

Arlington County Community Energy and Climate Adaptation Advisory Report



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Executive Summary

Climate change and the associated environmental concerns are indelibly linked with energy use in Arlington County. The increasing cost of fossil fuel resources needed to supply Arlington County's vast demands for energy promulgated by regional growth has made it apparent that reliable low-carbon alternatives for energy generation are vital for a sustainable future with the current growth rates. In an effort to mitigate the county's impact on climate change, Arlington County's progressive governmental leadership has drafted a Community Energy Plan (CEP) to address and plan for important global sustainability trends.

This Advisory Report provides an overview analysis of Arlington County, Virginia's Community Energy Plan (CEP) and Community Energy Implementation Framework (CEIF) with regards to transitions that are part of the 2050 trends that will be discussed in this report and the role that the 2050 trends hold in the sustainability of growing communities. This analysis seeks to relate CEP sustainability priorities to stakeholders, as framed in the CEIF for execution and implementation. An assessment of goals, strategies, risks, and a variance of considerations are presented to expand upon CEP goals and priorities to further increase stakeholder engagement in the CEIF. Alternatives to the climate mitigation program priorities are also proposed and evaluated for their success and contributions to Arlington County's CEP and CEIF efforts. The report includes a stylized representation of the program in the form of a brochure that is intended for distribution throughout the community to order to increase awareness and engagement. This advisory report also provides Arlington County with a broad approach to climate adaption and a means to promote direction, alignment and commitment for the development of such.

Introduction

As a National leader in innovative local government planning for sustainability with Metro/transit oriented development, Arlington County has been tracking and studying its environmental impact for over 50 years. Arlington is aware of the seriousness of the 450-ppm of CO₂ threshold and is working hard to not contribute to the looming 2-degree change in global surface temperature as a result of greenhouse gas emissions. Arlington County's mission is to *"be a diverse and inclusive world-class urban community with secure, attractive residential and commercial neighborhoods where people unite to form a caring, learning, participating, sustainable community in which each person is important."* Since cities are responsible for roughly 75% of greenhouse gas emissions, it is critical for high-density municipalities like Arlington to take the initiative to improve its environmental literacy and livability. In order to achieve this, the County's Department of Environmental Services has focused on energy usage, reducing greenhouse gas emissions, and educating and engaging the community.

Arlington is utilizing two of the most effective responses to climate chaos: *mitigation* (prevention) through reduction of greenhouse gas emissions and *adaptation* (preparation) to minimize climate-induced disruptions to essential services. Arlington's Community Energy Plan (CEP) was created to maintain overall competitiveness as a city through their response to rapid and expansive growth resulting in: high increases of energy usage, subsequent necessity to reduce energy waste and increasing

the quality, flexibility, and reliability of energy supplies. Through the CEP, Arlington County has thusly become a leader in confronting long-term global sustainability issues, such as, dramatic population increases and an overall widespread migration to urban centers.

In order to effectually address climate change, and corresponding energy mitigation strategies and tools, the CEP and Community Energy Implementation Framework (CEIF) must be evaluated and analyzed with specific regards to predicted transitions and trends in demography, markets, governance, and the environment for the year 2050. The predicted 2050 social, economic, and environmental changes constitute the core momentum for climate change. It is imperative that mitigation strategies throughout the CEP planning and CEIF implementation efforts reduce energy-related GHG emissions throughout Arlington County and be developed in a cumulative or cross-boundary mode in order to ensure a successfully determinative push to slow down the environmental impact of predicted growth in the County. Apparent changes in Arlington's climate are encompassed within the global context that is attributed to increases in urbanization and sprawl, population growth, market transformation (the rising middle class's demand of goods which require an increasing expanse of natural resources) and stressors on ecosystem services. The following report seeks to reprioritize CEP goals and suggest necessary expansions to program strategies within the CEP and CEIF in an effort to better address these 2050 trends specific to Arlington's urban stature.

This advisory report also provides Arlington County with significant information for a broad approach to climate adaption and a means to promote direction, alignment and commitment for the development of goals and policies to address those concerns.

Overview of Arlington's CEP Priorities

Arlington's purpose for implementing the CEP is to enhance the economic competitiveness of the county, ensure reliable and affordable energy supplies, and to demonstrate the county's long-term commitment to environmental responsibility. We've listed the 6 main goals from the CEP below. In order to achieve these goals, Arlington must prioritize and then rank the goals.

Current Order of CEP Goals:

- 1) Increase energy and operational efficiency of all buildings
- 2) Increase local energy supply and distribution efficiency using District Energy
- 3) Increase locally generated renewable energy
- 4) Refine and expand transportation infrastructure and operations enhancements
- 5) Integrate CEP goals into all county government activities
- 6) Advocate and support person action through behavior change and effective education

Clearly communicating and engaging with key CEP stakeholder groups and leaders to support and enact CEP efforts should be the CEP's top priority. Placing community engagement as the first priority allows for utilization of the key stakeholders to support the subsequent priorities. Combining the CEP's goals 5 and 6 into one overall goal of engagement, awareness and behavior change is recommended for simplicity.

Although the key stakeholder importance may vary depending on the CEP goal, the CEP’s success is contingent upon the accurate identification and relationship with all of its key stakeholders because without their support the implementation will be difficult and there will be a loss of the diversity and insights of a distinct stakeholder environment whose knowledge and cooperation can enhance them CEP effort. The CEP rightly identifies the key stakeholders as follows: *local businesses, energy-utility sector, NGOs, residents, educational institutions, local, state, and federal governments (CEP, 2012)*. Knowing it is important to ensure that there are no stakeholders left out of the engagement process, we have explored each stakeholder group in Figure 1: Stakeholder Chart providing a detailed outline of the stakeholders and their role in the group.

Figure 1 - Stakeholder Chart

| Stakeholder | Role in CEP |
|----------------------------------|---|
| Business community | The business community is the largest consumers of energy in Arlington and therefore has the largest impact on the goals that Arlington has set forth for sustainability. Additionally, as one of the major touch points with residents their business behaviors have the most ability to reach and educate resident by adopting the efforts put forth by Arlington County. There are currently 652 restaurants and the 2 million square feet of retail space. |
| Arlington Government | Arlington Government is the stakeholder that has the most influence over the success of the sustainability efforts since they are responsible for approval, allocating funding/staff, and coordinating across internal departments to ensure accurate communication and full adoption of these efforts. Groups, such as, Arlington’s Planning Research and Analysis Team (PRAT) is a key example of their role as a stakeholder, since the data collected by the PRAT team could be beneficial if focused on gathering data to support their efforts. Additionally, coordinating with other facets of the Arlington government, such as the park services since there are 146 parks in Arlington, can increase the education and engagement of residents and commuters. |
| Residents and commuters | Arlington County's January 1, 2013 population was estimated to be 212,900 (this is an 11.7% increase since 2000 (Arlington, 2012)) and there were an estimated 228,700 people working in Arlington County, including civilian and military. The total is roughly 442,000 individuals that have an impact on the community; their adoption of the sustainability efforts is vital. There are roughly 118,000 in-commuters, 89,000 out-commuters, 16,000 who roughly live and work in the area. |
| Land Developers/ Builders | Arlington estimates the potential developing area to be roughly 11.4 million square feet of office space, 2.0 million square feet of retail space, 24,500 residential units, and 1,100 hotel rooms. The majority of future development will take place within Metro corridors and therefore this stakeholder’s adoption and adherence to sustainable building methods is vital to having Arlington grow in line with the goals outlined. |
| Investors | Investors are a large component of new building development, especially when it comes to new sustainable products that result in a more sustainable development. Ensuring investors understand county goals and the benefits financially (long and short term) is highly valuable and could secure Arlington’s appeal as a county in which to invest. |

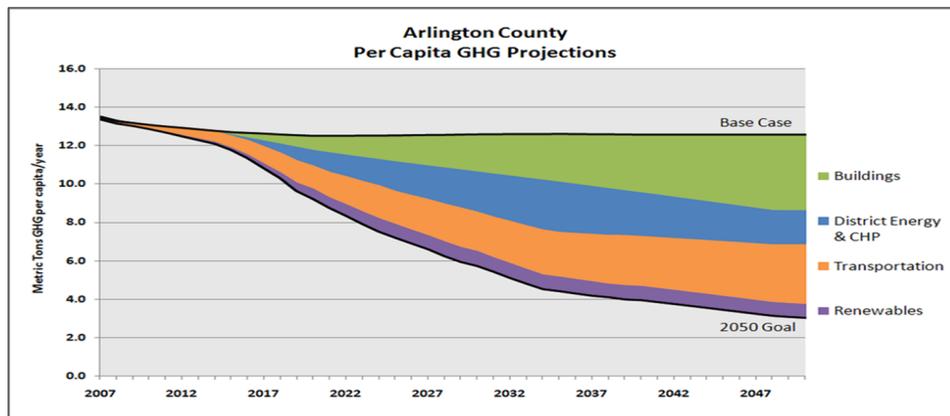
| Stakeholder | Role in CEP |
|--|---|
| Schools (K-12 and Universities) | There are 37 schools in Arlington County with 22,645 students enrolled in Pre-K-12 and 14,000 enrolled in adult education (Arlington Public Schools, 2013). The impact of this size of a group of stakeholders is substantial if they are properly engaged and educated of Arlington goals and vision, they would be great conduits for change. |
| Board of Trustees | The board has 5 members, many of whom have served on the board for several years. As a result the continuity of leadership can be positive if they understand and adopt the efforts. |

An evaluation of the priority of remaining four CEP goals is aided by an examination of the wedge graph from the CEP (Figure 2). The graphs depicts the per capita projected reductions in GHGs from 2007 to 2050 divided into four major energy categories which correspond to the four remaining CEP goals. The portion of the predicted GHG reductions by each of the four goals during different time ranges was used to construct the prioritization charts found Appendix. Estimating relative resource requirements verses the CEP goal’s essential value to the CEP’s mission on these charts yields a snapshot of changing priorities of the CEP throughout the next 38 years. While transportation-related goals should be prioritized in the near term to maximize GHG emission reductions; buildings, followed by District Energy plans will yield more GHG reductions in the future and so should be given greater priority as the years pass. Unless significant advances in technology occur, renewable energy technologies should be the lowest priority of the four energy categories.

CEP Proposed Top Priorities:

1. Community and County Engagement/Awareness/Behavior Change
2. Transportation
3. Energy efficient buildings
4. Local energy production and distribution (District Energy)
5. Sustainable, alternative energy supplies

Figure 2 - Draft Community Energy Plan, Arlington County Va., May 2013



Overview of Arlington's CEIF Priorities

Using the CEP prioritization framework, the CEIF identifies strategies and tools for implementation of the CEP. This section aims to evaluate the prioritization, as well as, the application of these strategies and tools as they pertain to broad sustainability strategies that are listed and summarized in the Appendix. The sustainability strategies presented have their roots in the social, economic and political perspectives and approaches used to address sustainability challenges brought about by the predicted 2050 trends. These strategies differ by their outlook on the best way to examine and solve sustainability-related issues. By identifying what sustainability strategies are employed in the CEIF's existing and potential strategies and tools, one can more readily determine which approaches, perspectives and stakeholders have been included and which may have been overlooked. Identifying those potentially missed opportunities for collaboration across the lines of sustainability strategies will result in a CEIF that will allow Arlington County's secure energy structures to maintain economic competitiveness whilst demonstrating environmental commitment.

When evaluating the specific tools used in the CEIF it is also important to note the risks associated with spanning private, public and nonprofit sectors. Most significantly, Dillon's Rule must grant Virginia enabling authority for actions taken and which will limit the success of sustainability strategies. Additional items to note when evaluating the CEIF tools are the means by which success or progress is measured. Coupling success with local incentives can inspire action to affirm the development of public commitment for the investment of financial resources. Recommendations have also been made with the specific intention to encourage effectual engagement of stakeholders.

Building Efficiency

Arlington County's sustainability goal is "increasing the energy and operational efficiency of all buildings in Arlington County". Arlington County includes 67 buildings, which total over 2.3 million square feet of floor area; this highlights the importance of building efficiency as a top concern. The original goal was to increase building efficiency by 10% from 2000 to 2012. Since, as Arlington's website states, "Energy efficiency is the most cost effective approach to reducing greenhouse gas emissions and to managing a building's operating costs (Arlington, 2013)." The focus to affect change in building efficiency has been successful by implementing regulations that ensured all new buildings and retrofits met county sustainability codes, as well as, to reach out the community to increase sustainable consumption through education and the hearts and minds approach. However, the utilization of Fixed Market Failures would be significantly effective in this situation. During our meeting with Arlington's Community Energy Director, it was stated that this was something that was beginning to be pursued, an assurance that fixing market failures would be able to supplement the program and encourage sustainable consumption by a more direct way to secure the intended outcome.

Evaluating the CEIF Goal 1 strategies based on relative value and resource (cost, time) requirements reveals recommended priority levels for each CEIF strategy. Strategies 2, 3, 4 and 8 all require low resource commitments and have relative high value and therefore should be given the highest priority for implementation. Strategies 1, 6 and 9 should be acted upon soon after. Strategies 5, 7, and 8 would have the lowest priority for initiation.

Transportation

Refining and expanding transportation infrastructure and operations in Arlington County is a task that has been worked on for many years. This goal closely adheres to the County's Master Transportation Plan (MTP). Therefore the strategies and tools proposed in the CEIF to accomplish the transportation policies have been well documented and are quite diverse. They address most of the sustainability strategies across the scale, from individual actions (hearts and minds) through institutional strategies (promethean and organizational change) to the use of partnerships (collaborative adaptive management and bio-regional localism). The strategies represented also run the gamut from reformist revisions of existing programs to the employment of radically different programs from the existing operations of the County.

Reflections on this well-covered goal did reveal two areas where additional tools may be of benefit. The use of government regulation to increase the efficiency of County and Arlington Public Schools can be applied to not only the choice of vehicle, but the operation of the vehicle as well. Implementation of a rotating Driver Management Program for County employees could result in a significant increase in the fuel mileage on any vehicle because it works to educate the driver on effective, fuel conservation habits. These good driver habits can also be applied to landscaping vehicles and heavy equipment. Making use of a promethean strategy to not only buy new vehicles that have lower-carbon impacts, the County could investigate the purchase of conversion kits to alter the fuel used to power existing County vehicles.

Evaluating the CEIF Goal 3 strategies based on relative value and resource (cost, time) requirements reveals recommended priority levels for each CEIF strategy. Strategies 1, 2, 3, 6 and 7 all require very low resource commitments and have relative higher value and therefore should be given the highest priority for implementation. Strategies 4, 5, 8 and 9 should be acted upon soon after as these either have higher value and more resource requirements or lower value and lower resource requirements.

District Energy

After an analysis of the CEIF Goal 2 to "increase local energy supply and distribution efficiency in Arlington using District Energy," it is evident that additional tools could be implemented to support the project. The most important aspect of District Energy is the adaptive management component across various stakeholders, which the current CEIF does well. There is an opportunity, however, to include the high energy density, federally- owned areas of Arlington – Fort Myer, The Pentagon. Working with the federal government requires a different regulatory approach, but a partnership with the Department of Defense should be included as a short or long-term goal. An additional group who could be included in the discussion is Metropolitan Washington Airports Authority, which operates Ronald Reagan Washington National Airport.

Evaluating the CEIF Goal 3 strategies based on relative value and resource (cost, time) requirements reveals recommended priority levels for each CEIF strategy. Strategies 8, 3, 4 and 5 all require low resource commitments and have relative higher value and therefore should be given the highest priority for implementation. Strategies 2, 1 and 6 should be acted upon soon after. Strategy 7 would have the lowest priority for initiation.

Renewable Energy

The use of renewable energy to reduce greenhouse gas emissions in the form of CO₂ emitted into the atmosphere is the focus of this CEIF goal. Renewable energy strategies for implementation are encompassed within the CEP's overarching parameters of providing economic competitiveness, generating social alignment, and adhering to environmental responsibilities. These parameters provide the foundation for collaborative adaptive management in all aspects of Arlington's Comprehensive Plan.

Through a strategically focused assessment and analysis of the CEIF's goal to "increase locally generated energy supply through the use of renewable energy options", and the associated prioritized strategies and tools to achieve said goal, various points of interest have been brought to light.

The heavily based regulatory measures/tools to support the outlined strategies could incorporate systems of organizational change through the education of stakeholders, such as those as outlined in the stakeholder section, to the inherent economic, social, and environmental benefits from the initial investment in renewable energy technologies. It is important to share with them the all-encompassing translation of energy savings for further development and expansion of the community's 21st century career infrastructure, which can result in the creation of new green employment opportunities. These employment opportunities could arguably generate an increased base of passionate and knowledgeable individuals or organizations that would provide personal and educational support for the CEP's aspirations to change cultural values, hearts and minds, on an unprecedented communal level.

Communicating diverse solutions to the Arlington community with prioritized stages of metrics to foster and promote accountability on an individual, organizational, and communal level will only further CEIF's efforts to "encourage solar hot water and other renewable technologies". Enacting disincentive programs for the use of unsustainable energy practices or utilizing focus-marketing with the residential and commercial real estate sectors to better express the pre-existing renewable energy strategies is a benefit. Additionally, leveraging case studies, white papers, and research reports throughout the various deployment stages can drastically increase stakeholder support, knowledge and funding.

As is the case with most challenges on the frontlines of the ominous 2050 global trends, popularized social support can impact change through groundswells of amassed provisioning. Amplifying and capitalizing upon the Promethean nature of the progressive citizens and organizations to create solutions to environmental issues is key. Human innovation in the form of renewable energy generation is a testimonial tool by which the Arlington community can accomplish goals to overcome their energy needs with respect to climate mitigation. The technological advancement for renewable energy sources is already available to mitigate the effects of climate chaos in Arlington County. However, the catalyst driving these vessels for change is stakeholder recognition, engagement and support to increase funding allowing access to these resources for the development of a more sustainable tomorrow.

Evaluating the CEIF Goal 5 strategies based on relative value and resource (cost, time) requirements reveals recommended priority levels for each CEIF strategy. Strategies 7, 3, 1, 6 and 5 all require low resource commitments and have relative higher value and therefore should be given the highest priority for implementation. Strategies 2 and 4 should be acted upon once the first group of strategies is initiated.

Community and County Engagement/Awareness/Behavior Change

An analysis of the program strategies and tools presented to achieve the goals of Community and County Engagement/Awareness and Behavior Change reveals several key points to consider. Education is key to affecting change and should have the highest priority. Without education and approval by County Trustees, there will be no funding to educate and encourage community-wide change. There is a top down approach to spreading the word about the CEP. After the Trustees have agreed to the CEP, then the rest of the County personnel must be engaged. The strategies and tools presented in the CEIF do not mention engagement of Arlington County personnel in the educational process.

Planning for County personnel engagement is a necessary second step to achieve these goals. In order to encourage County Personnel to take on the goals in the CEP, E-teams should be gathered in each department or building to seek advice from personnel and educate them on energy concerns. Meetings with representatives from all these groups should be called regularly to inform all on new efforts as well as successful or difficult projects attempted in the past. Information is key and should flow both ways- top down and bottom up. The County workers should be encouraged to speak their minds in offering solutions to increase efficiencies and reduce waste in big and small ways. This exchange of ideas should occur in a safe environment away from political concerns and taxpayers.

The education and participation of each County worker in the CEP ought to be the priority before community rollout. If County workers are not engaged and informed on the CEP, then there may be limited success in getting others outside of the government to engage. The County needs to not only educate about CEP and the CEIF, it needs to teach its employees how to teach outside groups to engage in a continuing process of energy efficiency improvement. This process of engagement, with the use of core energy groups and E-teams should be taught to leaders of groups looking to spread the word and affect change in their own organizations.

Evaluating the CEIF Goal 5 strategies based on relative value and resource (cost, time) requirements reveals recommended priority levels for each CEIF strategy. Strategies 7, 3, 1, 6 and 5 all require low resource commitments and have relative higher value and therefore should be given the highest priority for implementation. Strategies 4, and 2 should be acted upon once the first set of Goal 5 strategies are implemented. Evaluating the CEIF Goal 6 strategies reveals that Strategies 3, 2, 7, 5, 1 and 4 all require low resource commitments and have relative higher value and therefore should be given the highest priority for implementation. Strategies 8, and 6 should be acted upon once the first set of Goal 6 strategies are initiated.

Redirections and Expansions of the CEP and CEIF

The CEP vision statement advocates the rethinking of the use, generation and distribution of energy as a vehicle to mitigate the risks of climate change and electrical outages as well as the uncertainties of fossil fuel price and supply. We feel that the six goals identified in the CEP to carry out the vision statement do not completely mitigate the identified risks. Three additional goals are proposed to fulfill the intention of the vision statement. To achieve the desired reduction of electrical outages due to storm

events, other than in the DE zone and where homeowners have installed alternative energy sources, a goal to bury or “underground” electrical distribution lines throughout the County should be set. Reducing the urban heat island effect in the densely populated areas of the County as well as along the major asphalt covered roadways is another goal that can significantly reduce energy used during warmer months for air conditioning by promoting the reflection and reduction of unwanted thermal energy storage. Finally, the GHG emissions report did not consider the energy expenditures associated with the manufacture and delivery of supplies to the County. By advocating for the reduction and reuse of goods, as well as maintaining environmentally preferable purchasing (EPP) standards, significant GHG emission can be averted.

Proposed Additional CEP goals:

- 7) Increase security of electric supply from severe storms by burying electric distribution lines.
- 8) Encourage the reflection of solar energy to reduce unwanted thermal storage.
- 9) Promote the reduction and reuse of County supplies along with the application of EPP standards to avert GHG emissions associated with unneeded or environmentally harmful products.

The strategies and tools presented in the CEIF to achieve the CEP goals are fairly comprehensive. The following are some areas additional strategies and tools that would fill in a few gaps in attaining those goals. Tools and strategies are also presented to meet the three additionally suggested CEP goals.

Goal 1 Energy Efficiency in Buildings

S1.10 Provide incentives not only to builders, but owners and occupants as well, by encouraging the metering of water and electricity by individual users (sub metering). This should incentivize to save water and energy. Remote sensing meters make this much more feasible than in the past.

S1.11 Adjust water rate structures to encourage water conservation above certain basic levels. The rate structure of water usage could be altered to induce people to stay below certain levels of water usage, or risk being charge more per additional 1,000 gallons. Also, the water that is metered only for irrigation could be charged at a higher rate in order to encourage conversion to drip irrigation, xeriscaping, and the reduction of grass growing and cutting.

S1.12 Target high-value, low-effort energy saving efforts for homeowners by focusing on one issue a month or a season. Following in the steps of the smoke detector giveaways by fire departments and detector battery checks at the start of daylight savings time; initiate the use of and/or checking specific energy-saving efforts at appropriate times of the year. Solar-powered roof/attic fans on could be given away or promoted at the Summer Solstice, for obvious reasons. Insulation of attics could be pushed on All Hallows Eve to keep the “energy monster” away or on Thanksgiving to work off all those rolls we eat. These items would encourage attic cooling and insulation in home that are not being wholly renovated. Additional efforts could focus on the replacement of an old, inefficient appliance as part of “Spring Cleaning” in March and a lawn mower exchange program could encourage use of “old-fashioned” push mowers in April or May.

Goal 2 Heat Recovery in DE

S2.9 In areas outside of the DE zones, work on building partnerships between owners of neighboring buildings to utilize and create mini DE zones. Promote the use of existing renewable technology, such as banks of solar arrays or extensive vertical or horizontal heat pumps in parking lots and combine those systems with the use of tertiary coolers and gas/air heat exchangers in these mini DE systems. Group solar arrays should also be encouraged in single-family home neighborhoods.

Goal 4 Reduce Transportation Energy

S4.10 Promoting “right-sizing” personal vehicles, with the idea of renting/car sharing larger vehicles (minivans, pickup trucks, SUV’s), only when really needed. By encouraging the everyday use of small cars, Segway’s, or electric bicycles with the availability of large car sharing by Zip car or other companies, many larger cars and trucks could be taken off the roadways. Work to eliminate barriers to downsizing cars as well, such as tax breaks for increase in mpg of new car or sales tax relief, etc.

S4.11 Encourage use of smaller or high mpg motorized vehicles with non-monetary special privileges. Promoting special privileges for small or high mpg cars could entail charging only 1/2 price for cars that only take up 1/2 of a normal parking space. Parking garages could be relined in highly desirable locations for smaller cars or for cars that need to be charged up. Neighborhood parking permits could be based on length and weight of vehicle as well.

S4.12 Promote normal car maintenance to increasing the gas mileage of all cars. Encouraging the frequent checking and proper inflation of car tires to increase gas mileage of all cars up to 3%. Sponsor mobile tire pumping stations in easily accessible, weather-protected locations. Encourage stores and parking lots to have free or sponsored compressors with frequent (monthly) visitor stamps getting discounts at stores. Promote checking tires with compressors at dedicated locations in parking garage exits.

S4.13 Educate and encourage efficient driving habits. Promote the idea that people’s driving habits really do contribute to climate change. Easing off the gas pedal at the right time could save money and the earth. Driving at slower speeds, avoiding quick starts and stops, emptying the car of excess stuff and avoiding idling the car could save many gallons of gas a year.

S4.14 Encourage design of Cluster Mailbox Units. Group mailboxes increase daily post delivery vehicle mpg and social interaction amongst neighbors.

Goal 5 County Buy-in of CEP Efforts

S5.8 Promote evaluation of county operations from energy use perspective to optimize operational efficiencies. Evaluate operating times or days of schools and other operations to encourage shorter, off-hour commutes or minimizing heating/cooling/lighting expenditures. Evaluate shifting work or school day by the season to the warmest or cool time of day.

S5.9 Investigate the use of alternatives to gas powered landscaping equipment. Propane powered landscaping equipment emits less GHGs than gasoline, is more easily transported, is less apt to have a fuel spill and causes less stress on engine parts.

Goal 6 Advocate and Support Change Education

S6.9 Concentrate educational efforts on energy-intensive or GCG emissions businesses and business groups. An evaluation and comprehensive redesign of the County’s energy-related webpages, coordinated with other printed materials, to concentrate on key issues or desired behavioral changes would bring focus to the educational efforts while still allowing for additional information to be accessed in linked pages. Major efforts could change periodically and progress could be tracked to determine effectiveness of the outreach programs. For instance: Commercial landscaping equipment CO2 emissions were not included in report, yet one lawn mower emits as much GHGs as eleven cars in an hour. The use of alternative fuels, efficient operations, old-fashioned rakes could reduce GHGs and noise pollution as well. A concerted push to address this issue could be put forth and measured.

S6.10 Promote temperature-appropriate dress code.

Encourage dress code changes (ie, bring back the hat for indoor wear during winter and reduce wearing of suits in summer). Many seasonally dressed people in offices are kept cold in the summer to accommodate workers wearing suits. Space heaters are used under desks to battle the unnecessary air conditioning. Publicize this waste in terms of GHGs, money and human misery in order to affect change.

S6.11 Promote the facts about getting a cold virus. Debunk myths regarding “catching a cold” from being in the cold. A person doesn’t get sick from cold air, so promote continued walking and biking to commute in the colder months.

Goal 7. Solar Heat Reduction/Reflection

S7.1 Work to increase albedo of all surfaces in Arlington. Promoting the reflection of sunlight (albedo) from all surfaces will reduce the heat island effect in urban areas of the County. The use of thermo chromatic coverings of pavement and roofs can reduce temperature by more than 20 degrees C and therefore reduce cooling energy needs. Promote the use of alternatives to black asphalt roadway coatings. The strategic planting of trees or site orientation of parking lots will also help to reflect sunlight or reduce heat absorption. Promoting taller, long-lived tree species (instead of small ornamentals e.g. Bradford pear) will aid in long-term GHG reduction as well as heat absorption.

S7.2 Promote the use of trees and xeriscaping of grass strips along roadways. Encourage the planting of trees and native plants along roadways in swales or along sidewalks.

S7.3 Encourage the use and maintenance of living or green walls in urban areas. Gardening can be done in a very small space or on the sides of very large walls. Encourage the use of green-scaping to break up large areas of concrete in densely populated areas.

Goal 8 Electrical Energy Security

S8.1 Increase energy security with the undergrounding of electrical distribution lines. Encourage the undergrounding of electrical distribution lines in new development and the strategic undergrounding of existing lines to decrease electrical outages due to storm damage. If distribution lines are put underground, then trees can be grown nearer to street to reduce temperatures of asphalt roadways. (Actual costs of burying lines are not as expensive as publicized because repairs of electrical lines from storm damages are not typically included in cost/benefit evaluations.)

Goal 9 Reduce, Reuse, and EPP of County Supplies

S9.1 Call for the reduction and repurposing of supplies combined with the use of Environmentally Preferable Purchasing (EPP) standards. Promote the wise use of resources, starting with office supplies and ending with forklifts. Spending money for unneeded or useless items causes GHG emissions locally for the deliveries and globally for the manufacturing. Establish standards for purchasing a minimum amount of supplies that meet EPP standards.

S9.2 Encourage wise packaging practices. Promote conversations between manufacturers, shippers, business, and customers regarding unnecessary or alternative product packaging. Reductions in packages will payback in reduced costs and less trash.

Adaptation

Renewable Energy

Arlington County has the opportunity and responsibility to prepare their cities, and encompassing county, to better receive the inevitable effects of climate change. The significant climate induced changes that will occur in the coming decades will drastically alter the structure of Arlington County's naturally and human maintained essential services in the form of extreme increases in air and water temperatures, flooding, drastic storm surges, drought, lack of potable water, and sea level rise. These consequences establish the necessity for active preparation, in the form of climate adaptation, and thusly an opportunity to utilize renewable energy sources at a level that would otherwise be unattainable.

CEIF's goal to "increase locally generated energy supply through the use of renewable energy options" is not exclusive to mitigation efforts but can be inclusive of adaptation. The use of renewable energy to reduce greenhouse gas emissions in the form of atmospheric CO₂ has its own inherently invaluable qualities, as has been previously discussed. Yet, there is a forthcoming opportunity to utilize this same goal to better adapt to the portentous powder keg about to ensue, which is climate chaos. With the increasing severity of storm surges and natural disasters of late that brought flooding and high winds it became apparent that near coastal counties such as Arlington are vulnerable to the effects of climate change and energy security is of the utmost importance. Wind and solar power plants are not only the first to return to full power after devastating storms but are the safest mode of generating power in light of these climatic changes, as was illustrated in Hurricane Sandy on the eastern coast of the United States and the Fukushima Daiichi Nuclear catastrophe in Japan. The response time of these renewable energy sources would be critical to vital medical services and water treatment facilities.

In addition, a shift to more sustainable sources of energy generation through the utilization of renewable energy options can drastically reduce water usage in the process. Fossil fuel generation consumes a great deal more water than solar and wind photovoltaic resources throughout its supply chain. This avenue of sustaining Arlington's local energy supply is more water and cost-conscious than other renewable energy sources such as biofuels and geothermal technologies. With the effects of climate change on the forefront, potable water quality and quantity as well as the associated need to implement renewable

energy technologies in the operation of water treatment facilities creates a need for reliable energy accessibility.

In preparing for a safer future against climate provoked situations such as these, Arlington County would increase stakeholder and legislative support and funding for implementation, by relating such issues as national security priorities at a level that would be invaluable to its renewable energy mitigation successes as well as adaptation. In other words, ensuring the more tangible or visualized safety of Arlington's civic services would form a symbiotic relationship and the county would be beneficially reducing the carbon emissions that contributed to the very necessity for precautionary measures to be taken.

Building Efficiency

The greatest threat to the energy efficiency and physical integrity of buildings in Arlington County will be unpredictable, extreme weather patterns. Hotter summers and colder winters will inevitably cause spikes in air conditioner and heater use. This level of use in high-density areas will lead to malfunctions and energy waste. The County, working with developers can take action now in order to prevent the necessity of costly repairs and retrofits in the future.

Green infrastructure is a tool that can be used not only to mitigate for climate change through reduced GHG emissions, but also to prepare for its inevitably costly effects. Green roofing is a practice in which live vegetation is grown on rooftops in place of standard heat-absorbing surfaces. Cool roofs are a similar idea but use heat-reflecting materials instead of plants as a cover. They have been proven to reduce internal building temperatures, which will prevent the tenant from running air conditioning at a high power to combat hotter weather. They are effective in cold weather situations as well due to its heat retaining quality; 25% less heat is lost through the ceiling with a green or cool roof in place. The urban heat island effect – which describes increased temperatures caused by heat-absorbing impervious surfaces in densely populated areas – will be reduced through a cooperative green infrastructure plan amongst neighboring developers.

In preparing for the next 5-10 years, Arlington County must look at its building codes with regards to weather resistance. Older structures especially may not be able to withstand the severe winds and snow storms that will become more commonplace in the Washington, D.C. region. A restructuring of the code for new buildings as well as an incentives program to retrofit current structures will protect local homes and offices. Improved insulation and window weather stripping will alleviate the stress of energy demands during peak hours. Plans should be put in place to monitor their effectiveness and adjust as necessary as climate change intensifies.

Black and brown outs will be a common occurrence in the years and decades to come due to strain on the County's power grid and downed power lines. The plan to implement District Energy will remove some of the strain by creating a localized micro-grid in high-density areas and will provide energy security through an underground system. This project however, will also need to be monitored so that its long-term efficiency is not affected by change in global weather patterns. Important aspects to consider are the durability of the pipes and generators in harsh conditions as well as the ease of replacement.

Transportation

Arlington is roughly 26 square miles of urban county directly across from the Potomac River. Arlington maintains 376 miles of roads, almost 149 public parks, and 86 miles of biking/jogging trails (Profile 2012). It is one of the most densely populated jurisdictions in the country with a population density of 8,205 persons per square mile and a total estimated population of 211,700 on January 1, 2012.

Arlington's efforts to encourage alternative transportation methods have significantly increased the usage of parks and trails and with climate change posing the potential unpredictable weather swings Arlington needs to consider the challenges that are posed to low lying areas that are already flood risks, hydration stations for extremely hot days due to the high volume of alternative method commuters that currently use trails each day, and weather shelter stations for the extreme and sporadic weather swings that will result from climate change. These are important to discuss, budget for, and devise a solution to now, despite the future deadline since these don't all have quick or easy solutions, such as how to prevent flooding in a currently highly susceptible flood plain.

Suggested Adaptation for Transportation:

- Weather Shelters along commuting routes
- Hydration Stations for Trails and Parks
- Creating Barriers for low lying areas on Arlington to prevent flooding
- Reassess the Metro architecture to see how areas can be shut off in case of flooding and identify areas of the metro that could be moved above ground so that the transportation can continue to run despite weather and flooding.

The 2011 Census found that over 777,000 people throughout the US rode bicycles as their primary means of traveling to work last year. The first year that the bicycle was listed as an option on the national consensus was in 1980 and in 2007 Biker Commuter Act was signed into effect.

| City | Bike Share of Commuters | Total Bike Commuters | Margin of Error | Total Workers | Margin of Error |
|----------------------------------|-------------------------|----------------------|-----------------|---------------|-----------------|
| Washington, District of Columbia | 3.15 | 9,669 | 1,400 | 306,801 | 5,723 |
| Arlington CDP, Virginia | 1.29 | 1,808 | 734 | 139,722 | 3,390 |

The rise in the participation of biking to work combined with the 149 public parks, 86 miles of biking and jogging trails in Arlington that are used by both residents, tourists, and neighboring county residents highlights the need to ensure that these areas are safe and prepared to support usage as the side effects of climate change evolve so that active use isn't deterred. It is important to continue to provide safe and accessible trails, parks, and alternative transportation opportunities so that Arlington's efforts to produce fewer greenhouses gases and improve the alternative commutability of the county remain as these shifts begin to occur. Extreme weather will become part of Northern Virginia's future climate and Arlington County will need to provide protection and resources to combat the unpredictable weather and rising sea levels due to climate change.

In the 20th Century only the global sea level rose by an estimated seven inches. Therefore, for areas such as Arlington, there will be an increase in water levels over the next hundred years that will significantly increase the vulnerability of the low lying areas of the county such as Four Mile Run. Waterfront areas are vulnerable to increases in the intensity of storm surge and heavy precipitation. Storm surges flood low-lying areas, cause extensive damage to property which will impact insurance needs and costs, disrupt transportation systems or force them to close if they are underground such as the metro, destroy habitat for animals and drive them inland, and threaten human health and safety. Sea level rise is projected to magnify the impacts of storms on counties such as Arlington because they will raise the water level that storm surges affect. For example, with projected rates in sea level rise, it has been predicted that areas of New York City, namely sections of lower Manhattan and the southwest shores of Brooklyn, Queens, and Staten Island, could flood with several feet of water during strong storms. Arlington County is 39 feet above sea level and NYC is 33 feet above sea level, which means that the predicted flooding for NYC will have a similar impact in Arlington. Therefore it is important to prepare for all estimated impacts of climate change to ensure that when it occurs, Arlington is prepared.

Conclusion

In summation, stakeholder engagement and board support are key to the future of sustainable advancements, development, education and engagement in Arlington County. The stakeholders hold the access to valuable knowledge, resources, the community gatekeepers, and possible investors so engaging and utilizing them is suggested to be a top priority for Arlington's CEP efforts. Additionally, the reordering and additions of three goals will ensure that the CEP is effectively adopted, integrated, and successful:

CEP Proposed Top Goals:

1. Community and County Engagement/Awareness/Behavior Change
2. Transportation
3. Energy efficient buildings
4. Local energy production and distribution (District Energy)
5. Sustainable, alternative energy supplies

With the additional Proposed Goals added to the existing goals:

6. Increase security of electric supply from severe storms by burying electric distribution lines
7. Encourage the reflection of solar energy to reduce unwanted thermal storage
8. Promote the reduction and reuse of County supplies along with the application of EPP standards to avert GHG emissions associated with unneeded or environmentally harmful products

Lastly, the adaption efforts are vital to the longevity of the success of the mission and goals of Arlington County and the CEP. Arlington County has been a leader in sustainability efforts, willingness to evaluate the current standards and set a higher level of excellence for sustainability, but in order to maintain that success it is vital to look at ways in which to adapt to climate change. Adaptation will secure the current goals of Arlington County and set it up for success in as yet unforeseen challenges,

technological solutions that have yet to be developed, and for evolving climate changes that will require new approaches. By working with the known variables, data and working proactively to combat and prepare for better solutions Arlington County's willingness and leadership when it comes to adaptation will undoubtedly secure a sustainable future for the community and protect because of the proactive effort.

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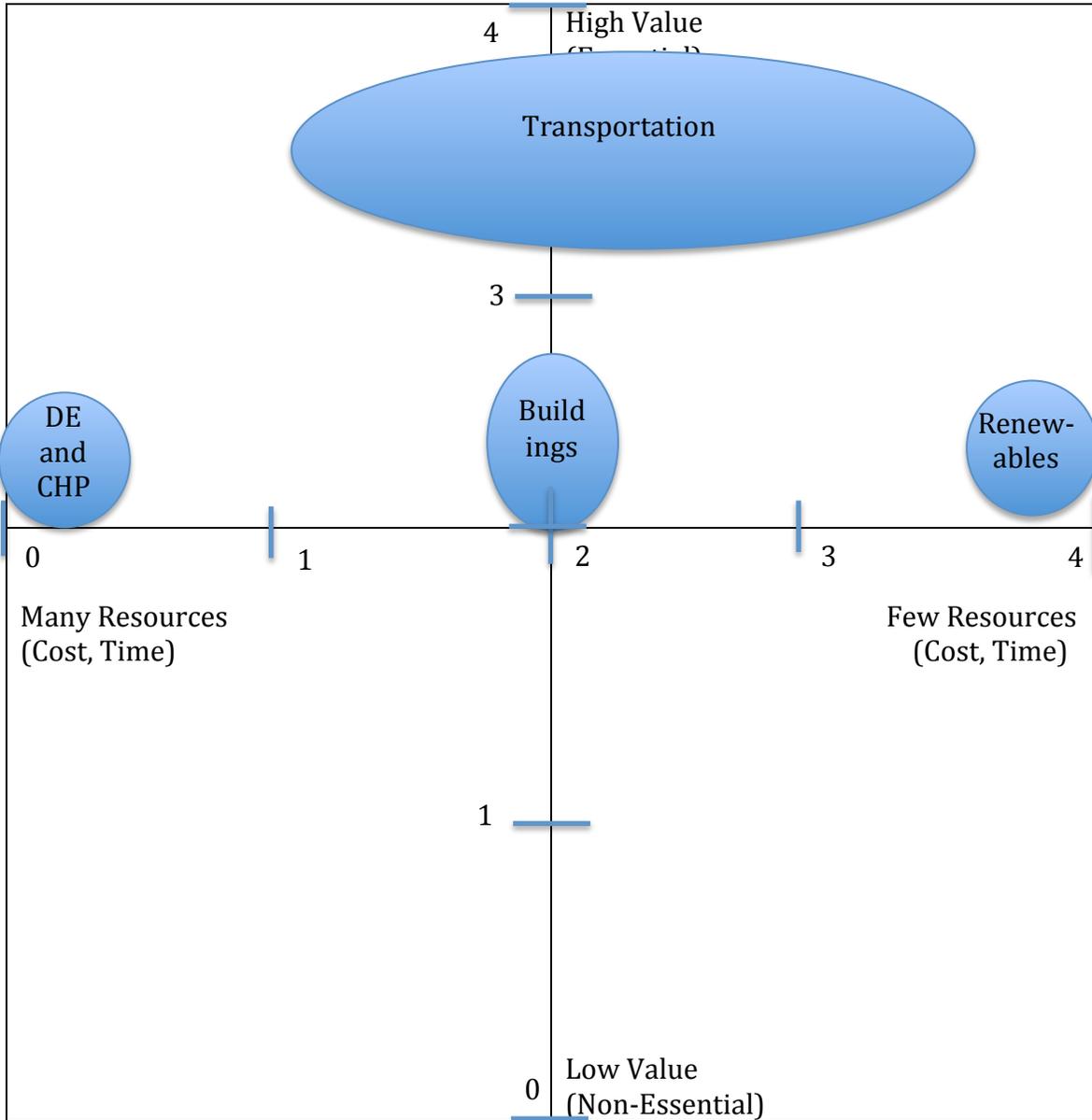
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Sustainability Strategies

1. Promethean - This strategy relies on the notion that “necessity is the mother of all invention.” If a resource is limited, then somehow, somewhere a solution will be devised to obtain it or replace it altogether.
2. Precautionary - Benjamin Franklin’s saying and “A small leak will sink a great ship” is at the heart of a group of strategies that forecast capitalism’s propensity to degrade the environment, if not kept in check. Also integral to this group thought is that social and ecological systems are not knowable and that they may need very little external force to become unhinged completely.
3. Preservation - Preservation is simply the strategy of putting away land “for a rainy day.”
4. Green Extreme - Proponents of this strategy could be labeled revolutionaries for the earth or eco-terrorists, depending on what side of a controversy you are standing on. “Desperate times call for desperate measures” could be their motto.
5. Government Regulation - Rules and policies agreed upon and approved by governmental bodies are the basis for this strategy to address sustainability concerns. “An ounce of prevention is worth a pound of cure,” wrote Ben Franklin.
6. Fixing Market Failures - This strategy attempts to correct the costs to the market for damages caused to or services rendered by the environment (air, water, land). The government with expert help, charges companies for these damages or services. These additional costs are thought to level the playing field across various market sectors, eliminating advantages previously obtained, but not paid for by businesses.
7. Collaborative Adaptive Management - This strategy is a committee led effort to define and act on issues that it deems important to address. It is an iterative strategy that requires constant tracking of progress and redesign to address new concerns or fix solutions that did not work as intended.
8. Organizational Change - Progressing with the times, this strategy has an organization change itself without outside an outside force in order to become an organization that is sustainable.
9. Sustainable Consumption - This strategy involves businesses working in partnership to solve sustainability challenges while benefitting themselves in the process.
10. Local and Bioregionalism - This strategy takes the position that doing business on a local or regional basis works to support the local economy and reduces transportation pollution leads to greater food nutritional content - among other things.
11. Hearts and Minds - This strategy uses our moral compass, religious leanings and bleeding hearts to effect change in our every day actions toward sustainable living behaviors. “An apple a day, keeps the doctor away” would be an applicable saying.

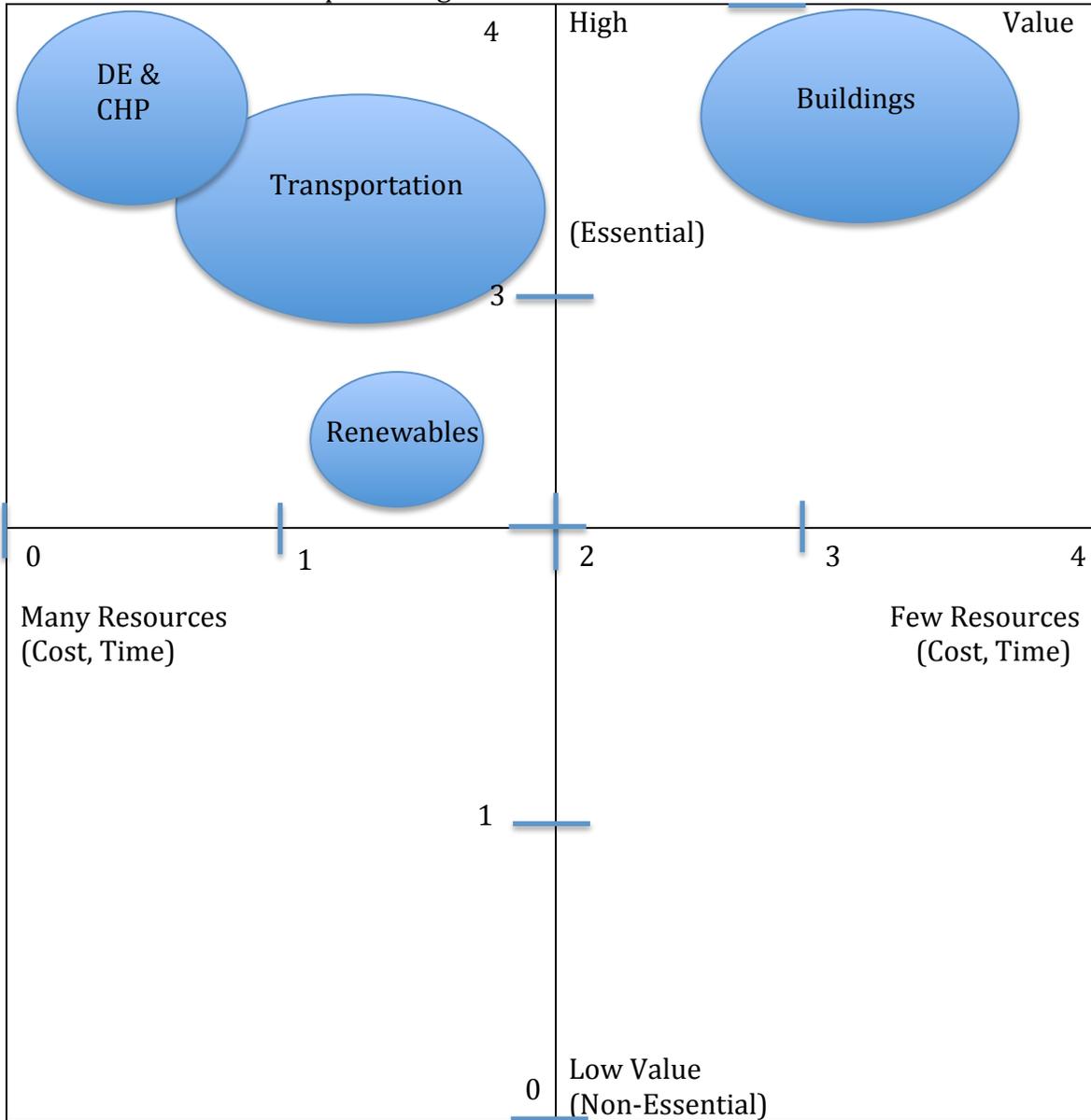
Prioritization Chart of CEP Approach to GHG Reduction- 2013-2018

Size of Circle relative to percentage of future GHG emission reductions in 2018.



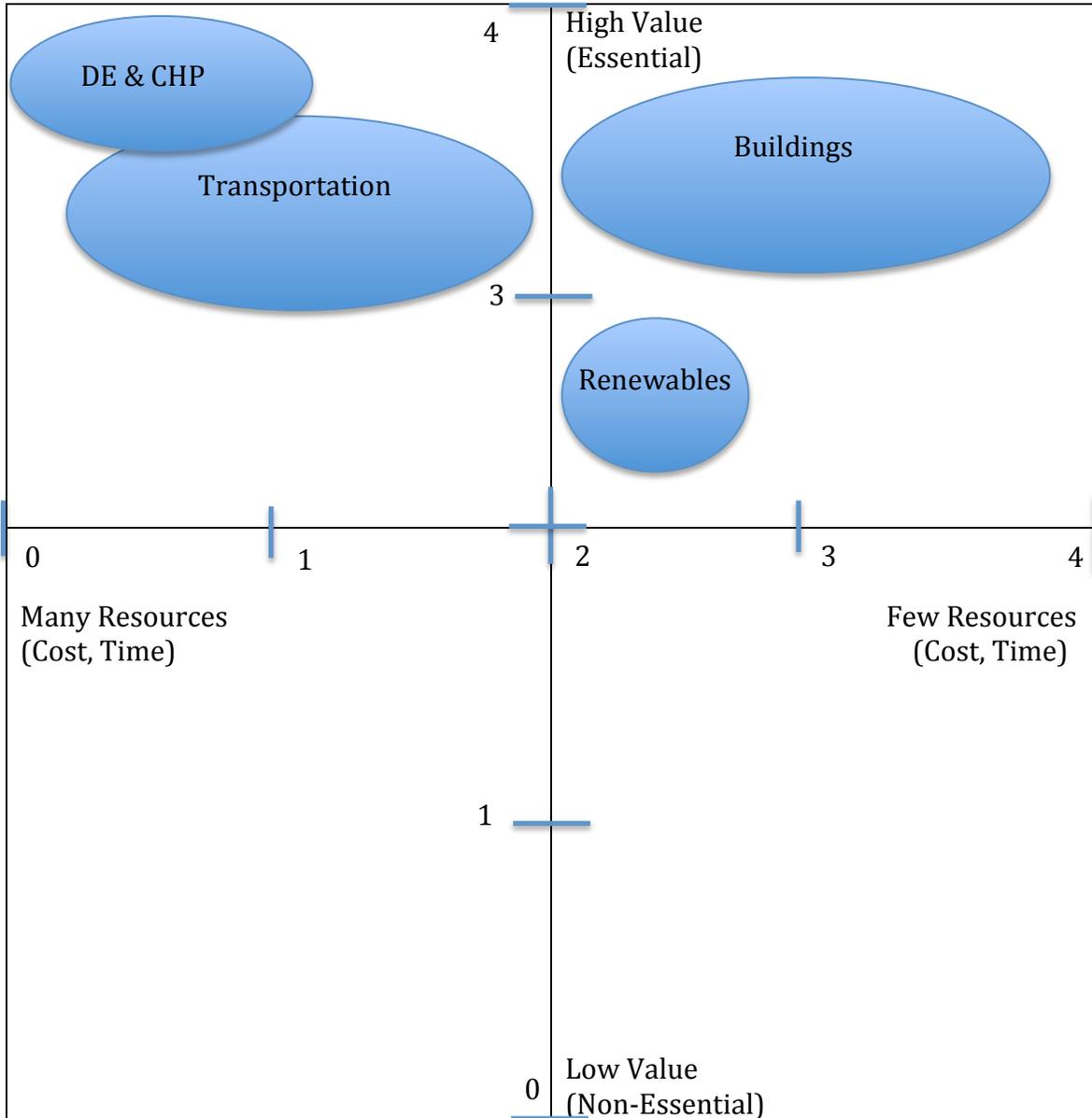
Prioritization Chart of CEP Approach to GHG Reduction- 2018-2030

Size of Circle relative to percentage of future GHG emission reductions in 2030.



Prioritization Chart of CEP Approach to GHG Reduction– 2030-2050

Size of Circle relative to percentage of future GHG emission reductions in 2050.



- Goal #1 Increase the energy and operational efficiency of all buildings.
- Goal #2 Increase local energy supply and distribution efficiency in Arlington using District Energy.
- Goal #3 Increase locally generated energy supply through the use of renewable energy options.
- Goal #4 Refine and expand transportation infrastructure and operations enhancements.
- Goal #5 Integrate CEP goals into all County Government activities.
- Goal #6 Advocate and support personal action through behavior changes and effective education.

| Stakeholder Engagement Analysis | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------|--|-----------|---------------|-----------|--------------|-----------|---------------|-----------|--------------------------|-----------|---------------------|-----------|-----------------------|-----------|-------------------------|-----------|-----------------------------------|-----------|-----------------------|-----------|------------------|-----------|
| | Sustainability Strategy Used to Engage Stakeholder | | | | | | | | | | | | | | | | | | | | | |
| | Promethean | | Precautionary | | Preservation | | Green Extreme | | Govern-mental Regulation | | Fix Market Failures | | Organizational Change | | Sustainable Consumption | | Collaborative Adaptive Management | | Bio-Regional Localism | | Hearts and Minds | |
| Identified Stakeholders | Planned | Suggested | Planned | Suggested | Planned | Suggested | Planned | Suggested | Planned | Suggested | Planned | Suggested | Planned | Suggested | Planned | Suggested | Planned | Suggested | Planned | Suggested | Planned | Suggested |
| Business Community | | | x | x | x | x | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Arlington County Gov. | | | x | x | x | x | | | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Residents-MFR | | x | | x | | x | | | | x | | | | | x | x | x | x | | x | x | x |
| Residents – SFR | | x | | x | | x | | | | x | | | | | x | x | x | x | | x | x | x |
| Land Developers/B uilders | | | | x | | x | | | x | x | | | x | | x | x | x | x | | x | x | x |
| Schools | | | | x | | x | | | | x | | | x | | x | x | x | x | | x | x | x |
| Board of Trustees | | | | x | | x | | | | x | | | x | | x | x | x | x | | x | x | x |

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

| Goal 1: Increase the energy and operational efficiency of all buildings | | | | | | | | | | | | |
|--|---------------------------|---------------|--------------|---------------|-------------------------|---------------------|-----------------------|-------------------------|-----------------------------------|-----------------------|------------------|---|
| Existing Tools | Sustainability Strategies | | | | | | | | | | | |
| | Promethean | Precautionary | Preservation | Green Extreme | Governmental Regulation | Fix Market Failures | Organizational Change | Sustainable Consumption | Collaborative Adaptive Management | Bio-Regional Localism | Hearts and Minds | |
| Community planning guidance | x | x | x | | x | x | x | x | x | x | x | x |
| Energy Performance Labels (EPLs) in County Buildings | | x | x | | x | | x | x | x | x | | x |
| Site plan development process | | x | x | | x | | x | | x | x | | x |
| Energy Star | | x | x | | | | | x | x | x | | x |
| LEED green building bonus density incentive | | x | x | | | | | x | x | x | | x |
| Lighting retrofit rebate for commercial properties | | x | x | | | | | x | x | x | | x |
| Local Energy Alliance Program (LEAP) | x | x | x | | x | | x | x | x | x | | x |
| Energy Performance Labels (EPLs) in County Buildings | | x | x | | x | | x | x | x | x | | x |
| Training Programs | | x | x | | | | x | x | x | x | | x |

| Goal 1: Increase the energy and operational efficiency of all buildings | | | | | | | | | | | |
|--|------------|---------------|--------------|---------------|-------------------------|---------------------|-----------------------|-------------------------|-----------------------------------|-----------------------|------------------|
| Short-term Tool | Promethean | Precautionary | Preservation | Green Extreme | Governmental Regulation | Fix Market Failures | Organizational Change | Sustainable Consumption | Collaborative Adaptive Management | Bio-Regional Localism | Hearts and Minds |
| Updated State Building Code | | X | X | | X | | | | X | X | |
| Building Energy Asset Rating | | X | X | | X | | X | | X | X | |
| Financial incentive programs | | X | X | | X | X | | X | X | X | X |
| Energy Performance Labels (EPLs) in private sector and APS buildings | | X | X | | X | | | X | X | X | X |
| Informational Technology and Smart Building Energy Management | | X | X | | X | | | | X | X | |
| Updated VHDA process | | X | X | | X | | | | X | X | |
| Form Based Code (FBC) enhancements | | X | X | | X | | | | X | X | |
| Transformative energy efficient construction | | X | X | | X | | X | | X | X | X |
| Energy help desk | | X | X | | X | | | | X | X | |
| New/revised site plan condition(s) | | X | X | | X | | | | X | X | |
| Energy upgrade money set aside for affordable housing | | X | X | | X | X | | | X | X | |
| Leasing requirements for federal tenants | | X | X | | X | | | | X | X | |
| Permit fees | | X | X | | X | X | | | X | X | |
| Energy/green building store | | X | X | | X | | | | X | X | |

| Goal 1: Increase the energy and operational efficiency of all buildings | | | | | | | | | | | |
|--|------------|---------------|--------------|---------------|-------------------------|---------------------|-----------------------|-------------------------|-----------------------------------|-----------------------|------------------|
| Long-term Tool | Promethean | Precautionary | Preservation | Green Extreme | Governmental Regulation | Fix Market Failures | Organizational Change | Sustainable Consumption | Collaborative Adaptive Management | Bio-Regional Localism | Hearts and Minds |
| Lot-based energy targets* | | X | X | | | X | X | X | X | X | X |
| Energy disclosure at the time of sale | | | | | | | | X | X | X | X |

Goal 2: Increase local energy supply and distribution efficiency in Arlington using District Energy (DE)
 STRATEGY 1: Create a District Energy Entity (DEE) to own 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 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

| Existing Tools | Sustainability Strategies | | | | | | | | | | |
|--|---------------------------|---------------|--------------|---------------|-------------------------|---------------------|-----------------------|-------------------------|-----------------------------------|-----------------------|------------------|
| | Promethean | Precautionary | Preservation | Green Extreme | Governmental Regulation | Fix Market Failures | Organizational Change | Sustainable Consumption | Collaborative Adaptive Management | Bio-Regional Localism | Hearts and Minds |
| Community planning guidance | | X | | | | | X | X | X | X | X |
| Crystal City Integrated Energy Master Plan | | X | | | | | | X | X | X | |
| EPA's Combined Heat & Power Partnership | X | | | | X | X | X | X | X | | X |
| Site plan development process | | X | | | X | X | | X | X | | |

| Goal 2: Increase local energy supply and distribution efficiency in Arlington using District Energy (DE) | | | | | | | | | | | |
|---|------------|---------------|--------------|---------------|--------------------------|---------------------|-----------------------|--------------------------|-----------------------------------|-----------------------|------------------|
| Short-term Tool | Promethean | Precautionary | Preservation | Green Extreme | Govern-mental Regulation | Fix Market Failures | Organizational Change | Sustain-able Consumption | Collaborative Adaptive Management | Bio-Regional Localism | Hearts and Minds |
| County's Horizontal Design Guidelines | | X | | | X | | | X | X | X | |
| District energy best practices, interoperability standards, and operations and maintenance plan | | X | | | | | | | X | X | |
| District Energy Company (DEC) | X | | | | | | | | X | X | |
| Integrated Energy Master Plans (IEMPs) for Rosslyn, Columbia Pike, Courthouse, etc. | | X | | | | | X | X | X | X | X |
| DE infrastructure plan, including maps showing probably location of DE infrastructure | | X | | | | | | | X | | |
| Crystal City and Columbia Pike Streetcar Plans | | X | | | | | | X | X | X | |
| Energy Overlay Districts | | X | | | X | | | | | | |
| Energy Use Ordinance | | X | | | X | | | | | | |

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 and 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

| Goal 3: Increase locally generated energy supply through the use of renewable energy options | | | | | | | | | | | |
|---|---------------------------|---------------|--------------|---------------|-------------------------|---------------------|-----------------------|-------------------------|-----------------------------------|-----------------------|------------------|
| Existing Tools | Sustainability Strategies | | | | | | | | | | |
| | Promethean | Precautionary | Preservation | Green Extreme | Governmental Regulation | Fix Market Failures | Organizational Change | Sustainable Consumption | Collaborative Adaptive Management | Bio-Regional Localism | Hearts and Minds |
| Financial Incentives | | X | x | | x | x | | x | x | x | x |

| Goal 3: Increase locally generated energy supply through the use of renewable energy options | | | | | | | | | | | |
|---|---------------------------|---------------|--------------|---------------|-------------------------|---------------------|-----------------------|-------------------------|-----------------------------------|-----------------------|------------------|
| Short-Term Tool (Years 1-5) | Sustainability Strategies | | | | | | | | | | |
| | Promethean | Precautionary | Preservation | Green Extreme | Governmental Regulation | Fix Market Failures | Organizational Change | Sustainable Consumption | Collaborative Adaptive Management | Bio-Regional Localism | Hearts and Minds |
| New Regulatory Language or Enabling State Legislation | | x | x | | x | | | | x | x | |
| Local Financial Incentives | | X | x | | x | x | | x | x | x | X |
| Dominion Virginia Power (DVP) Solar Leasing | | X | x | | x | | x | x | x | x | |

| Goal 3: Increase locally generated energy supply through the use of renewable energy options | | | | | | | | | | | |
|---|---------------------------|---------------|--------------|---------------|-------------------------|---------------------|-----------------------|-------------------------|-----------------------------------|-----------------------|------------------|
| Long-Term Tool (Years 5+) | Sustainability Strategies | | | | | | | | | | |
| | Promethean | Precautionary | Preservation | Green Extreme | Governmental Regulation | Fix Market Failures | Organizational Change | Sustainable Consumption | Collaborative Adaptive Management | Bio-Regional Localism | Hearts and Minds |
| Case Studies of Solar Thermal Installations | | x | x | | | | x | x | x | x | x |
| White Papers/Research Reports | | x | x | | | | x | x | x | x | x |

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

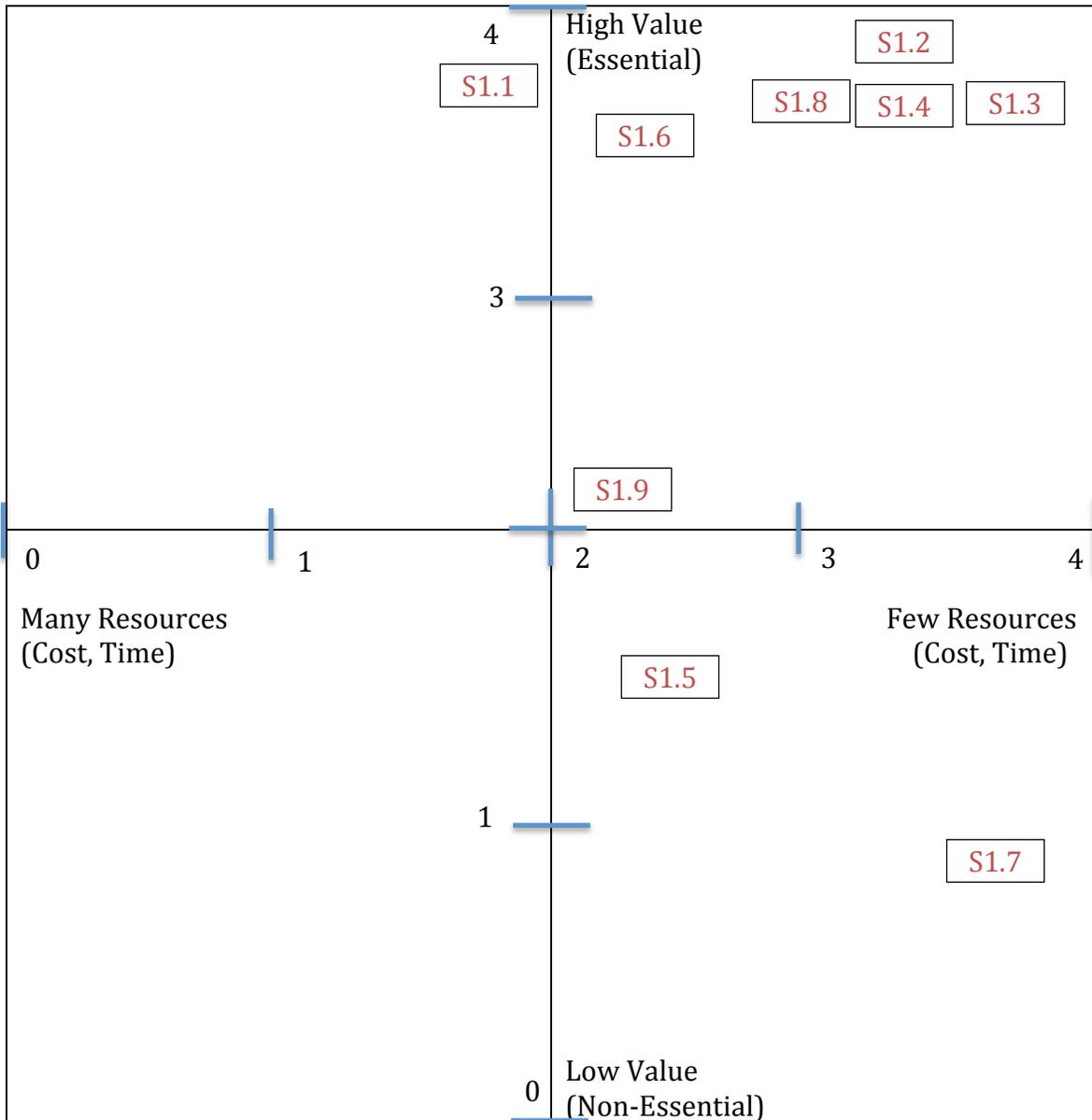
STRATEGY 9: Work with regional organizations and individual jurisdictions in the DC Metro region to proactively address transportation issues

| Existing Tools | Sustainability Strategies | | | | | | | | | | |
|---|---------------------------|---------------|--------------|---------------|-------------------------|---------------------|-----------------------|-------------------------|-----------------------------------|-----------------------|------------------|
| | Promethean | Precautionary | Preservation | Green Extreme | Governmental Regulation | Fix Market Failures | Organizational Change | Sustainable Consumption | Collaborative Adaptive Management | Bio-Regional Localism | Hearts and Minds |
| Bikeshare Transit Development Plan | x | | | | | | x | x | x | x | x |
| Master Transportation Plan (MTP) Implementation Plans for adopted elements | | | x | | x | | | | | x | x |
| Site plan conditions, e.g., Transportation Management Plan, Bicycle Storage Facilities | x | | | | x | | | x | | x | |
| Telecommuting and Hoteling | x | | | x | | | x | x | x | x | x |
| Taxi Ordinance requiring improving fuel economy | | x | | | x | x | | | | | |
| Transit Development Plan | x | x | | | x | | | x | | x | x |

| Goal 4: Refine and expand transportation infrastructure and operations enhancements | | | | | | | | | | | |
|--|------------|---------------|--------------|---------------|-------------------------|---------------------|-----------------------|-------------------------|-----------------------------------|-----------------------|------------------|
| Short-term Tool | Promethean | Precautionary | Preservation | Green Extreme | Governmental Regulation | Fix Market Failures | Organizational Change | Sustainable Consumption | Collaborative Adaptive Management | Bio-Regional Localism | Hearts and Minds |
| Promotion of transit options | x | | | x | | | | x | x | x | x |
| Regional coordination | | | | | x | | x | x | x | | x |
| County Government-wide policy regarding vehicle purchases | | | | | x | | x | x | | | x |
| Alternative vehicle fueling options | x | | | x | | | | x | x | x | x |
| Links to Federal efforts on the CEP/County website | x | | | | x | | x | x | x | x | x |

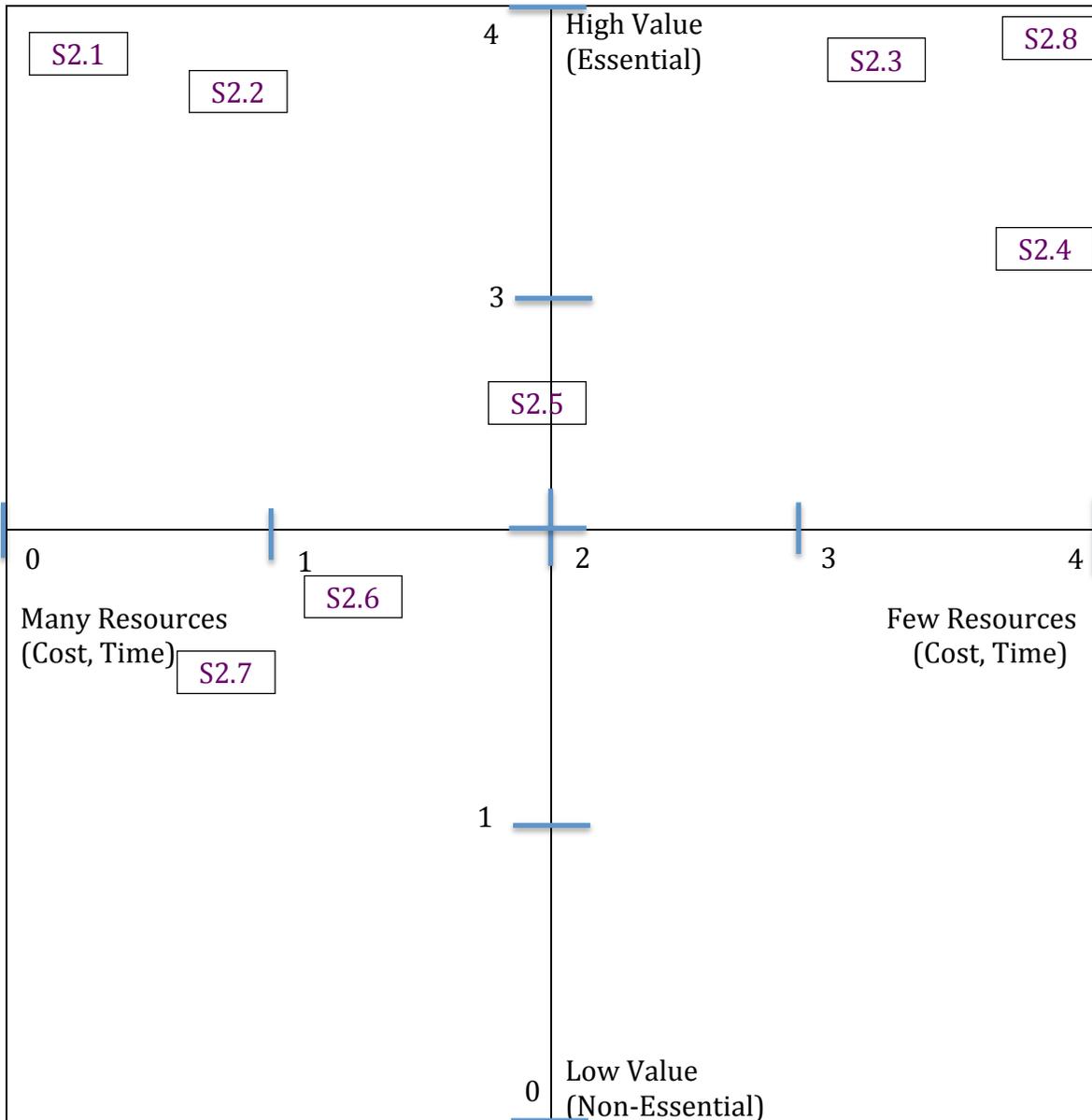
| Goal 4: Refine and expand transportation infrastructure and operations enhancements | | | | | | | | | | | |
|--|------------|---------------|--------------|---------------|-------------------------|---------------------|-----------------------|-------------------------|-----------------------------------|-----------------------|------------------|
| Long-term Tool | Promethean | Precautionary | Preservation | Green Extreme | Governmental Regulation | Fix Market Failures | Organizational Change | Sustainable Consumption | Collaborative Adaptive Management | Bio-Regional Localism | Hearts and Minds |
| Clearinghouse website for low-carbon producing vehicles | x | | | x | | | | x | x | | x |

Prioritization of Goal #1 Strategies
Increase the energy and operational efficiency of all buildings



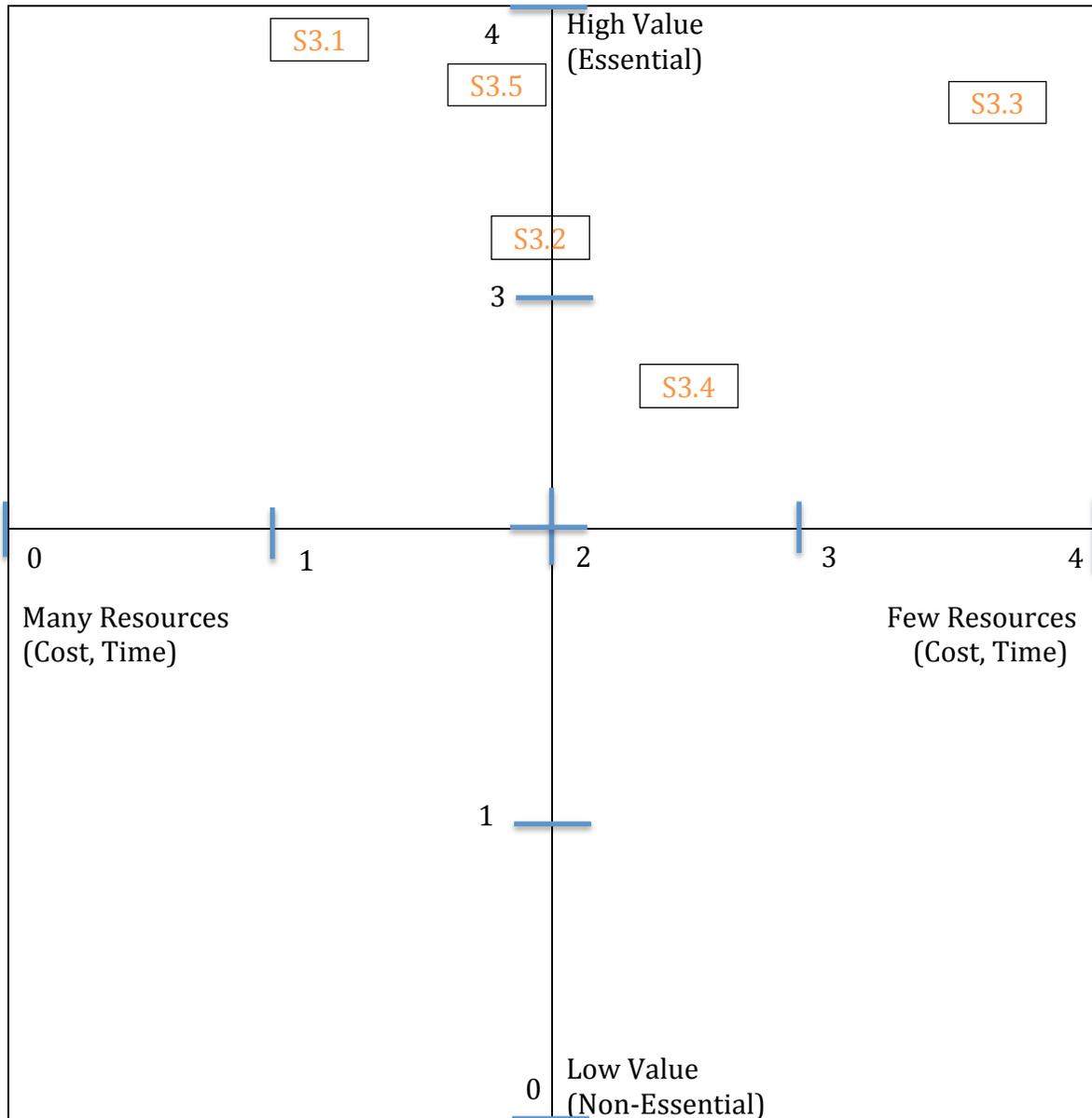
- S1.1** Take advantage of the renovation process to encourage buildings to reduce energy use by 30-40% on average compared to 2007 levels of energy use
- S1.2** Encourage new buildings to be designed, constructed, and operated more energy efficiently
- S1.3** Ensure compliance with energy efficiency code provisions
- S1.4** Take advantage of incentives to reduce new and existing building energy usage
- S1.5** Ensure equitable access to and use of energy efficiency and incentives programs for all income levels
- S1.6** Use the special exception development process to create more energy-efficient buildings
- S1.7** Promote widespread use and display of EPLs
- S1.8** Encourage the use of lower carbon fuels, both onsite and for electricity generation
- S1.9** Steadily reduce energy intensity (i.e., increase energy efficiency) in County and Arlington Public Schools (APS) buildings and operations

Prioritization of Goal #2 Strategies
 Increase local energy supply and distribution efficiency in Arlington using District Energy (DE)



- S2.1 Create a District Energy Entity (DEE) to own a DE System
- S2.2 Build, operate and maintain DE systems as opportunities arise, and CHP systems as appropriate, in areas having the highest probability for DE
- S2.3 Encourage new and renovated buildings to have DE compatible systems in areas where DE has a high probability of success
- S2.4 Establish a process and guidelines for buildings to connect to DE Systems in areas where DE has a high probability of success.
- S2.5 Develop a DE infrastructure plan to facilitate DE distribution and future connections
- S2.6 Coordinate the installation of DE distribution pipes and related infrastructure as appropriate
- S2.7 Link DE/CHP to streetcar lines and other transportation infrastructure as appropriate
- S2.8 Revise the Arlington County Code to reflect CEP goals

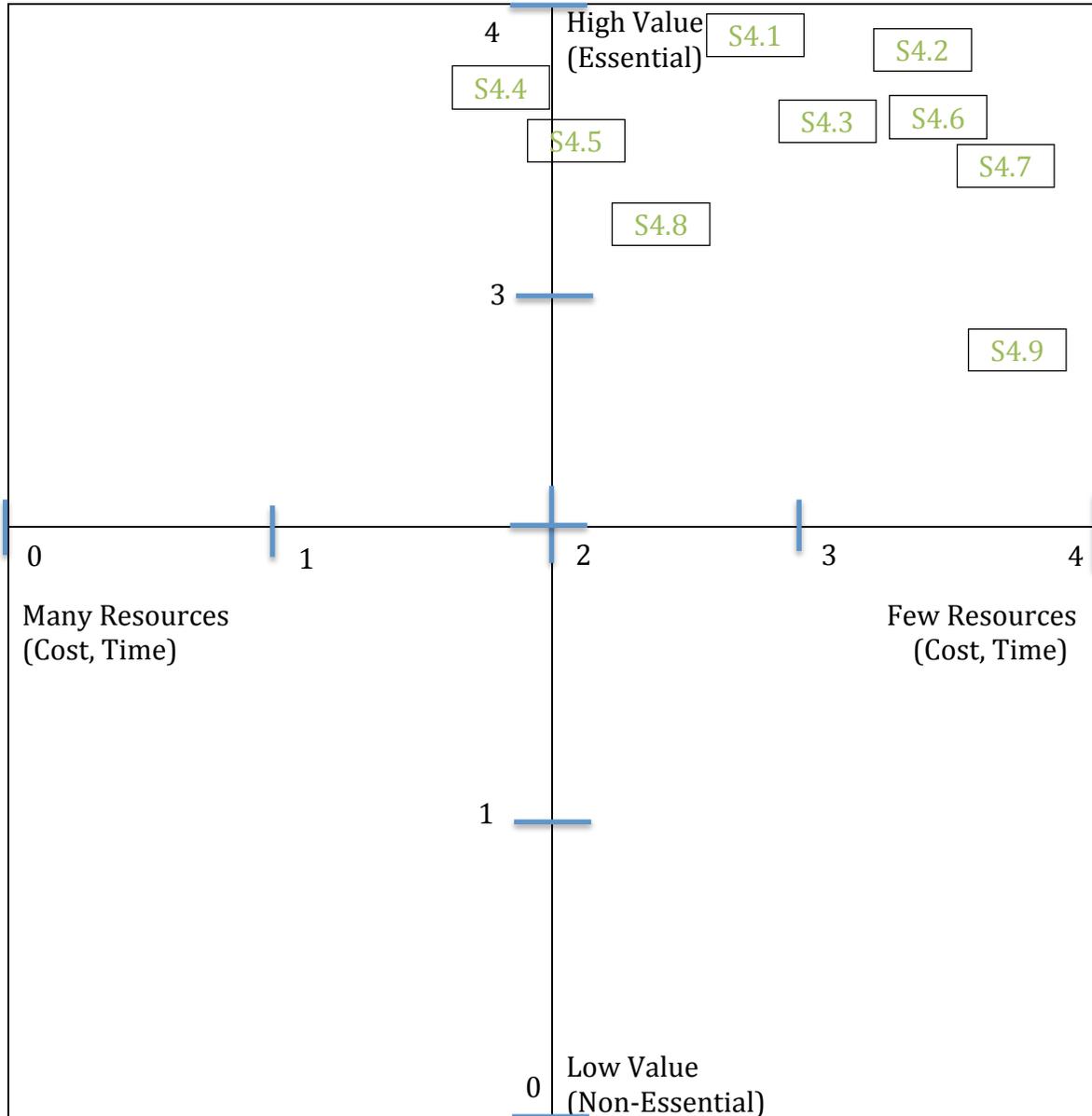
Prioritization of Goal #3 Strategies
 Increase locally generated energy supply through the use of renewable energy options



- S3.1 Increase renewable energy generation through incentives
- S3.2 Eliminate regulatory and legislative barriers to increase renewable energy production
- S3.3 Encourage the development industry to integrate renewable energy technologies and best practices into the development design process
- S3.4 Partner with utilities to increase and optimize the use of renewable energy to create a more secure and reliable power grid
- S3.5 Encourage solar hot water and other renewable technologies

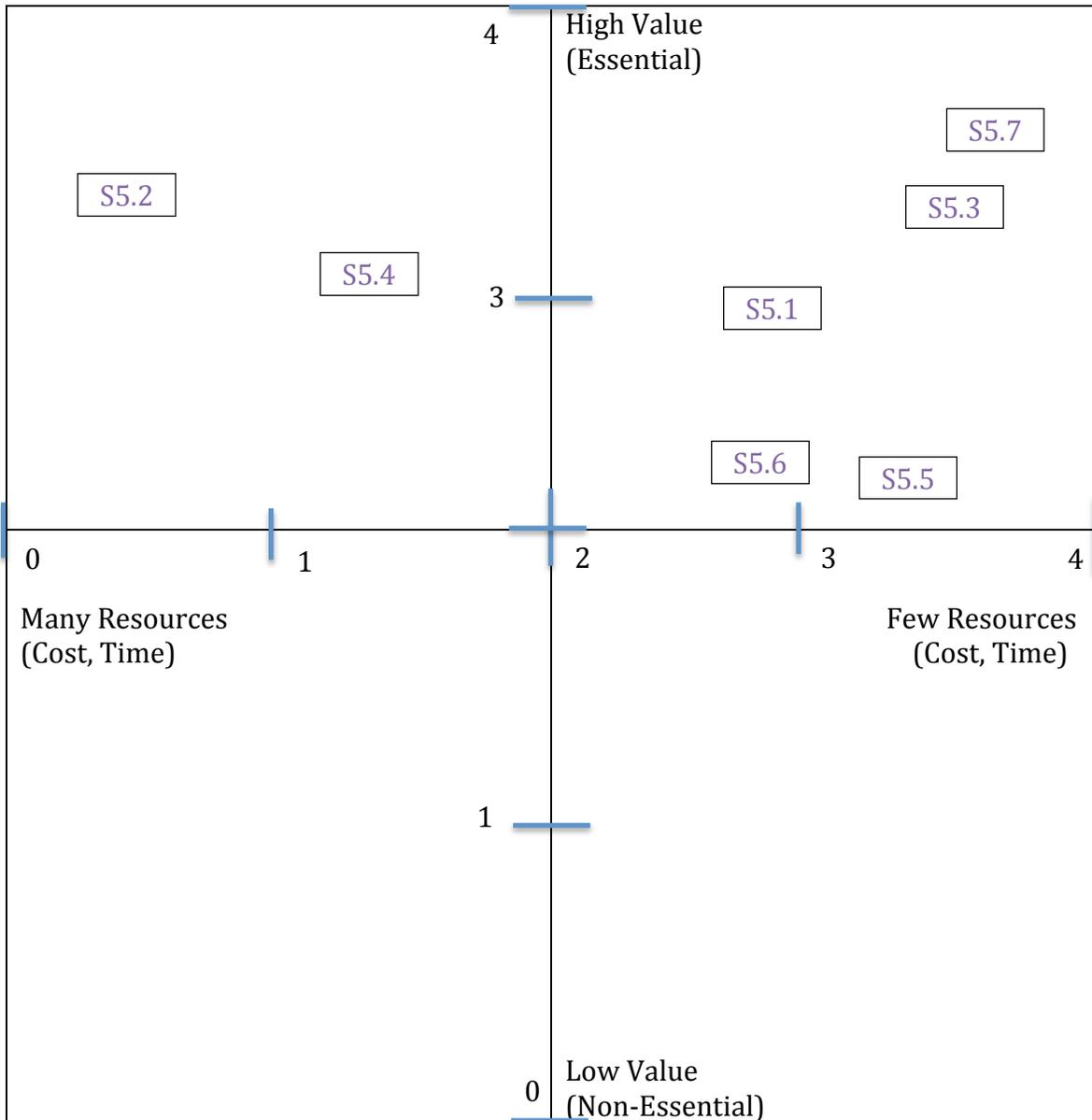
Prioritization of Goal #4 Strategies

Refine and expand transportation infrastructure and operations enhancements



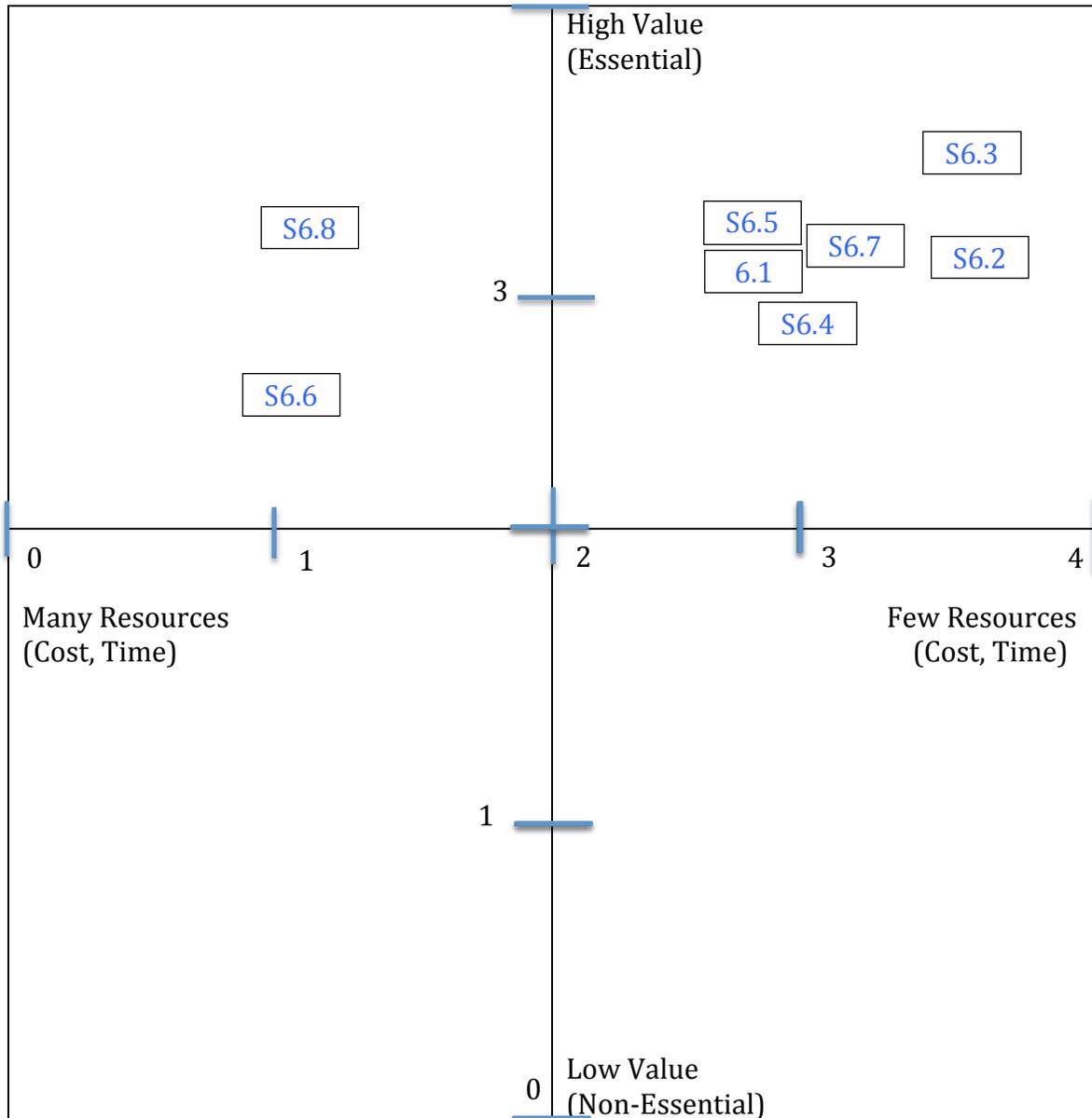
- S4.1 Support MTP General Policies implementation: Reduce vehicle miles traveled by integrating transportation with land use, developing Complete Streets, and managing travel demand and transportation systems**
- S4.2 Continue to support alternatives to car ownership and use**
- S4.3 Support Federal and State efforts to increase vehicle fuel efficiency**
- S4.4 Increase the fuel efficiency of County and Arlington Public Schools fleets**
- S4.5 Reduce the carbon produced by County and Arlington Public Schools fleets**
- S4.6 Operate and maintain traffic infrastructure with an eye toward energy efficiency and vehicle fuel efficiency**
- S4.7 Encourage the purchase and use of lower-carbon producing vehicles**
- S4.8 Increase the availability of reduced-carbon content vehicle fuels**
- S4.9 Work with regional organizations and individual jurisdictions in the DC Metro region to proactively address transportation issues**

Prioritization of Goal #5 Strategies
 Integrate CEP goals into all County Government activities



- S5.1 Propose state and federal regulatory and legislative remedies to achieve CEP goals
- S5.2 Fund CEP Implementation
- S5.3 Work with regional organizations and individual jurisdictions in our metro region to proactively address energy issues
- S5.4 Develop and coordinate financial incentive programs
- S5.5 Establish and track metrics to measure CEP progress
- S5.6 Retain existing and attract new businesses and jobs through CEP implementation
- S5.7 Strengthen partnerships with colleges and universities to identify opportunities to reach CEP goals

Prioritization of Goal #6 Strategies
Advocate and support personal action through behavior change and effective education



- S6.1 Raise personal energy literacy among all populations**
- S6.2 Be a trusted and leading source of energy information**
- S6.3 Maintain and build partnerships**
- S6.4 Engage the public through electronic and print media**
- S6.5 Collaborate with Arlington Public Schools and local colleges and universities to provide education to reduce energy use**
- S6.6 Partner with stakeholders to develop and provide energy training and courses.**
- S6.7 Partner with stakeholders to map workforce development**
- S6.8 Encourage energy conservation and efficiency through recognition of success**