy Master Plan (CC IEMP) – <em>examined the feasibility of District Energy in Crystal City. The study took an integrated approach to energy generation and usage- it also looked at building energy efficiency measures and renewable energy options.</em></td>
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<td>EPA’s Combined Heat &amp; Power Partnership – <em>a voluntary program that works with energy users, the CHP industry, state and local governments, and other clean energy stakeholders to facilitate the development of new projects and to promote their environmental and economic benefits.</em></td>
<td>X</td>
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<td>Site plan development process – <em>Arlington’s special exception process, and the use of incentive zoning, provides opportunities for developers to ensure projects meet CEP goals. Provides an opportunity to encourage or incentivize buildings in targeted areas to build district-energy compatible buildings, or for buildings in areas with district energy to tie into the district energy system. The site plan process is regularly reviewed to better align with CEP implementation.</em></td>
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Improving Arlington’s economic competitiveness, energy security, and environmental commitment

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<td><strong>Short Term (Years 1-5)</strong></td>
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<td><strong>County’s Horizontal Design Guidelines</strong> – guidelines for buildings to tie into a district energy system (DES) which would facilitate DES creation and expansion.**</td>
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<td><strong>District energy best practices, interoperability standards, and operations and maintenance plan</strong> – compiling best practices from the industry will help facilitate a district energy system and allow it to operate more economically.</td>
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<td><strong>District Energy Entity (DEE)</strong> – a third party (private, public, co-op, or combination) entity to help set up and operate a district energy system. It would also coordinate interoperability standards, infrastructure plans, seek out capital, etc.**</td>
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<td><strong>Integrated Energy Master Plans (IEMPs) for Rosslyn, Columbia Pike, Courthouse, etc.</strong> – analysis on the economic and technical feasibility of district energy in the most promising neighborhoods in Arlington. They would inform future work and investment.**</td>
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<td><strong>DE infrastructure plan, including maps showing probable location of DE infrastructure</strong> – district energy systems require large pipes to run under streets, and their installation could be strategically coordinated with other street work for cost savings.</td>
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<td><strong>Crystal City and Columbia Pike Streetcar Plans</strong> – Arlington’s proposed streetcars in Crystal City and along Columbia Pike will require power, which are opportunities for crossover with prospective combined heat and power (CHP) systems in the area.**</td>
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Goal 3: Increase locally generated energy supply through the use of renewable energy options

| STRATEGY 1: | Increase renewable energy generation through incentives |
| STRATEGY 2: | Eliminate regulatory and legislative barriers to increase renewable energy production |
| STRATEGY 3: | Encourage the development industry to integrate renewable energy technologies and best practices into the development design process |
| STRATEGY 4: | Partner with utilities to increase and optimize the use of renewable energy to create a more secure and reliable power grid |
| STRATEGY 5: | Encourage solar hot water and other renewable technologies |

<table>
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<tr>
<th>Tools</th>
<th>Strategy 1</th>
<th>Strategy 2</th>
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<tr>
<td><strong>Existing</strong></td>
<td>Financial incentives – <em>federal tax credits make renewable energy projects more attractive investments.</em></td>
<td>X</td>
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<tr>
<td><strong>Short Term (Years 1-5)</strong></td>
<td>Power Purchase Agreements* – <em>a Solar Power Purchase Agreement (SPPA) is an agreement in which a third-party developer owns, operates, and maintains the photovoltaic (PV) system and a host customer agrees to site the system on its property and purchases the system’s electrical output. SPPAs are not currently allowed in Virginia.</em></td>
<td>X</td>
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<td></td>
<td>Local financial incentives – <em>to the extent authorize by law, Arlington could provide additional incentives for renewables in addition to existing federal incentives.</em></td>
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<td>Dominion Virginia Power (DVP) solar leasing – <em>DVP’s pilot program for deploying 3 MW of solar PV across the state by leasing space on local government buildings.</em></td>
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<tr>
<td><strong>Long Term (Years 5+)</strong></td>
<td>Case studies of solar thermal installations – <em>people gain confidence to adopt new technologies by learning from the experiences of others. These case studies will describe use of solar thermal energy in a variety of settings.</em></td>
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<td>White papers / research reports – <em>cost-benefit analyses of renewable deployments in a variety of settings, and studies of the achievable potential for renewable energy in Arlington.</em></td>
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</table>
**Goal 4: Refine and expand transportation infrastructure and operations enhancements**

| STRATEGY 1: | Support MTP General Policies implementation: Reduce vehicle miles traveled by integrating transportation with land use, developing Complete Streets, and managing travel demand and transportation systems |
| STRATEGY 2: | Continue to support alternatives to car ownership and use |
| STRATEGY 3: | Support Federal and State efforts to increase vehicle fuel efficiency |
| STRATEGY 4: | Increase the fuel efficiency of County and APS fleets |
| STRATEGY 5: | Reduce the carbon produced by County and APS fleets |
| STRATEGY 6: | Operate and maintain traffic infrastructure with an eye toward energy efficiency and vehicle fuel efficiency |
| STRATEGY 7: | Encourage the purchase and use of lower-carbon producing vehicles |
| STRATEGY 8: | Increase the availability of reduced-carbon content vehicle fuels |
| STRATEGY 9: | Work with regional organizations and individual jurisdictions in the DC Metro region to proactively address transportation issues |

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<tr>
<td>Bikeshare Transit Development Plan – provides a strategic blueprint for expanding the Capital Bikeshare system between FY13-18.</td>
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<tr>
<td>Master Transportation Plan (MTP) Implementation Plans for adopted elements – provide detailed guidance on how the County plans to implement the MTP’s six elements (Streets, Transit, Pedestrian, Bicycle, Parking and Curbspace Management, and Transportation Demand &amp; System Management).</td>
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<td>Site plan conditions, e.g., Transportation Management Plan, Bicycle Storage Facilities – provide site plan review input on active plans.</td>
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<td>Telecommuting and Hoteling – allowing employees to work from home to reduce transportation associated with commuting.</td>
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<td>Taxi Ordinance requiring improving fuel economy – provides detailed guidance on Average Fuel-Efficiency Rating for New Taxicabs on an annual basis.</td>
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<td>Transit Development Plan – provides a strategic blueprint for the Arlington Transit system.</td>
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<td><strong>Promotion of transit options</strong> – provides travelers with real-time information and current transit options.</td>
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<td><strong>Regional coordination</strong> – working with other localities and with regional entities such as the Northern Virginia Regional Commission and the Metropolitan Washington Council of Governments to coordinate efforts.</td>
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<td><strong>County Government-wide policy regarding vehicle purchases</strong> – clear policy guidance on the fuel efficiency of vehicle purchases, and vehicle fuel choices, will help transform the County and APS vehicle fleet.</td>
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<td><strong>Alternative vehicle fueling options</strong> – provides linkage to alternative fueling location web sites, with particular attention to electric vehicle charging in near term and assisting development of biodiesel and compressed natural gas refueling options in the mid-term.</td>
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<td><strong>Links to Federal efforts on the CEP/County website</strong> – provides linkage to Federal web sites.</td>
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<td><strong>Clearinghouse website for low-carbon producing vehicles</strong> – provides linkage to low-carbon producing vehicle web sites.</td>
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</table>
Goal 5: Integrate CEP goals into all County Government activities

| STRATEGY 1: | Propose state and federal regulatory and legislative remedies to achieve CEP goals |
| STRATEGY 2: | Fund CEP Implementation |
| STRATEGY 3: | Work with regional organizations and individual jurisdictions in our metro region to proactively address energy issues |
| STRATEGY 4: | Develop and coordinate financial incentive programs |
| STRATEGY 5: | Establish and track metrics to measure CEP progress |
| STRATEGY 6: | Retain existing and attract new businesses and jobs through CEP implementation |
| STRATEGY 7: | Strengthen partnerships with colleges and universities to identify opportunities to reach CEP goals |

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<tr>
<td>County Government Operations Energy Plan – a comprehensive plan for improving energy security and reliability in County operations, while decreasing energy consumption through efficiency and renewables in buildings, infrastructure, and vehicles as well as staff training. This plan will help inform all aspects of the community energy plan while leading by example.</td>
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<td>CEP budget – implementation of the community energy plan requires resources for staffing and program activities.</td>
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<td>Future County Capital Improvement Plans (CIPs) – capital investments in energy technologies and infrastructure will be needed in County and APS facilities and for County and community operations, e.g. district energy.</td>
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<td>Financial incentive programs – to the extent authorized by law, County funds may be used for incentives for efficiency gains and deployment of renewables in the private sector.</td>
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<tr>
<td>Regional energy planning – establishing and improving local, regional, statewide and national relationships and partnerships can help the County implement the CEP and accelerate its success. The County should continue work with regional organizations and neighboring jurisdictions to advance coordination on energy and transportation planning.</td>
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Improving Arlington’s economic competitiveness, energy security, and environmental commitment
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<tr>
<td><strong>Marketing CEP benefits</strong> – the value of community energy planning and implementation – energy security, economic competitiveness, and environmental protection – should be understood by a broad array of constituents.</td>
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<td><strong>IT Improvements</strong> – upgrade Connect Arlington and supervisory control and data acquisition (SCADA) capabilities.</td>
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<tr>
<td><strong>Agreement w/ Workforce Investment Board</strong> – a well-trained workforce in energy-related careers is needed for long-term achievement of many CEP goals. Consistent engagement with local and regional employers and educational institutions on the energy workforce is one way to ensure the workforce will meet our needs.</td>
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<td><strong>Long Term (Years 5+)</strong></td>
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<td><strong>VEPGA and contract with DVP</strong> – the County’s electric rates – and Terms &amp; Conditions – with Dominion Virginia Power are set through a contract negotiated by the Virginia Energy Purchasing Governmental Association, of which Arlington is a member. This contract is a vehicle through which local governments procure power and related energy services.</td>
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Goal 6: Advocate and support personal action through behavior changes and effective education

| STRATEGY 1: Raise personal energy literacy among all populations |
| STRATEGY 2: Be a trusted and leading source of energy information |
| STRATEGY 3: Maintain and build partnerships |
| STRATEGY 4: Engage the public through electronic and print media |
| STRATEGY 5: Collaborate with Arlington Public Schools and local colleges and universities to provide education to reduce energy use |
| STRATEGY 6: Partner with stakeholders to develop and provide energy training and courses |
| STRATEGY 7: Partner with stakeholders to map workforce development |
| STRATEGY 8: Encourage energy conservation and efficiency through recognition of success |

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<td>Existing</td>
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<td>Recognition programs – Arlington’s AIRE team currently runs “Green Games”, a series of friendly competitions and trainings for businesses and residents to reduce their energy use and costs. Such programs raise energy awareness and result in energy savings, at minimal cost to the County.</td>
<td>X</td>
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<tr>
<td>Community Energy Plan (CEP) and AIRE public websites – inexpensive and easy tools to disseminate information on energy savings tips, new programs, etc.</td>
<td>X</td>
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<tr>
<td>Social and print media – the CEP actively operates a blog, a Twitter account, and a Facebook account, all of which are used to interact with the public on energy matters. The CEP team will also make use of other media outlets, such as the County’s PLACE Space and local print media.</td>
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<tr>
<td>Community Events – provide opportunities to interact face-to-face with the public. In addition to taking advantage of existing options, the CEP team anticipates putting on its own events, such as energy workshops.</td>
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<td>Arlingtonians for a Clean Environment (ACE) Energy Efficiency Education/Energy Masters program – promotes a more energy efficient and sustainable Arlington community, engaging professionally trained volunteers in retrofitting, weatherization, and water conservation techniques serving low-income apartment residents.</td>
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### Improving Arlington’s economic competitiveness, energy security, and environmental commitment

#### Tools

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<tr>
<th>Short Terms (Years 1-5)</th>
<th>Strategy 1</th>
<th>Strategy 2</th>
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<th>Strategy 6</th>
<th>Strategy 7</th>
<th>Strategy 8</th>
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<tr>
<td><strong>Partnerships with workforce investment board, colleges and universities, and APS’s Career Center</strong> – working with local institutions will help prepare our workforce for the new opportunities that the energy field presents.</td>
<td>X</td>
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<td><strong>Home utility bill benchmarking, programs</strong> – allows homeowners to compare their energy usage against similar homes.</td>
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<td><strong>Workshops for the trades on transformative energy efficient construction standards</strong> – there are several building standards and practices like the Passive House concept which represent transformative energy efficiency gains over conventional building design. A significant barrier to more widespread acceptance of these building practices in the US is a lack of familiarity among tradespeople.</td>
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<td><strong>Motivating Community Prime Movers</strong> – actively engage certain subgroups within the community whose capabilities could accelerate this plan, including but not limited to: the financial community, the defense and national security community, and regional and community foundations.</td>
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<th>Long Term (Years 5+)</th>
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<tr>
<td><strong>School curriculum and extracurricular activities</strong> – Arlington Public Schools offer a valuable opportunity to educate students on energy matters.</td>
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<td><strong>Energy help desk</strong> – a “one stop shop” for energy information for residents and builders.</td>
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Improving Arlington’s economic competitiveness, energy security, and environmental commitment

Appendix C: Leading Local Efforts To Reduce Greenhouse Gas Emissions

About This Report

In June 2012, HR&A Advisors, Inc. (HR&A) was retained by Arlington County, VA to assist it in developing a Community Energy Plan (CEP). The purpose of the Plan is “to establish energy goals and strategies for the entire County.” The primary goal of the Plan is for the County to reduce its greenhouse gas (GHG) emissions from 13.4 metric tons carbon dioxide equivalent per capita per year (as of 2007) to 3.0 metric tons per capita per year by 2050, as recommended by the Arlington County Community Energy Strategy Task Force in 2011.

The Task Force recommended that the County frame the Plan primarily in terms of four areas of intervention: Buildings, District Energy, Renewable Energy, and Transportation. Staff at the County’s Department of Environmental Services (DES) generally adopted this framework in developing ideas for potential policies, strategies, and tools to implement the Plan. The Staff’s preliminary work in these areas was made available to HR&A as “DRAFT CEP Policies for the Comprehensive Plan Energy Element and draft Strategies for the CEP Implementation Framework” (draft dated July 5, 2012).

At the DES staff’s request, HR&A analyzed the efforts of other jurisdictions in the U.S. and overseas that have attempted to achieve significant reductions in GHG emissions and improvements in energy efficiency through interventions in Buildings, District Energy, Renewable Energy, and Transportation. DES requested such an analysis to “baseline” Arlington’s emerging CEP policy framework against other similarly ambitious, and perhaps more experienced jurisdictions in each area. DES’ goal in requesting the analysis was to identify common approaches among leading cities that may be relevant for Arlington County in finalizing its CEP.

In identifying other jurisdictions as leaders in reducing GHG emissions in Buildings, District Energy, Renewable Energy, and Transportation, HR&A performed an extensive literature review, interviewed local officials and national experts, and called on the firm’s direct experience in working with cities across the country for three decades. HR&A also sought some geographic diversity in the group as a whole. Overall, HR&A looked closely at the activities of 18 cities.

HR&A’s analysis did not attempt to evaluate or compare cities’ efforts. DES did not request such a comparison, and, as discussed below, it may not be possible due to the early status of most cities’ activities. HR&A also did not make recommendations on whether Arlington County should or should not adopt specific policies in place elsewhere or assess the feasibility of doing so. DES did not request such recommendations or feasibility assessment from HR&A.

Introduction

Hundreds of local jurisdictions in the U.S. and around the world have adopted plans to reduce their GHG emissions and improve their environmental sustainability. In many cases these plans seek to achieve other objectives as well, such as fostering economic development, accommodating future growth,
and preparing for potential adverse effects of extreme weather.\textsuperscript{7}

The majority of these plans were developed in the last five years and many were developed since 2009. As a result, it is too early in most cases to evaluate the impact or effectiveness of the plans in terms of their stated goals. Comparative analysis among plans is also challenging; while many plans share similar overall aims, their specific baselines, goals, strategies, tactics, metrics and, perhaps most critically, their economic, environmental, and public policy contexts vary widely.\textsuperscript{8}

It is possible, however, to identify common themes and approaches across a set of leading localities, especially with respect to specific areas of intervention, such as Buildings, District Energy, Renewable Energy, and Transportation. The most fundamental commonality is that cities and counties in the U.S. and overseas that have made the boldest commitments and, in many cases, made the most promising progress, were driven by strong public sector leadership.

This leadership manifests itself in many forms in localities at the forefront of climate and energy innovation; indeed, it seems necessary for local leaders to have access to as many tools, especially public policy tools, as possible. The types of tools most often employed are:

- Mandates, e.g., building energy codes, zoning requirements, disclosure ordinances;
- Incentives, e.g., zoning bonuses, tax breaks, rebates; and
- Direct Action, e.g., public investment, technical assistance, marketing/education.

In addition to deploying a range of policy tools, leading localities have developed innovative ways of working with the private sector, community-based organizations, and local residents. These Public-Private Engagements often involve the use of one or more of the aforementioned types of policy tools, in combination with commitments from nongovernmental partners.

Within each of these categories there is of course substantial variation by jurisdiction. The specific Mandates, Incentives, Direct Actions and Public-Private Engagements deployed in a given community by necessity reflect local (as well as state and regional) political, fiscal, and energy market realities.

That said, certain tools and broader approaches are commonly utilized by leading localities to advance energy and climate progress in their communities. This is especially apparent when examining local leadership in the specific areas of Buildings, District Energy, Renewable Energy, and Transportation. The following sections of this report describe innovative local efforts in each area.


Buildings

Draft Arlington CEP Goal: Increase the energy and operational efficiency of all buildings.

The primary tool at the disposal of local governments for increasing energy efficiency in buildings is the application and enforcement of building energy codes and standards. According to the U.S. Department of Energy (DOE), building energy codes and standards are adopted by state and local jurisdictions to “establish minimum requirements for energy efficient design and construction for new and renovated buildings that impact energy use and greenhouse gas emissions for the life of the building” (emphasis supplied).9 The DOE has determined that contemporary energy codes could reduce total current residential energy consumption in the U.S. by 2%.

The two major baseline building energy codes and standards are the International Energy Conservation Code (IECC), and the ANSI/ASHRAE/IESNA Standard 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings (ASHRAE 90.1). Generally, IECC applies to low-rise residential buildings and ASHRAE to larger residential and commercial buildings. Each is typically revised and made more rigorous every three years.

In the U.S., local governments are required to apply building energy code determined by their states. Some cities have the authority to adopt stronger codes and a few have done so. Most states, and by implication most cities, are at least one iteration of IECC/ASHRAE behind the most current versions, according to the U.S. DOE.10

“Benchmarking” is a process of comparing similar buildings in terms of their energy use. According to the DOE, “When applied to building energy use, benchmarking can provide a mechanism for measuring how efficiently a building uses energy relative to the same building over time, other similar buildings, or modeled simulations of a building built to code or a desired standard.”11 A recent report by the Institute for Market Transformation found that more than 50 jurisdictions worldwide have implemented benchmarking and related disclosure policies.12 While these policies are relatively new in the U.S., evidence suggests they are growing.13

HR&A analyzed the buildings-focused energy efforts of the following cities: 1) Boulder, CO; 2) New York, NY; 3) San Francisco, CA; 4) Seattle, WA, and 5) Washington, DC. Common approaches among these and other leading cities in this area are:

- Strong Energy Codes and Standards for New and Existing Buildings;
- Requirements to Audit, Benchmark, and/or Disclose Building Energy Data; and
- Local Public Incentives to Fund Building Improvements.

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9 http://www.energycodes.gov/why_codes/
10 http://www.energycodes.gov/ adoption/states
11 http://www1.eere.energy.gov/seeaction/pdfs /commercialbuildings_factsheet_benchmarking_s tategovt.pdf
Strong Energy Codes and Standards for New and Existing Buildings

Boulder requires new residential construction to be 30-75% more efficient than the 2006 IECC, depending on square footage. Major home renovations must be 15-50% more efficient than the 2006 IECC, depending on square footage. New commercial construction must exceed ASHRAE 90.1-2007 by at least 30%. Renovations of existing commercial buildings must exceed the 2006 IECC by 30%.15

New York City recently closed a loophole in the State’s energy code that exempted renovations impacting less than 50% of a building’s total square footage from code requirements. Now, all alterations or renovations of residential and commercial buildings (with exceptions for historic and landmarked buildings) must meet the State’s energy code, which is currently ASHRAE 90.1-2007. In addition, by 2025 all commercial and residential buildings larger than 50,000 square feet (SF) must upgrade lighting systems at the time of renovation to meet the current energy code requirements.16

Seattle. In 2013, Seattle’s new City energy code for residential and commercial buildings will be based on an amended version of the Washington State 2012 IECC, which references ASHRAE 90.1-2010. This will result in Seattle’s energy code being 20% more efficient than ASHRAE 90.1-2010. By law, Seattle’s code will update in accordance with future revisions of the IECC.17

San Francisco requires new commercial buildings 25,000 SF and larger to exceed ASHRAE 90.1-2007 by at least 15%, and meet a set of additional environmental requirements through compliance with the Gold level of the U.S. Green Building Council’s Leadership in Energy and Environmental Design (LEED) rating system. Commercial buildings smaller than 25,000 SF must follow the California Green Code, which has similar energy requirements.18 Existing commercial buildings that are undergoing alterations must meet LEED Gold, which requires at least 10% greater energy efficiency than ASHRAE 90.1.19

Washington, DC requires that all new construction and major renovation of public buildings greater than 50,000 SF meet LEED New Construction requirements. New construction and major renovation of privately owned buildings greater than 50,000 SF must meet similar requirements. Privately owned buildings that meet the more rigorous LEED Gold criteria are eligible for expedited permitting.20 Failure to comply with the requirements may result in fines assessed by the City.21

14 http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=208&Itemid=4 89
15 Ibid.

17 Interview with Duane Jonlin- Seattle Energy Codes and Energy Conservation Advisor, June 2012.
18 San Francisco ordinance AB-093, January 2011.
20 http://ddoe.dc.gov/service/green-buildings
Requirements to Audit, Benchmark, and/or Disclose Building Energy Data

**Boulder** requires that residential building permit applicants for new construction or renovations must also obtain an energy audit and comply with the Boulder Green Points Building Program, a mandatory residential green building program that requires a builder or homeowner to include a variety of sustainable building components based on size.\(^\text{22}\)

**New York City** requires that all buildings over 50,000 SF annually benchmark their energy use utilizing the EPA Portfolio Manager online benchmarking tool and publicly disclose the results via the New York City Department of Finance website.\(^\text{23}\) Those buildings also must perform an energy audit and retro-commissioning study every 10 years, with exceptions for Energy Star and LEED certified buildings.\(^\text{24}\)

**San Francisco** requires all non-residential buildings over 10,000 SF to annually benchmark using the EPA Portfolio Manager. Benchmarking scores must be reported to the San Francisco Department of the Environment. The City in 2011 adopted legislation requiring energy audits in non-residential buildings greater than 10,000 SF. Owners are required to report compliance to the City and include a list of retro-commissioning and retrofit measures that have a simple payback of three years or less.\(^\text{25}\)

**Seattle** requires all commercial buildings over 10,000 SF and all multi-family buildings larger than five units to annually perform energy audits. Buildings must report their benchmarking results to the Department of Planning and Development utilizing the EPA Portfolio Manager. Building owners must provide results upon request of tenants, lenders, and buyers.\(^\text{26}\)

**Washington, DC** requires all public buildings greater than 10,000 SF to annually benchmark using the EPA Portfolio Manager starting in 2010. Private buildings larger than 50,000 SF must annually benchmark on a staggered schedule starting this year. Public disclosure is required via the District Department of the Environment website.\(^\text{27}\)

Local Public Incentives to Fund Building Energy Improvements

**Boulder**'s residents in 2006 voted to impose a "carbon tax" based on their electricity usage to fund energy audits and technical assistance for homes and businesses.\(^\text{28}\) The tax expires on March 31, 2013.\(^\text{29}\) The City and County also sponsor the Energy Smart Program, which provides low cost energy assessments plus incentives, such as low interest financing, rebates and grants to

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\(^{22}\)http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=208&Itemid=489


\(^{25}\)http://www.imt.org/resources/detail/building-energy-transparency-a-framework-for-implementing...energy-rating-d

\(^{26}\)Institute for Market Transformation, Ibid.

\(^{27}\)http://ddoe.dc.gov/energybenchmarking


\(^{29}\)http://www.bouldercolorado.gov/index.php?option=com_content&view=article&id=15356&Itemid=2150
homeowners and businesses to help facilitate energy reductions.\textsuperscript{30}

**New York City** established the New York City Energy Efficiency Corporation to provide financing products for energy efficiency and clean heat improvements in private buildings throughout the City. NYCEEC is an independent, non-profit financial corporation that is utilizing federal stimulus funding and partnering with banks, community development financial institutions, and energy services companies to help catalyze energy efficiency improvements for private business owners.\textsuperscript{31}

**San Francisco** recently launched a “Property Assessed Clean Energy” low-interest financing program for commercial building retrofits.\textsuperscript{32} Additionally, San Francisco Environment, an office of the City and County, has teamed with Pacific Gas and Electric to offer commercial buildings free on-site energy surveys and recommendations for low-cost improvements.\textsuperscript{33} San Francisco also gives priority permit review for all new and renovated buildings that achieve a LEED Gold certification.\textsuperscript{34}

**Washington, DC’s** Sustainable Energy Utility (SEU), which operates under contract to the District Department of the Environment, provides a $500 incentive to homes that successfully complete qualifying energy upgrades. Both owner-occupied homes and rental properties with the property owners’ authorization are eligible to participate. In addition, the DC SEU’s Business Energy Rebates program provides DC businesses and institutions with financial rebates for installing energy-efficient equipment. This is a prescriptive program.\textsuperscript{35}

**Seattle’s** Community Power Works offers rebates and customer services for the residential sector that complement programs offered by Seattle City Light and Puget Sound Energy. In addition, single family homes that are not served by utilities for heating fuel are eligible for energy rebates. The program also provides free energy assessments, financing, and rebates for restaurants, corner stores, and small to medium grocers. Large commercial buildings served by Seattle Steam can upgrade their facilities using competitive financing and new rebates for energy upgrade programs.\textsuperscript{36}

\textsuperscript{30} http://www.energysmartyes.com/
\textsuperscript{31} http://www.nyceec.com/mission/
\textsuperscript{32} https://commercial-pace.energyupgradeca.org/county/san_franisco/overview
\textsuperscript{33} http://sfenvironment.org/commercial/overview/sf-energy-watch-commercial-program
\textsuperscript{34} San Francisco Planning Department, Planning Director Bulletin #2, May 2006.
\textsuperscript{35} http://www.dcseu.com/for_your_home/dc_home_performance/incentives_and
\textsuperscript{36} http://www.communitypowerworks.org/
District Energy

Draft Arlington CEP Goal: Increase local energy supply and distribution efficiency in Arlington using district energy.

While cities generally do not determine the supply of energy to their citizens, they have a variety of tools and authorities for creating economic opportunities to make the supply and distribution more efficient and “cleaner” from a GHG emissions perspective. Enabling district energy (DE) is one strategy for doing so.

“DE” is a somewhat general term that according to the International District Energy Association (IDEA) involves connecting “multiple heating and cooling energy users (buildings) through an underground piping network to environmentally responsible energy sources (central plants), such as combined heat and power (CHP), industrial waste heat and renewable energy sources such as biomass, geothermal and natural sources of heating and cooling.”37

DE systems support energy efficiency and GHG emissions reduction goals in two fundamental, interrelated ways. First, by aggregating heating and cooling supply to multiple buildings they optimize thermal energy efficiency, by as much as 20% in some settings. (Efficiency can be further increased if the buildings connected to a DE system have diverse loads.) Second, the aggregation of buildings allows those that could otherwise not access lower-emission energy sources to do so on a more affordable basis.

DE systems are common in U.S. cities, on college and hospital campuses, and at airports and military bases. They provide energy to about 10% of non-residential spaces in the U.S., according to the IDEA.38 Urban systems in downtown business districts generally serve between 50 and several hundred buildings — often a substantial share of Class A office buildings in a city. In urban systems, buildings usually have multiple owners, are located near each other, and are interconnected individually to the distribution piping network.

One way cities can support development of DE systems is through their regulatory jurisdiction over buildings, such as zoning authority and codes adoption and enforcement. Benchmarking and disclosure policies can also be supportive of DE planning and implementation. Localities also can play a wide range of roles in creating, owning, and/or managing a DE system.39

HR&A analyzed the efforts in developing DE systems of the following cities: 1) Montpelier, VT; 2) Nashville, TN; 3) St. Paul, MN; and 4) Toronto, Canada. Common approaches among these and other leading cities in this area are:

- An Active Role by the Locality in Establishing the System;
- Strategic Targeting of Locations to be Served by the System; and
- Linking the System’s Creation to Other Top Local Priorities.

38 Ibid.
Improving Arlington’s economic competitiveness, energy security, and environmental commitment

An Active Role by the Locality in Establishing the System

Montpelier, in collaboration with the Chittenden County Regional Planning Commission and the Central Vermont Regional Planning Commission, completed a Capital District Master Plan in the late 1990s that included DE as one of its key components. In 2002-2004, the City passed a bond referendum to fund further study, also in collaboration with the Commissions. In 2010, Montpelier was awarded an $8 million DOE Community Renewable Energy grant to begin construction of its system, which it anticipates will begin operations in fall 2012.40

Nashville in the 1970s built a plant that would burn solid waste and convert the energy into heating a cooling for downtown buildings. By the early 2000s, the plant had reached its maximum lifespan and the City initiated a study that recommended a new DE source for the City. In 2004, the new Nashville District Energy Plant began operations, and today provides steam and chilled water for nearly 40 downtown buildings. It is operated by Constellation Energy.41

St. Paul established its DE system as a pilot project in 1983. The City was responsible for securing much of the early funding.42 St. Paul’s DE system was first formed as a public-private partnership, with the public and private sectors each owning and operating different elements of the total system. Since then, it has grown into the largest DE system in North America, supplying heat to 187 buildings and 300 single family homes, and is operated by a not-for-profit organization, District Energy St. Paul.43

Toronto began supplying district heating in 1964. In 1976, five independently operated systems consolidated. In 1982, the Toronto District Heating Company was founded, to be owned and operated by the City of Toronto. In 1993 it restructured itself as a private entity, now known as Enwave Energy Corporation.44 The City continues to support the system, recently allocating $1 million for a study of the costs and benefits of extending the system to other parts of the city.45

Strategic Targeting of Locations to be Served by the System

Montpelier’s system will link various municipal buildings in the City: City Hall, the fire station, the police station, Montpelier High School, and Union Elementary school. These buildings were identified as heavy consumers of fuel oil: Montpelier intends to use the new system in part to hedge against a projected increase in the cost of fuel oil through 2035.46

Nashville’s first system consisted of a plant that burned solid waste and converted the energy into heating and cooling for downtown buildings. The plant, operated by the not-for-profit Nashville Thermal Transfer Corporation, was the first of its kind in the

http://www.nashville.gov/des/history_ofMetro.asp
Ibid.

41
43 http://www.portlandoregon.gov/bps/article/349828
44 http://www.enwave.com/history.html
45
world to use solid waste as an energy source for both heating and cooling. The current system, which replaced the original solid-waste burning plant, provides steam and chilled water for nearly 40 downtown buildings.\(^47\)

St. Paul’s system has grown into the largest district energy system in North America, supplying heat to 187 buildings totaling 32 million square feet—nearly 80% of downtown buildings—\(^48\) and 300 single family homes.\(^49\) District Energy St. Paul’s cooling system supplies chilled water to 19 million square feet of downtown building space, via 36,000 feet of piping.\(^50\)

Toronto’s system has its roots in what were previously five distinct district energy systems: University of Toronto, Hospitals Steam Corporation, Toronto Hydro, Queen’s Park, and the Toronto Terminal Railways Corporation. These five systems had provided downtown buildings with heating in piecemeal.\(^51\) It was not until their consolidation in 1982, referenced above, that the systems were integrated and significant portions of downtown began to share a single distributed system.

**Linking the System’s Creation to Other Top Priorities**

Montpelier’s system will act as a hedge against rising fuel oil prices: prices of West Texas Intermediate, a proxy for benchmarking oil prices, are projected to continue rising through 2035, from what is currently just over $80/barrel to $125-$150/barrel. Further, as both a more cost-effective alternative to oil and as a way to support the local economic, Montpelier’s system will use locally-harvested wood fuel.\(^52\)

Nashville frames the benefits of its system in terms economic and environmental benefits. Economic benefits result from a reduction in upfront capital costs for buildings systems, lower operating expenses, and economies of scale when purchasing fuel. Environmental benefits result from reduced overall energy consumption, stringent emissions controls leading to better quality air, and reduced peak power demand for air conditioning.\(^53\)

St. Paul has long been tied to environmental and local economic development goals. First, in 2003, the company began operating a biomass-processing CHP facility, which produces 70% of the heat generated for the system. Because it utilizes biomass, it consumes waste wood from downed trees, trimmings and branches. Further, the City estimates that its conversion of this waste into a useable product, that about $12 million dollars have been kept in the local economy.\(^54\)

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\(^47\) http://www.nashville.gov/des/history_of_metro.asp

\(^48\) Metropolitan Washington Council of Governments, Ibid.

\(^49\) http://www.portlandoregon.gov/bps/article/349828

\(^50\) Metropolitan Washington Council of Governments. Ibid.

\(^51\) http://www.enwave.com/history.html

\(^52\) http://www.montpelier-vt.org/group/99.html

\(^53\) http://www.nashville.gov/des/benefits_of.asp

Toronto’s system is integrated with its water supply system, using a Deep Lake Water Cooling system in Lake Ontario as its main source of chilled water.\textsuperscript{55} The City has determined that the lower operating costs, economies of scale when purchasing fuel, and reduced upfront capital building costs have increased property values in the downtown core and facilitated further development.\textsuperscript{56}

\textsuperscript{55} http://www.enwave.com/environmental\_benefits.html

Improving Arlington’s economic competitiveness, energy security, and environmental commitment

Renewable Energy

Draft Arlington CEP Goal: Increase locally generated energy supply through the use of renewable energy options.

Dozens of cities in the U.S. and hundreds around the world have made commitments to increase the use of renewable energy. Local governments have commonly set specific goals in this area. A global study of local renewable energy policies found: “Almost all cities working to promote renewable energy at the local level have established some type of renewable energy or CO₂ reduction target.”\(^5\)

In the U.S. the strongest interest in most communities to date has been in expanding the deployment of solar photovoltaic (PV) panels to generate electricity for buildings.\(^6\)

The Interstate Renewable Energy Council reported that installed PV capacity in the residential and non-residential sector in the U.S. increased 60% in 2010 from 2009.\(^7\)

Bloomberg New Energy Finance projects residential and commercial PV capacity will grow at a 22% compounded annual growth rate from 2010 to 2020.\(^8\)

The two most widely cited reasons for “distributed” (i.e. rooftop) PV’s current and projected growth in the U.S. are the development of new forms of “third party” financing for PV installations and the availability of public-sector and utility incentives. On the first, “power purchase agreements,” leases, and the like, enable building owners to pay a fixed price for 10-20 years for solar power, without having to buy or maintain the panels themselves. On the second, state, local, and utility rebates, tax breaks, and other incentives are still seen as essential for driving demand for PV, even when low-cost third-party financing is available.

Local governments usually have a significant say in design, permitting, installation, and/or operations of a distributed solar system in their communities. The most common requirements for distributed PV involve building electrical codes and fired codes. Zoning authority maybe also be relevant, to the extent it determines building locations, orientations, and allowable external features. Cities also may have a role in ensuring compliance with interconnection codes via a local utility.

HR&A analyzed the efforts in renewables of the following cities: 1) Austin, TX; 2) Boston, MA 3) Denver, CO; 4) Orlando, FL; 5) San Diego, CA. Common approaches among these and other leading cities in this area are:

- Extensive Use of Analysis and Data to Inform Policy and Drive Adoption;
- Robust Incentives and Access to Third Party Financing; and
- Commitment to Marketing, Outreach and Education.

**Extensive Use of Analysis and Data to Inform Policy and Drive Adoption**

Austin utilized publicly available data held by City and County agencies and the

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\(^6\) Cities worldwide may be able to generate 10 – 30% of their electricity through rooftop PV systems, according to the International Energy Agency: [http://www.iea.org/w/bookshop/add.aspx?id=380](http://www.iea.org/w/bookshop/add.aspx?id=380)


Improving Arlington’s economic competitiveness, energy security, and environmental commitment

municipal utility, Austin Energy, to assess potential PV generating capacity and annual energy generation based on rooftop area in the City. The analysis considered several deployment scenarios in which available square footage yielded a range of potentially available solar power. The results were ultimately incorporated into Austin Energy’s Generation Plan.61

Boston pursued a similar approach. After assessing “rooftop PV potential,” the City determined that there was sufficient rooftop space to set an aggressive deployment target. To establish a specific target, the City considered current installed capacity and developed a projected growth rate based on experience in other jurisdictions in Massachusetts, around the U.S, and in other countries.62

Denver developed a solar “master plan” that described the deployment potential and the costs of solar PV, as well as solar hot water, in public buildings. The modeling was verified and revised as necessary through rooftop inspections. The City conducted additional analysis to ensure the local zoning code does not impede and where possible supports PV installations.63

Orlando created a region-wide geographic information system (GIS)-based solar mapping website. The website enables users to calculate the solar potential on their roof and understand the potential benefits of a solar system. It also provides detailed information on individual solar projects in the Orlando area.64

San Diego conducted an analysis aimed at maximizing the economic benefits of its support for solar PV, including the systems’ impacts on electric utility bills. The study found that, “rate structures, particularly those with time-of-use energy charges, have an impact on the overall economics of a PV system, and that the impact may be large. Demand charges can also vary widely depending on when the peak time is set.”65

Robust Incentives and Access to Third Party Financing

Austin’s municipal utility, Austin Energy, offers rebates up $15,000 per home for solar PV. Austin Energy also offers its residential, commercial, and municipal customers up-front rebates or low interest loans for the purchase and installation of solar hot water heaters. In addition, Austin Energy provides direct payments to its commercial and multi-family residential customers for electricity generated by PV systems.66

Boston, until July 2012, provided rebates for solar PV and solar hot water. The rebate has been folded into a statewide program, which encourages the adoption of rooftop solar via education, marketing, and tiered pricing. Boston also passed an ordinance reducing permitting fees by 60% for solar projects by removing the cost of PV panels and other hardware from the calculation of project costs.67

Denver has made substantial investments in the Denver International Airport, which the ______________________

61 http://www.austinenergy.com/about%20us/Environmental%20Initiatives/climateProtectionPlan/index.htm
62 http://gis.cityofboston.gov/solarboston/#
63 http://www.greenprintdenver.org/
64 http://gis.ouc.com/solarmap/index.html
65 http://www.nrel.gov/docs/fy08osti/42923.pdf
66 http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX105F&re=0&ee=0
City and County of Denver owns. The City and County provided part of the financing through a loan to the project developer that was collateralized by the PV system and “renewable energy certificates.” This power purchase agreement structure lowered the financial risk in the transaction and resulted in lower cost electricity than the airport pays the local utility for conventional power from the grid.68

Orlando’s Utilities Commission has partnered with Orlando Federal Credit Union to provide low-interest loans for rooftop PV and solar water heating systems. Customers may borrow up to $7,500 for a water heating system or up to $20,000 for a PV system. Loans are repaid over time as fixed payments on customers’ monthly utility bills. Interest rates range from zero to 5.5% and terms range from 3-10 years. Borrowers do not have to be members of the credit union to participate.69

The County of San Diego’s Green Building Incentive Program expedites building plan approvals by 7-10 days and reduces permitting fees by 7.5% for projects containing eligible environmentally sustainable elements, which can include PV systems. (San Diego also benefits from generous incentives provided by the State of California.) 70

Commitment to Marketing and Education

Austin’s City Council in 2010 entered into a two-year agreement with the Austin Independent School District to install solar panels and “solar outdoor learning centers” at up to 21 schools. The goal of the centers is to give children an opportunity to participate in interactive lessons on solar energy. This effort is part of a program in which Austin Energy worked with school district science teachers to develop a solar energy curriculum. 71

Boston produced a comprehensive guidebook to assist residents, businesses, and solar installers in all aspects of solar systems. The guide provides background information on solar technologies, describes how property owners can evaluate solar options, and details state and federal financial incentives that may be available. The guide also advises on finding a qualified solar installer and the area’s permitting and interconnection process.72

Denver commissioned a “Solar Market Analysis” report to assess and increase the participation of existing Denver area businesses in the solar industry supply chain, and identify challenges and barriers to expanding participation. The report was developed from a survey of local installers, manufacturers, installers, integrators, and

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69 http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=FL63F&re=0&ee=0
70 http://www.sdcounty.ca.gov/dplu/greenbuildings.html
service providers, and provided recommendations for City support.\textsuperscript{73}

Orlando conducted a series of seven solar roundtables (interactive workshops) to develop a list of solar policies and priorities to help the City meet its deployment goals. A report summarized recommended approaches to solar implementation in all key market segments and identified policy, financial, and marketing ideas collected during each of the roundtables. The report also contained detailed conclusions and recommendations based on participant feedback.\textsuperscript{74}

San Diego conducted a citywide survey and series of focus groups with real estate professionals, City agency staff and current solar homeowners aimed at identifying specific barriers to PV systems for homes and apartments. The results, including specific actions the City has taken in response, were compiled in a publicly available report.\textsuperscript{75}

\textsuperscript{73} U.S. Department of Energy, Ibid.

\textsuperscript{74} http://orlandorunsonsun.com/solar-by-sector.

\textsuperscript{75} http://www.sandiego.gov/environmental-services/sustainable/pdf/100330solarcityreport.pdf
**Transportation**

**DRAFT Arlington CEP Goal: Refine and expand transportation infrastructure and operations enhancements.**

It is generally the case that the largest near term opportunities to reduce GHG emissions in transportation are through increasing the efficiency of existing gasoline, diesel, and hybrid-electric engines in privately owned vehicles — areas that local governments have little ability to affect. (Localities can of course have direct and sometimes substantial influence on fuel type and fuel efficiency with respect to municipal fleets.)

There are however a wide range of actions that cities and counties can take to reduce “vehicle miles travelled” (VMT) that could over time significantly contribute to emissions reductions and a more energy efficient transportation system. Primary categories of public-sector led VMT-reduction strategies include: 1) pricing (tolls, fees, taxes, etc. on private modes of transport); 2) alternative public transit options (bus, rail, ferry, etc.); 3) ride-sharing and the like (park-and-ride facilities, van pools, HOV lanes); 4) smarter growth development (e.g., denser development closer to transit and existing infrastructure); 5) walking and biking initiatives; and 6) parking management programs.

A report by the U.S. Department of Transportation concluded that broad application of select pricing, public transit, smart growth development — policies well within the authority of most local governments in the U.S. — could reduce U.S. GHG emissions by 4-13% by 2030. In addition, local governments - through their land use, building code, and zoning authorities - can encourage the creation of viable markets for lower “cleaner” vehicles such as electric cars. The extent to which such strategies may reduce GHG emissions is complex and depends substantially on which primary energy source supplies the electricity for the vehicles. According to the DOE, “Electrification [of the light duty vehicle fleet] centralizes emissions from many individual mobile sources, potentially easing environmental impacts because pollution controls on a single power plant are more economical and effective than controls on individual cars” (emphasis supplied).

HR&A analyzed the efforts in buildings of the following cities: 1) Chicago, IL; 2) London, United Kingdom; 3) Los Angeles, CA; 4) Research Triangle Area (Raleigh-Durham-Chapel Hill), NC; Common approaches among these and other leading cities in this area are:

- Substantial New Commitments to Transit;
- Other Creative Approaches to Reducing VMT; and
- Significant Investment to Create Markets for Cleaner Vehicles.

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76 In addition, some cities own and operate airports, marine ports, public transit systems, and intermodal freight and passenger facilities, creating other opportunities for interventions.

77 There are also private sector-led strategies for reducing VMT that local governments could support, such as teleworking.


Substantial New Commitments to Transit

Chicago recently announced a Building a New Chicago initiative, which aims to invest $7 billion in a wide range of infrastructure, including transit. Among the transit related planned investments are improvements to 100 Chicago Transit Authority stations and the creation of the first 16 miles of a bus rapid transit route. According to the City, the initiative will not be funded by tax increases, but through various administrative cost reductions, efficiency improvements, user fees, and private investment.

London is rebuilding its Underground system and replacing its municipal bus fleet with cleaner vehicles, financed in part by Central London’s congestion pricing system (see below). The City is also creating a 13-mile, $22 billion, 37-station transit link that will run across the entire urban core, partially funded by a special tax assessment on properties within zones that are expected to benefit from the new line. When completed, this project will bring an estimated 1.5 million additional workers within 45 minutes of central London.

Los Angeles County in 2008 passed a half-cent sales tax to help fund $40 billion in transit and related infrastructure investments over 30 years. The City has subsequently committed to complete all the major projects within 10 years. The effort is estimated to create more than 210,000 new construction jobs and infuse an estimated $32 billion back into the local economy.

Research Triangle. Raleigh is creating a new multi-modal transit hub downtown with a combination of local, state, and federal funds. Durham County has approved a half-cent sales tax to expand commuter rail and bus service. Wake County and Orange County have not yet approved it but are taking other steps to improve existing transit infrastructure.

Other Creative Approaches to Reducing VMT

Chicago. The Chicago Metropolitan Agency for Planning’s “GO TO 2040” plan, Chicago’s first comprehensive regional plan in more than 100 years, contemplates several innovative mechanisms to reduce VMT. The plan considers options for replacing federal and state gasoline taxes with “pay as you drive fees,” including a potential “VMT fee.” Such an approach could be more efficient and effective than gas taxes through the utilization of GPS and other technologies.

London. Since February 2003 the City of London has imposed a fixed daily charge to drive or park on public roads in its central area during weekdays as a way to reduce traffic congestion and raise revenues to fund transit investments. Individuals who live within the charging zone are entitled to much lower charges. A wide range of payment plans and mechanisms are available.
Los Angeles' Department of City Planning, with funding from the Metropolitan Transit Authority, is actively supporting “transit oriented development” (TOD). The funding is enabling the Department to launch a comprehensive program to complete and adopt 10 TOD station area plans within the next two years. Transit-oriented planning is also a key feature of three specific plans that are starting the approval process and has been touted by the Mayor of the City as a top priority.  

Research Triangle. The City of Durham and City of Chapel Hill developed a joint blueprint for regional mobility and growth that includes a major focus on park-and-ride facilities as an important component of travel demand management. The plan describes potential partnerships with retail locations, creating joint-use of existing parking facilities that may be underutilized and well positioned along key corridors. It also recommends potential new locations for park-and-ride facilities.

Significant Investment to Create Markets for Cleaner Vehicles

Chicago raised $9 million in private and public funds to create 280 EV charging stations in the city and surrounding region by the end of 2011. The effort included the first large scale EV car sharing program by Zipcar. Recent reports have suggested that implementation has been slower than expected but the project is more than 60% complete.

London. Source London is a program to install 1,300 publicly accessible points across the city by 2013 (double the number of gas stations in the City). The program will begin as a membership program (EVs are exempt from London’s congestion charges described above.) In addition, London’s newest buses are diesel-electric hybrids.

Los Angeles provides rebates, expedited permitting and customer service support to EV buyers. The City has also revised the building code to be “EV ready” and has been investing in the existing grid infrastructure – upgrading thousands of distribution transformers for example – in order to ensure reliability as expected demand for EVs grows.

Research Triangle communities developed a community-wide “readiness plan” for large scale adoption plug-in EVs. The City of Raleigh has worked to remove local barriers to EV adoption in its building code, electrical code, and other local policies, while streamlining permitting and inspections for EVs. The City installed nearly 60 EV charging stations in 2010 and 2011 is also exploring the feasibility of solar-powered charging stations.

http://www.planningreport.com/2012/01/31/reinventing-los-angeles-seizing-transit-opportunity
http://www.nc54-i40corridorstudy.com/index.html
http://theexpiredmeter.com/2012/06/possible-investigation-short-circuits-chicagos-electric-vehicle-charging-station-program/
http://www.soucelondon.net/
http://www.socalev.org/index.htm