

RADNOR TOWNSHIP

Renewable Energy and Conservation Plan

The Renewable Energy and Conservation Plan provides actionable strategies for achieving the *Ready for 100* Goals in Radnor Township. These strategies include reducing energy consumption, transitioning to all electric system, and accelerating the use carbon-free energy sources, with considerations for all sectors in the Township.

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energy
solutions

Practical Energy Solutions

A Division of Spotts, Stevens and McCoy

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The Ready for 100 Movement

Radnor Township is joining a growing number of *Ready for 100* communities across the country. 46 municipalities, five counties, and one school district have already achieved 100% clean electricity or 100% clean energy across all sectors. These communities have forged a path for Radnor Township’s clean energy journey.

ACROSS THE COUNTRY:



| | Committed to 100% Clean Energy | Achieved 100% Clean Electricity or 100% Clean Energy |
|------------------|--------------------------------|--|
| Counties | 13 | 5 |
| States | 8 | |
| Cities & Towns | 166 | 46 |
| School Districts | 8 | 1 |

IN SOUTHEAST PA:



SECTION 1 - INTRODUCTION

In February 2019, Radnor Township Commissioners joined cities and towns across the country when it passed its “Ready For 100” resolution committing the community to transition to 100% clean renewable electricity by 2035 and 100% renewable energy for heating and transportation by 2050.

The Commissioners’ rationale for this plan is clear:

Climate change threatens the long-term survival of life on the planet. Extreme weather associated with climate change also poses immediate and growing risks to communities, including testing our infrastructure, emergency and social services; impacting our access to food, water and energy supplies; heightening disruption of services, commerce and quality of life; and harming property and health.

~ Radnor Township Resolution for a Clean Energy Future



Figure 1.1. Burning of Fossil Fuels Rapidly Accelerates Earth’s Greenhouse Effect
Credit: NASA/JPL-Caltech

In December 2019, the Township hired West Chester, PA-based Practical Energy Solutions to generate an actionable plan for achieving these goals.

Radnor Township is committed to doing its part to follow the United Nations Panel on Climate Change’s urgent call to:

- 🌍 Reduce greenhouse gas emissions 45% by 2030 and secure carbon neutrality by 2050,
- 🌍 Limit global temperature rise to 1.5 degrees Celsius, and thereby
- 🌍 Decrease the likelihood of catastrophic climate change.



1.1 Climate Change: A Global Issue with Hyper-Local Impacts

In 2018, the Delaware Valley Regional Planning Commission (DVRPC) released a municipal guide to the effects of climate change on the region’s municipalities. Radnor Township is expected to become warmer and wetter, and these changes will come in waves ([Source](#)).

Increase in Number and Severity of Storms:

Flash flooding is the result of unpredictable weather patterns and will be exacerbated by climate change. Radnor’s aging stormwater and sewage infrastructure is already overburdened by flash flooding. The cost of improvements to stormwater infrastructure has been estimated to total \$16 million. Costs to the township and taxpayers will increase as the effects of climate change become more severe.



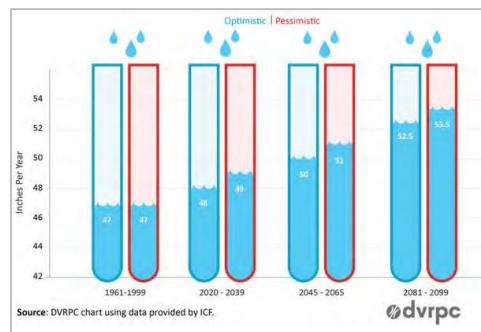
**Flash flooding in Radnor Township
August 2018**

[Source](#)



**Hazy skies in Philadelphia suburbs as
a result of wildfires in Western US
September 2020**

[Source](#)

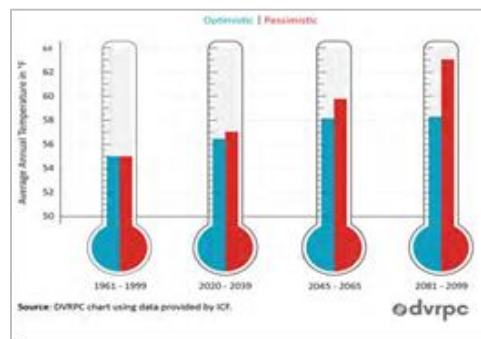


Annual Precipitation – Historic and Projected in the Delaware Valley

[Source](#)

Extreme Heat and Air Quality Affect Public Health:

Radnor’s most vulnerable populations are affected by extreme heat and poor air quality. As climate change progresses, Radnor has seen more instances of global climate change hitting closer to home.



Average Annual Temperature – Historic and Projected in the Delaware Valley

[Source](#)

The Bottom Line

Radnor needs to act immediately to build resilience and mitigate the crisis at hand. Local impacts are serious and expensive; broader impacts on the food supply, mass migrations, and ecosystem failure are also very serious. This plan provides an outline to reduce Radnor Township’s impact on global climate change by investing in clean energy solutions. All communities are called to take action.

SECTION 2 - LANDSCAPE OF ENERGY USE IN RADNOR

Overall, the Township consumes 8% of all energy used in Delaware County (Table 1). Those who live, work and travel through Radnor Township spend approximately \$100 million annually on energy.

| Area | BBTU | Energy Expenditures | MTCO ₂ e |
|-------------|--------|---------------------|---------------------|
| DelCo | 65,167 | \$1,237,830,000 | 5,709,324 |
| Radnor Twp. | 5,300 | \$96,700,000 | 404,669 |
| (%) | (8.1%) | (7.8%) | (7.1%) |

Table 1. Radnor Energy Use, Expenditures, and MTCO₂e

Source: DVRPC Energy Use & Greenhouse Gas Emissions Inventory for Greater Philadelphia, November 2018.

Definition of terms:

- BBTU = 1 billion BTU.
- BTU = British thermal unit.
- 1 BTU = the amount of heat energy required to raise the temperature of 1 lb. of water by 1°F.
- MTCO₂e = Metric tons of CO₂-equivalents, a measure of greenhouse gas emissions that warm the atmosphere and impact the climate.

The greenhouse gas pollution from fossil fuel energy use in Radnor Township produces 404,669 metric tons of CO₂e, or CO₂ equivalent, a measure of greenhouse gas emissions from all sources, converted into CO₂ 'equivalents'.



Radnor would need to plant 18.6 million mature trees to absorb the CO₂ pollution produced by the community's energy consumption.

2.1 Energy Use by Sector

The commercial sector (including educational institutions, corporate and healthcare, and small commercial) consumes the most energy, followed by mobile/highway (transportation) and, lastly, residential (Figure 2.1).

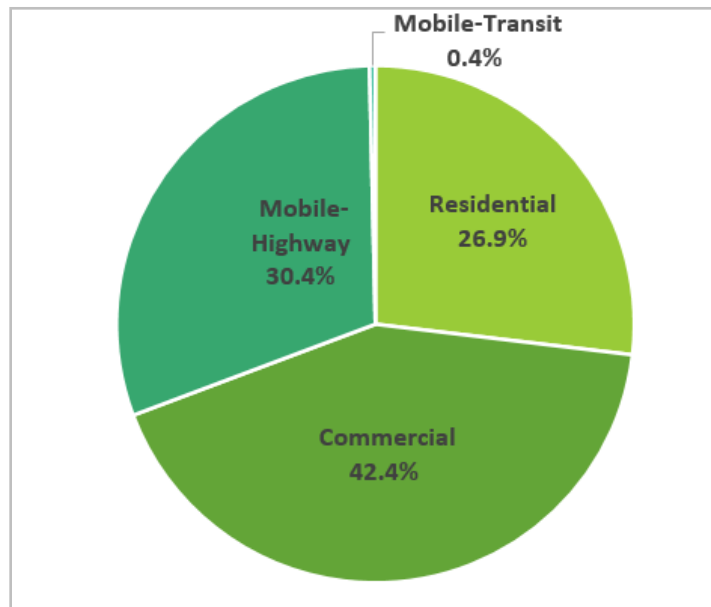


Figure 2.1. Community-Wide Energy Use Breakdown, By Sector

Because the commercial sector contributes substantially to Township-wide energy use, it must participate actively in the actions in this plan for the Township to achieve its clean energy goals. As Figure 2.2 shows, this sector also occupies a good portion of the Township’s geography.

Additionally, while the residential sector is the third-largest energy consumer, per-capita energy use in Radnor Township remains high. Radnor ranks in the Top 10 among the 40 Delaware County municipalities when it comes to per-capita residential energy use.

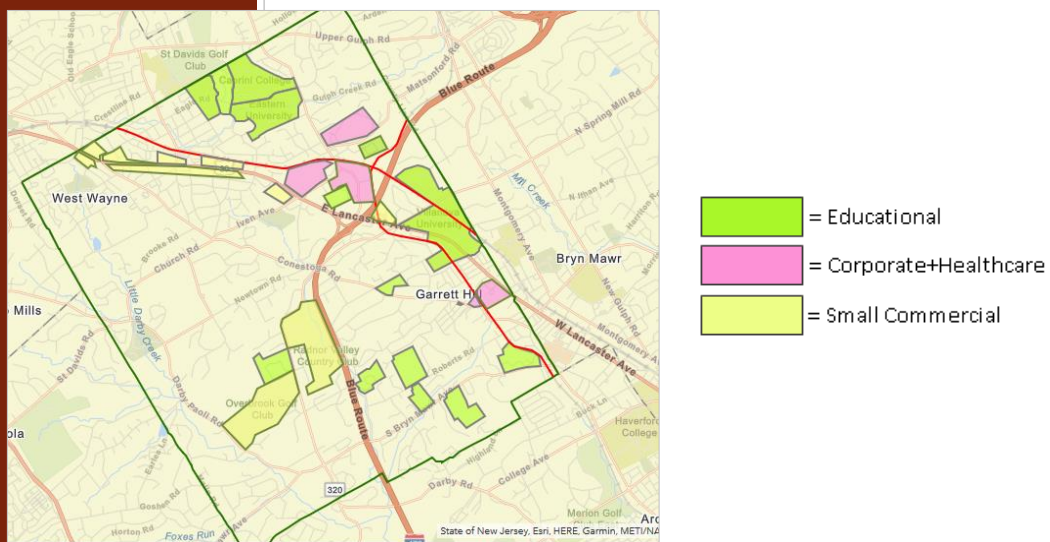


Figure 2.2. Commercial Parcels by Type in Radnor Township

2.2 Energy Use by Source

On a unit-of-energy basis, the Township consumes more natural gas than other fuel sources. Due to the artificially low market price of natural gas, however, significantly more money is spent on electricity and gasoline (Figure 2.3).

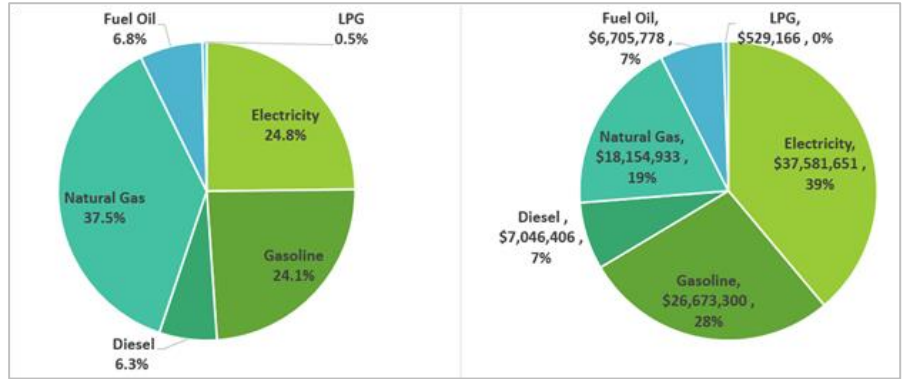


Figure 2.3. Breakdown of Energy Use and Expenditures, By Source

This breakdown of energy consumption demonstrates the need to pursue strategies and programs to “electrify” heating systems and vehicles so they can ultimately be powered by 100% carbon-free renewable energy sources, whether from on-site solar PV or grid-produced clean electricity. Given the currently low price of natural gas, this also illustrates the economic challenge of transitioning to all-electric systems in today’s energy market.

WHAT IS BUILDING ELECTRIFICATION?



“Building electrification” means swapping out fossil-fuel-powered appliances for electric appliances (or “fuel switching”) in a significant fraction of buildings. Berkley, California, became the first American city to ban natural gas infrastructure in new buildings. Several other California cities, including Los Angeles and San Francisco, are considering building electrification ordinances, New Jersey’s draft Energy Master Plan will end natural gas use in buildings by 2030, and new Maine laws will reduce natural gas use in buildings. Meanwhile, eight states, along with Washington, D.C. and Puerto Rico, have established 100% clean electricity goals.

~ Forbes, July 22, 2019

➔ See Appendix A for a more detailed analysis of energy use and expenditures in Radnor Township.

SECTION 3 - FOCUS OF THE PLAN

The focus of this plan is to provide Radnor Township public officials, residents, employers, employees, students, and visitors with an actionable guide for achieving the *Ready for 100* goals outlined in the Commissioners' resolution.

Because greenhouse gas emissions arise primarily from human activity – notably the combustion of fossil fuels to generate electricity, power vehicles, heat our homes and businesses, cook, and power industrial processes – this plan focuses on ways we can alter these activities and re-power them with clean energy sources, and thereby reduce our impacts.

3.1 Strategies

There are three strategies for achieving the *Ready for 100* Goals:

1. Reduce unnecessary energy consumption through energy efficiency and conservation.
2. In buildings, transition natural gas-powered energy systems to all-electric systems (i.e., electrification). Additionally, transition gasoline-fueled cars to electric vehicles (EVs).
3. Accelerate the replacement of fossil fuels with carbon-free energy sources, both on-site and at the utility level (i.e., utility-scale power generation).

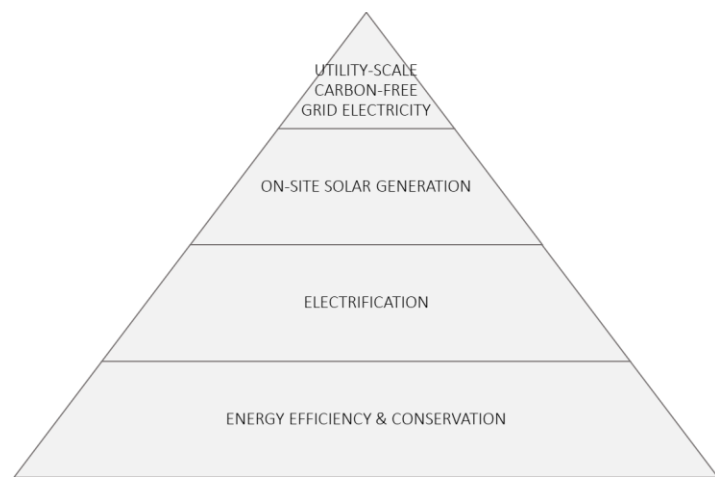


Figure 3.1. Strategies to Obtain Carbon-Free Energy Goals

- *Energy Efficiency and Conservation:* Reducing energy consumption through energy efficiency and conservation is one of the most powerful resources we have for meeting energy and environmental goals. Why? Nearly two-thirds of the energy we use is wasted and simply does not need to be consumed. (Lawrence Livermore National Laboratory; <https://www.llnl.gov/news/americans-used-more-clean-energy-2016>). Recent research shows that well-constructed energy efficiency policies alone could enable more than 40% of the emissions cuts needed to reach The Paris Accord climate goals – *using existing technology*. Additionally, energy waste costs American businesses and households billions of dollars every year.

- *Electrification:* We must move toward converting to 100% electricity for all energy needs, including electrification of heating systems (i.e., conversion of oil- and gas-based heating systems to electric systems) and transportation (electric vehicle, or EV, charging stations). By converting technologies that directly combust fossil fuels (natural gas, oil, coal) with technologies that use electricity, we can move away from unsustainable and polluting fuel sources that prevent attainment of the *Ready for 100* clean energy goals.
- *Local Solar Generation:* We must maximize our ability to generate renewable electricity on-site using solar technology. The time has come to begin aggressive on-site solar generation programs, as the cost of solar PV has declined more than 70% since 2010, making it competitive with conventional electricity. Further, financing models are available to make solar systems in residences and commercial buildings financially viable.
 - In addition to the lower installation costs of solar, costs throughout the lifetime of the system make the investment more financially viable. Financial incentives are available to lower the upfront costs of the array, which are outlined in Appendix D. Additionally, the typical costs for operation and maintenance for solar arrays are minimal since the system is stationary. The typical maintenance includes replacement of panels/inverters (which can be covered by warranties), cleaning panels (which is not anticipated based on the location of the Township, this is typically required in sandy regions), and maintenance plans (which are typically needed on large, commercial arrays).
 - With a solar array, electricity customers will still have to pay an electric bill but the total costs will be significantly lower throughout the lifetime of the array. Electricity customers with on-site solar do not have to pay for supply charges for the portion of electricity generated by the renewable energy system, which can account for a large portion of the electricity charges depending on the tariff. Additionally, net-metering legislation allows solar owners to receive financial credit for excess solar electricity production. Net metering allows the electricity customer to only be charged based on the net amount of energy used during each billing period, also known as the amount of energy delivered to the home minus the excess amount generated by the array. This legislation allows electricity customers to receive financial incentives through the life of the array.
 - If investing in a renewable energy array is not cost-effective, electricity consumers have the option of shopping around for renewable electricity directly from their power supplier, as discussed in the **Buy Green Energy through the Grid** action (Section 5.2.3).

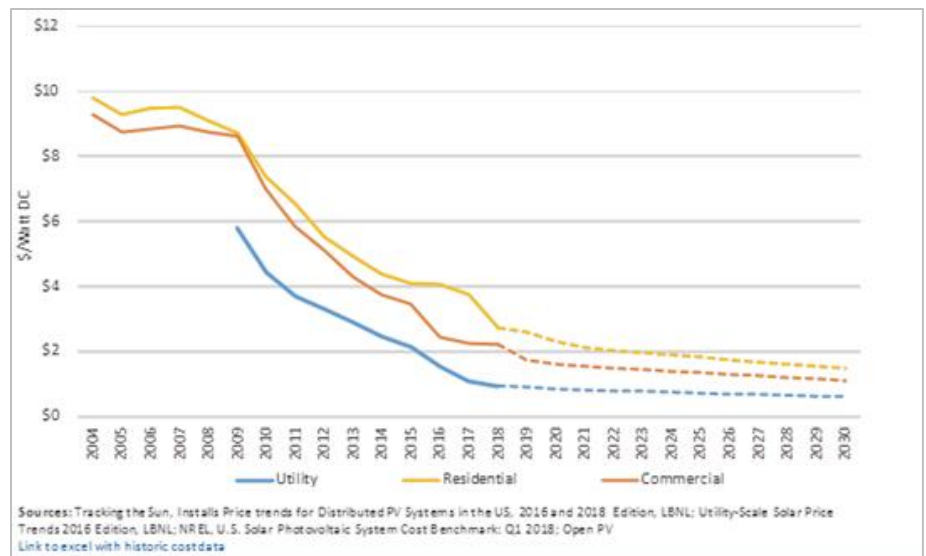
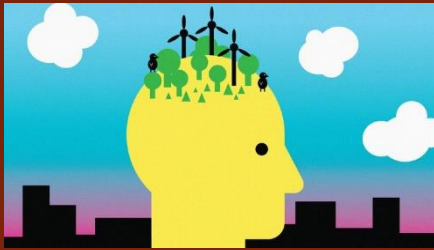


Figure 3.2. US Solar Historic Installed Costs & Cost Forecast

- *Utility-Scale Clean Energy:* As we move toward to electrification, we must ensure that electricity delivered by the utility (i.e. PECO) is generated from carbon-free and clean energy sources such as solar, small-scale hydroelectric power, onshore and offshore wind. The good news is, the EIA has just dubbed solar the “new king of electricity,” because utility-scale solar is now cheaper to build than new coal- or gas-fired power plants, offering some of the lowest-cost electricity ever seen. ([Source](#))



RESOURCES

This plan demonstrates that achieving *Ready for 100* goals requires community-wide commitment and collective action. And this requires leadership. For the Township to meet these goals, it will be essential to create a municipal position (i.e., Sustainability Director) as soon as possible to spearhead these efforts, run a marketing campaign around them, engage community stakeholders, and track progress. Throughout the plan, the role of the *Sustainability Director* is highlighted.

Alternatively, the Township could hire an on-call consultant or part-time contract employee to carry out duties recommended for the Sustainability Director until hiring someone full-time is financially feasible.

As of January 2021, Delaware County now has a full-time Chief Sustainability Officer. The Township should work with surrounding municipalities and the Chief Sustainability Officer to leverage county-level strategic planning.

3.2 Application of Strategies at the Local Level

Importantly, while energy efficiency, conservation, and on-site solar generation are all readily achievable now, there is not one method or order for pursuing these strategies. In fact, to achieve the *Ready for 100* goals, the strategies must often be pursued simultaneously and in various combinations and orders depending on the application. For example, developers should pursue electrification, energy efficiency, and on-site solar generation in parallel during design and construction of new homes and buildings. Homeowners, on the other hand, may wish to pursue energy efficiency first, electrification when existing boilers, furnaces and gas stoves are in need of replacement, and on-site solar generation when roofing repairs are planned.

3.3 Tactics

This plan outlines various tactics for implementing these strategies.

The tactics vary based on several factors:

- The Township’s legal authority.
- Technical viability.
- Economic feasibility
- Impact on greenhouse gas emissions

Throughout this plan, the tactics are categorized and identified as follows:



Community Action



Municipal Ordinance Program



Legislative/Regulatory Advocacy



Partnership Opportunity

SECTION 4 - BUILD THE COMMITMENT

Achieving the *Ready for 100* clean energy goals requires, first and foremost, the commitment of everyone in the Township. **A collective partnership is necessary.**

As such, the first step of this plan is to launch a community-wide commitment pledge, asking residents, employers, and students to support the Commissioners' resolution and sign on to the "POWER OF COMMITMENT" *Ready for 100* Radnor resolution.



COMMUNITY ACTION

The Township will distribute to property owners an on-line commitment pledge, which will be tracked and tabulated on the Township's website.



The Power of Collective Commitment

In August 2020, Radnor School Board joined the Township and unanimously passed a resolution to pursue 100% renewable electricity by 2030 and 100% clean energy across all sectors of the District by 2040. This resolution was fueled by a group of students who petitioned, gained support from a "Climate Parents" team, and successfully presented their case to the School Board. These students have shown that Radnor's clean energy movement is fueled by collective action and a strong commitment to fighting the climate crisis. Join them and show how the power of commitment makes a difference!

"This resolution will pave the way for our classrooms and school buses to run on clean power, and for our heating, ventilation, and air conditioning systems to be cleaner and energy efficient... I am grateful that Radnor's school board values the voices of their students and other community members..."

~ Ali Bauer, Student Leader

THE POWER OF COMMITMENT

I Take the Radnor Township Ready for 100 Pledge!

As a Radnor Township stakeholder, I commit to doing everything I can to get *Ready for 100* by converting to 100% clean electricity by 2035 and 100% clean energy by 2050. I will aim to:

- Purchase renewable electricity by 2023.
- Reduce energy use in my home/business 30% by 2025.
- Follow the Township's lead and participate actively in ongoing legislative advocacy for a clean energy economy.
- Electrify my heating & cooking systems as these systems need replacement over the next 10 years, to reduce gas/oil use.

I understand this is a joint effort requiring individual commitment, community partnerships, and legislative advocacy. I will do my part to make our community livable and sustainable.

NAME _____ RESIDENCE OR BUSINESS _____

Figure 4.1. Radnor's Pledge

SECTION 5 - ACTIONS

5.1 Advocacy Opportunities

Overview

5.1.1 Immediate/Time-Sensitive Advocacy Opportunities



LEGISLATIVE/REGULATORY ADVOCACY

- Radnor Green Team take on task of identifying and issuing advocacy alerts to the community, branded Clean Energy Champions.
- Current time-sensitive targets include:
 - RGGI
 - AEPS
 - Act 129 Expansion
 - Community Solar
 - Coronavirus Relief for Public Transit
 - Public Transportation Trust Fund (Act 44)



COMMUNITY ACTION

- Ensure C-PACE Passage and Implementation in DeIco

5.1.2 Ongoing Advocacy Work



LEGISLATIVE/REGULATORY ADVOCACY

- Ongoing support is needed to advance:
 - Community Choice Aggregation
 - Modernized energy efficiency building codes
 - PA Clean Transportation Legislation (SB 596, HB1908)

5.1.1 Immediate/Time-Sensitive Advocacy Opportunities

Policy advancements are essential to breaking down the state-mandated pre-emptive barriers that prevent communities from moving energy efficiency and clean energy initiatives and programs forward at the local level. Several short-term opportunities exist for municipal governments to lobby their representatives and call for action.



Legislative/Regulatory Advocacy

We recommend the Radnor Green Team take on the task of identifying and issuing advocacy alerts to the community, and working to ensure these alerts are part of a community-wide legislative push. By branding the initiative (i.e., Radnor Clean Energy Champions), community members and state legislators will begin to identify with the initiative over time, giving it visibility in the community and the legislature. The role of the *Clean Energy Champions* is highlighted in orange.



Time-sensitive advocacy targets include:

- Act 129 expansion. PA's flagship energy efficiency law, Act 129, requires all seven of PA's major electric distribution companies (EDCs) to reduce energy use in their service territories. Since its inception in 2008, Act 129 energy efficiency programs generated \$9 billion in economic benefits and more than 71,000 jobs in PA through installation of energy-efficient lighting, smart thermostats, efficient appliances, and construction of high-efficiency homes. (<https://keealliance.org/what-will-phase-iv-look-like/>)

PECO Energy is the local EDC for Radnor and provides financial incentives for energy efficiency improvements to Radnor homes and businesses through its Act 129 Smart Ideas program. Currently, the PA Public Utility Commission is determining how to structure phase IV of Act 129, which will renew the program for 5 years beginning June 1, 2021. This opens the door to opportunity for a more robust program that Radnor business owners and residents can take advantage of.

A key lobbying initiative is to support expansion of Act 129 by removing the cap on the utility's investment in the program, which is currently set at 2% of 2006 utility revenues. This cap significantly limits program effectiveness and has caused the PA program to lag behind peer states in terms of efficiency outcomes. Senate Bill 232 aims to remove the cap.

- Regional Greenhouse Gas Initiative (RGGI). PA is moving toward joining RGGI, a regional program intended to cut greenhouse gas emissions. RGGI requires electricity-generating power plants to purchase allowances for the CO2 they emit. States, in turn, invest the money from allowance auctions into energy efficiency and clean energy generation programs. For example, Maryland invested auction proceeds to create its Home Energy Retrofit and Weatherization Workforce Training Program, a "one-stop" training source

RGGI Boosts Small Business Efficiency

This small automotive service owner in Concord, NH, needed to upgrade his shop. The owner, Dan, took advantage of his state's RGGI program to fund the work. He upgraded light fixtures and insulation, sealing leaks to decrease heating and cooling costs. Dan paid only \$10,000 of the \$25,000 job and is saving money on his utility bill every month while moving his business and his community to a cleaner energy future.



RGGI Revolving Loan Program in Delaware

Delaware directs 65% of the proceeds from the RGGI program to the Sustainable Energy Utility, a non-profit organization promoting the use of affordable, reliable clean energy and energy efficiency through its Energize Delaware initiatives. One of the most impactful initiatives is the Low-Interest Revolving Loan Program, which offers low-interest loans for businesses, farms, non-profits, school districts, and local governments for energy efficiency and clean energy projects. ([Source](#))

Because the projects will result in energy savings, they are structured to ensure the cost savings is higher than the loan repayment and that the project is cash flow positive. Since the inception of the program, the lifetime energy savings for loans in repayment was \$5,074,640, with 1,684 kW of solar capacity added and 1,516 tons of air emissions avoided. ([Source](#))



that provided energy efficiency job training to more than 600 contractors at 13 community colleges across the state. Elsewhere, Conservation Services Group, a national energy services firm, hired 170 people last year, bringing its total workforce to almost 600, with nearly half its staff located in the RGGI region. Ten northeastern states already participate in RGGI, achieving a 47% carbon reduction to date. Public comment will soon take place in PA, and the Department of Environmental Protection will hold five hearings. The DEP is currently reviewing substantial public input on the proposal for PA to join RGGI. If successful, PA will join the program in 2022..

Radnor Clean Energy Champions: Stay abreast of the ACT 129 and RGGI advocacy opportunities by signing up here for Keystone Energy Efficiency Alliance (KEEA) action alerts, and distributing them to key stakeholders throughout the Township for quick action: <https://keealliance.org/membership-renewal/join-keea/>. Elected officials and other key stakeholders will also have opportunities to testify for strong state-based energy efficiency programs that will help boost Radnor's RF100 success.

- **Community Solar.** Community solar allows residents and small business owners to access a shared renewable energy system (a larger solar farm or field). Rather than investing in a system on individual properties, community members can subscribe to a portion of electricity generated from the solar farm. This allows property owners who may not have the ability to install solar PV on their own parcels (due to shading, space limitations, or other barriers) to generate local, renewable solar power for their electricity needs. Financing models allow participation in these ventures with no upfront costs; users can pay for the power through the utility bill just as they would for conventional energy. Legislation allowing municipalities to permit community solar projects in PA is critical to meeting the *Ready for 100* goals, and there has been significant bipartisan support for community solar in the PA legislature. It is a key advocacy initiative for 2021!

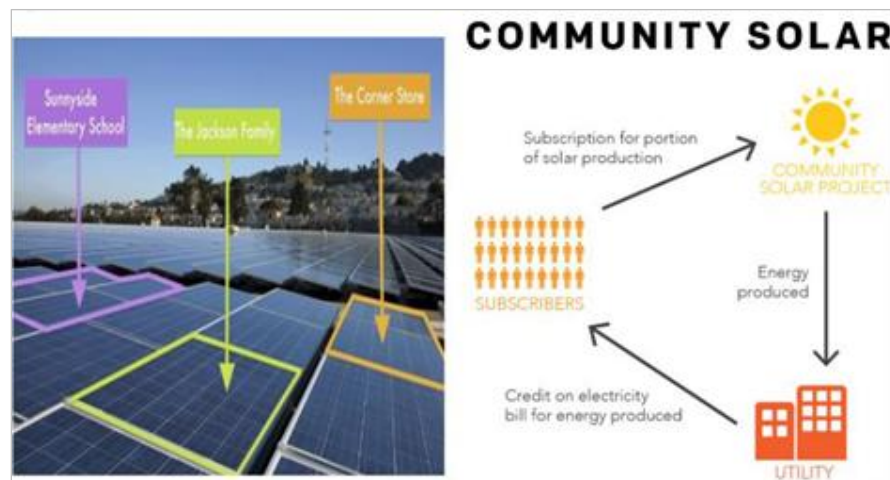


Figure 5.1. The Community Solar Concept

Radnor Clean Energy Champions: Advocate for Community Solar by contacting Community Solar Project Consultant Steve Stroman, stevestroman@hotmail.com, 717-350-0437. Ask to join the ListSrv and weekly advocacy calls.

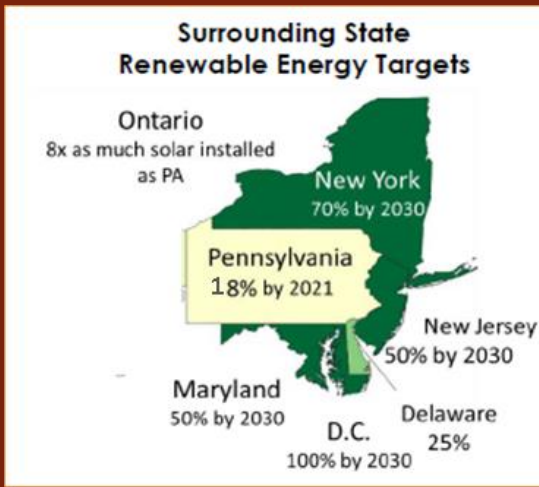


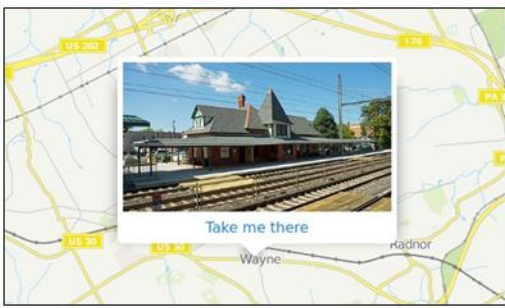
Figure 5.2. Pennsylvania Needs to Increase AEPS Solar Requirements. Exploit Renewable Energy-Based Economic Opportunities

- Alternative Energy Portfolio Standards (AEPS) expansion. Many states, including Pennsylvania, require utilities to source a minimum percentage of their electricity generation from renewables. In PA, this mandate is known as the AEPS, and it is the main driving force behind our ability to increase renewable energy resources in the electric grid. These standards not only help utilities diversify their energy resources for better resilience and cost control, but they also encourage domestic energy production and increase economic development.

PA has an “alternative energy” requirement of 18% by May 31, 2021. There are three concerns with Pennsylvania’s requirement. First, 18% is far lower than surrounding states, which leaves PA behind when it comes to clean energy job creation. Second, as much as 10% of PA’s 18% requirement can include nonrenewable sources, including highly-polluting coal waste. Lastly, the specific solar PV requirement is extremely minimal at 0.5% (Fig. 7). The PA Department of Environmental Protection’s *Solar Future Plan* calls for an increase in the AEPS solar requirement to 10% by 2030, and legislative activity is underway to support this plan.

(<https://www.dep.pa.gov/Business/Energy/OfficeofPollutionPrevention/SolarFuture/Pages/Pennsylvania's-Solar-Future-Plan.aspx>)

Radnor Clean Energy Champions: Advocate for expanded AEPS by joining the *Renewables Work for PA Campaign* and signing the on-line petition. See: <https://www.renewablesworkforpa.com/>.



Additional Key Public Transportation Advocacy Tips for Radnor Township:

Stay up to date with public transportation advocacy opportunities by signing up here for 5th Square's weekly newsletter, and distributing advocacy opportunities to key stakeholders throughout the Township for quick action: <https://www.5thsq.org/join>. Though this newsletter focuses on urban transportation issues, advocacy opportunities for SEPTA and active transportation methods are regularly shared here.

Consider sending a representative to the Citizens Advisory Commission on behalf of Radnor Township. The Citizens Advisory Commission is an independent body that provides feedback on policy and planning issues, including fares and routes. They meet with SEPTA management, including the General Manager, to help SEPTA provide best-in-class transportation services that meets or exceeds rising customer expectations.

<https://www.delcopa.gov/clerk/boardscommissions/SEPTACitizensAdvisoryCommittee.html>

- Coronavirus relief and public transit. Investment in public transit is essential to realizing reductions in energy use and emissions. The level of density and economic productivity in the Greater Philadelphia Region is only possible with a high-capacity, efficient network to keep people moving. Advocating for increased capacity and support for public transit is an essential step to increasing public transit ridership in Radnor Township and achieving the *Ready for 100* goals. The \$2.2 trillion CARES Act relief bill that passed in early spring 2020 allotted \$25 billion for public transportation nationwide. Pennsylvania received \$1.13 billion of the funds, with \$643 million going to SEPTA. The CARES Act has been a lifeline for SEPTA, but additional assistance is critically needed to preserve the current public transit system in the Greater Philadelphia region. SEPTA is currently losing \$1 million in fare revenue every single day. Based on current ridership forecasts, SEPTA anticipates an additional operating budget shortfall of at least \$622 million through the end of fiscal year 2023. Without funding, service reductions and layoffs at SEPTA will cause transit service cuts in the short- and long-term, and pose consequences for riders, the environment, and the economy.

Radnor Clean Energy Champions: Contact your U.S. representatives and senators to advocate for public transportation funding in the next coronavirus relief package and beyond.

- Public Transportation Trust Fund (Act 44). Act 44 transfers \$450 million a year from the Pennsylvania Turnpike Commission to public transit agencies and is set to expire in 2022. In April 2019, the Southeast Partnership for Mobility issued a report calling on state leaders to address this funding crisis, with measures to raise revenue through ride-hailing service fees, congestion pricing charges, and fees for tire purchase, vehicle leases and vehicle rentals. SEPTA's aging infrastructure requires that this fund is preserved for public transit.

Radnor Clean Energy Champions: As 2022 approaches, demand that PA state legislators protect the Public Transportation Trust Fund.



COMMUNITY ACTION

Ensure C-PACE Passage & Implementation in DelCo

Launched in 2018, the Pennsylvania Commercial Property Assessment Clean Energy Program (C-PACE) is a unique funding tool for energy efficiency, clean energy, and water conservation projects. C-PACE provides commercial property owners with access to low-interest, long-term loans for up to 100% of project costs. But unlike a conventional loan, the C-PACE loan is repaid as *property tax*, which eliminates the need for an upfront payment, ensures that loan payments do not exceed utility cost savings, and eliminates the requirement that debt be paid at time of sale or refinancing since loan payments remain with the property.

To comply with the state level requirements, local municipalities and counties must pass an ordinance to establish a C-PACE district. To date, more than 35 states plus



DC have C-PACE enabling legislation. In Pennsylvania, C-PACE has been adopted by Northampton, Chester, Philadelphia, Allegheny, and Wayne counties. The Sustainable Energy Fund is leading the adoption of C-PACE in PA, with support from the Keystone Energy Efficiency Alliance, the City of Pittsburgh, and the Philadelphia Energy Authority.

To adopt this program, Delaware County must pass an ordinance to formally establish a C-PACE program. The ordinance must establish a program administrator (typically a local government or a third-party nonprofit organization such as the Sustainable Energy Fund). Delaware County Council already discussed implementing this program in March 2020 ([link](#)). For more information on how to guide policy development and get the program started, see "[C-PACE in a Box](#)."

Radnor Clean Energy Champions: Advocate for Delaware County Council to adopt and implement C-PACE. For assistance contact Sustainable Energy Fund, Holly Edinger, hedinger@thesef.org.

5.1.2 Ongoing Advocacy Work



Legislative/Regulatory Advocacy

Additional advocacy opportunities exist, and ongoing support from the southeastern PA municipalities seeking *Ready for 100* goals is much needed to advance these critical new policies:

- Community Choice Aggregation (CCA)**, a state-level policy that allows local governments to purchase electricity on behalf of their residents, business owners, and municipal operations. CCAs can be administered directly by a municipality or a third party through contractual arrangement. A key component of CCA is that the municipality becomes the default electricity provider, allowing customers to "opt out" if they wish to return to the traditional electric utility generator. Municipalities can choose their sources of electricity, prioritizing renewable and carbon-free sources. The model allows CCAs to serve large customers and thereby create substantial demand for clean renewable energy into the grid. Eight states in the U.S. already allow CCAs. For more information: [Link](#)



Figure 5.3. Community Choice Aggregation
Source: National Renewable Energy Laboratory

Radnor Clean Energy Champions: Advocate for Community Choice Aggregation by contacting Food & Water Watch. See [link](#).



- *Modernized energy efficiency building codes.* States adopt mandatory commercial and residential energy efficiency codes, or IECC codes, as part of a larger building code package known as the Uniform Construction Code, or UCC. The building energy codes require a minimum level of energy efficiency for new construction and are the basis upon which architects, builders, and developers make decisions about energy efficiency.

Every three years, global experts representing the International Code Council automatically update the IECC/UCC to reflect new technologies and safety standards. As technology has rapidly improved, the code updates have greatly improved energy efficiency of the standards (Figure 5.5).

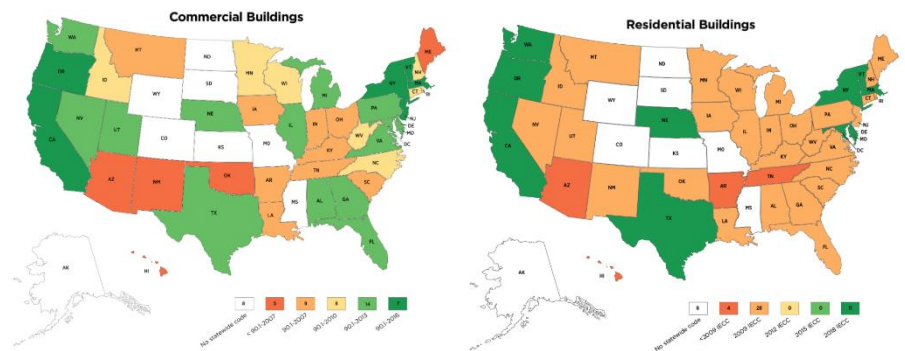


Figure 5.4. Adoption of IECC code by state ([Source](#))

Unfortunately, unlike some other states, Pennsylvania does not automatically adopt these updates. Instead, PA has an appointed a “Review and Advisory Committee” (consisting primarily of special interests) that determines which provisions, if any, to adopt. This means PA is consistently laggard in adopting new codes (Figure 5.4). For close to a decade, the RAC prevented adoption of updated building codes in PA, resulting in substantial lost opportunities for energy efficiency in new construction and major renovation projects. This process has also burdened local governments, because building code inspectors attend training for codes they cannot even enforce in our state. Importantly, municipalities cannot simply adopt the updated codes on their own; local governments are effectively pre-empted from doing so, trapping them in the state’s outdated process and preventing progress on *Ready for 100* commitments.

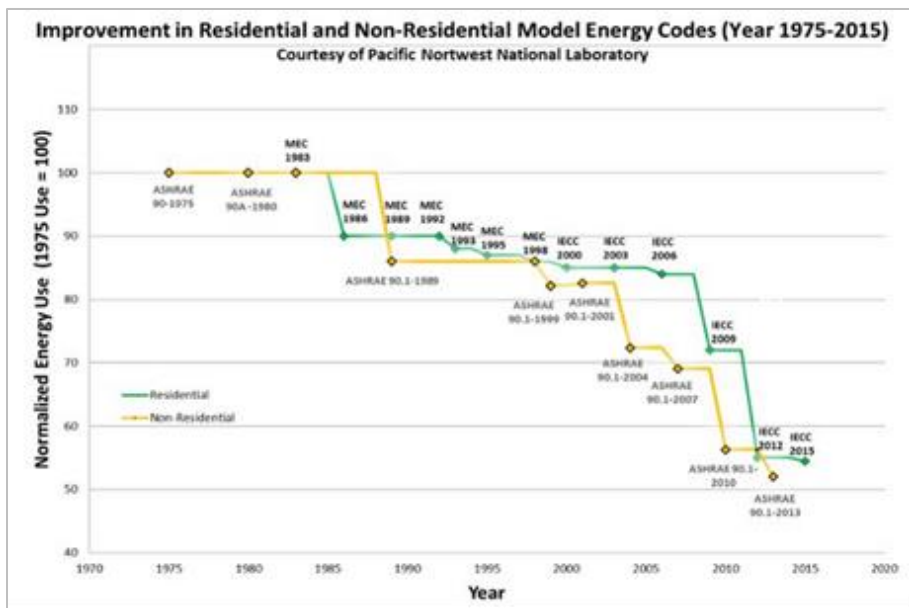


Figure 5.5. Reductions in modeled building energy use due to code improvements

In Pennsylvania, the energy efficiency code of 2013 is now in effect for new commercial construction (Uniform Construction Code (UCC) of 2015 – ASHRAE 90.1-2013 – IECC 2015) except in Philadelphia, which has adopted the most recent energy code (UCC 2018 – ASHRAE 90.1-2016 – IECC 2018).

Radnor Clean Energy Champions: Lobby the state to pass legislation requiring a return to automatic adoption of the UCC updates every three years, to ensure energy efficiency in new construction and major renovation projects. Follow the PA Environmental Council Bill Tracker for opportunities and updates: <https://pecpa.org/pec-bill-tracker/>



GET READY FOR 100! ACHIEVE ZERO!

Some leading jurisdictions across the country have begun to take the energy efficiency code a step further by incorporating both *zero energy* and *zero carbon* goals into their new construction codes. A “zero carbon” building is a highly efficient building that uses no on-site fossil fuels and produces on-site, or procures through the grid, enough carbon-free renewable energy to meet building energy consumption each year. Radnor Township can lobby for statewide adoption of these codes, voluntarily implement these codes as pilot programs for any new municipal facility, and negotiate with developers to enact these standards in return for special exceptions developers may want.

The Zero Code is a building energy standard for new construction that integrates cost-effective energy efficiency standards with on-site and/or off-site renewable energy to support construction of zero-carbon buildings. The zero code applies to new commercial, institutional and residential buildings and is a good model for municipalities to follow. For more information, click [here](#).

The U.S. Department of Energy (DOE) [Zero Energy Ready Home Program](#) is also a great way to move in the direction of zero. This program recognizes builders for increasing energy efficiency, improving indoor air quality, and building homes to be “zero ready.” Zero-ready homes are at least 40% to 50% more energy efficient than a typical new home and are solar PV ready.



- *Clean transportation.* Radnor Township has a personal vehicle-focused culture of transportation; 30.3% of energy consumption derives from vehicle transportation, while only 0.4% comes from other forms of transportation (i.e., public transit) (Appendix A). To clean up this sector, the township needs to install electric vehicle (EV) infrastructure. The Township can advocate for policies that will facilitate this, namely:
 - *The Pennsylvania Clean Transportation Infrastructure Act (SB 596).* This bill was advanced to the House Consumer Affairs Committee by the Pennsylvania State Senate in December, 2019. The bill seeks to jump-start the electric vehicle market in Pennsylvania by establishing more ambitious goals for regional electrification infrastructure, while directing public utilities and the governor to support the initiative. SB 596 also establishes a goal of increasing electrification by at least 50% over currently forecasted levels by 2030, with a focus on development of metropolitan areas. If this bill is passed, it will significantly help Radnor reach its clean energy goals by providing needed infrastructure support and incentives for citizens of the Township to buy electric vehicles. The PA Clean Transportation and Infrastructure Act may be reintroduced in the State House in the near future, so the Green Team should keep up with its progress.
 - *Electric Vehicle Charging Infrastructure (HB 1908).* This bill was referred to the House Labor and Industry Committee in October, 2019. This legislation encourages consumers to embrace electric vehicles by supplying the infrastructure to support them. Through requiring new non-residential buildings in the Commonwealth to be constructed with the necessary infrastructure to support EV charging stations, this legislation would expand the opportunity to charge EVs in places



consumers frequent most, such as retail facilities, hotels, schools and restaurants. This bill may be reintroduced in the near future and should be followed closely.

Radnor Clean Energy Champions: Stay up to date with clean transportation advocacy opportunities by signing up [here](#) for the monthly **Eastern Pennsylvania Alliance for Clean Transportation (EP-ACT)** newsletter, and distributing advocacy opportunities to key stakeholders throughout the Township for quick action. These newsletters provide opportunities for the public to engage with clean transportation policy and programs.

5.2 The Built Environment: Energy Efficiency + Renewable Energy

Overview

5.2.1 Energy-Efficient Homes



COMMUNITY ACTION

- Get a Home Energy Audit.
- Take advantage of programs and financial incentives.

5.2.2 Energy-Efficient Commercial, Multi-Family, and Mixed-Use



MUNICIPAL ORDINANCE PROGRAM

- Benchmarking Ordinance
- Require Commercial Energy Auditing and Building Retuning



COMMUNITY ACTION

- Fuel Switching



PARTNERSHIP OPPORTUNITY

- Fuel Switching

5.2.3 Renewable Energy in All Existing Buildings



PARTNERSHIP OPPORTUNITY

- Solarize Radnor!



COMMUNITY ACTION

- Buy green energy through the grid (RECs)
- Create Renewable Energy Purchasing Agreements (vPPAs)

5.2.4 New Construction



MUNICIPAL ORDINANCE PROGRAM

- Net Zero Expectations for All New Construction

Existing Buildings

5.2.1 Energy-Efficient Homes

To achieve energy efficiency goals in the residential sector, individual residents will need to take proactive measures. Residents can progressively reduce in-home energy consumption and move toward a renewable energy future, while saving money on monthly utility bills. Just follow these actions!



COMMUNITY ACTION

Get a Home Energy Audit

Through its Act 129 *Smart Ideas* program, PECO sponsors \$49 home energy assessments for everyone, and free home energy check-ups for those with low incomes. Additionally, the Community Action Agency of Delaware County provides home energy audits to income-eligible households.

The assessment identifies homeowners' opportunities to save energy. A PECO energy advisor will visit the home to understand typical electricity uses and develop energy savings recommendations. The advisor will also review the electric bill to highlight high consumption and help homeowners understand typical charges. Through the program, homeowners can also receive free energy efficient products, such as light bulbs and power strips. These assessments give homeowners a guide for action and represent the first, best step toward achieving energy efficiency.



COMMUNITY ACTION

Take the Next Steps: Make Your Home Energy Efficient!

Follow the guidance of the home energy audit and start taking steps to make your home energy efficient. Homeowners can take advantage of these programs to help pay for the efficiency upgrades:

- Equipment tax credit: The Federal Government provides tax credits for installing energy efficient equipment in a primary residence, including air-source heat pumps and central air conditioning, among others. The tax credit is 10% of the total project cost, to \$500. This program is only available for existing homes. The tax credit expired on December 31, 2020, but has been extended retroactively, through December 31, 2021. Click [here](#) for more information.
- PECO's Smart Ideas program provides rebates and discounts for ENERGY STAR certified products that you install – including appliances, pool pumps, heating and cooling systems, lighting, and water heaters. Learn more and apply [here](#).



HOMEOWNER

Sign up for a PECO home energy audit by calling 855-312-5923, or visit:
<https://www.peco.com/WaysToSave/ForYourHome/Pages/EnergyAssessment.aspx>

Call 1-855-270-7327 M-F 8 am-5:30 pm to see if you qualify for a free *Smart Ideas* check-up, or visit:
<https://www.peco.com/WaysToSave/ForYourHome/Pages/EnergyAssessment.aspx>

Call 610-521-8770 to reach the Community Action Agency and apply for the free home energy audit, or visit:
<https://caadc.org/services/energy/>



Programs for Energy Efficiency

Homeowners' Energy Efficiency Loan Program (HEELP)

Administered by the PA Housing Finance Agency, the HEELP program offers loans from \$1,000 - \$10,000 for energy efficiency projects, with a fixed rate of just 1% and a loan term of 10 years with no prepayment penalties. That's \$44 per month for a \$5,000 loan or \$88 per month for a \$10,000 loan. Eligible energy efficiency projects include insulation installation, window replacement, HVAC system upgrades, and roof replacement. For information, call 855.827.3466 or visit <https://www.phfa.org/programs/heelp.aspx>

This Community Action Agency offers a **Weatherization Assistance Program** that reduces utility bills and improves comfort, including repairs of the building envelope, weatherstripping and caulking, heater inspection and service, and window repair/replacement. All services are available at no charge for those who qualify. CAADC also provides grants to assist Delaware County residents with outstanding bills, to restore utility service. For more information, call 610-521-9770 or visit <https://caadc.org/services/energy/>



CASE STUDY: *The Perfect Roadmap for a clean, green, comfortable home.*

One local homeowner, motivated to lower his energy footprint, set off to follow the energy pyramid: conservation first, efficiency second, and renewables third.

- ✓ To conserve energy and identify efficiency projects, he signed up for a free PECO energy audit and a blower door test to identify areas of air leakage and poor insulation. The energy auditor directed him to replace attic insulation, seal windows, shut off lights when rooms are unoccupied, and plug electronics into outlet strips so they can be easily turned off when not in use.
- ✓ The homeowner began programming his thermostat back 8-10° during unoccupied times.
- ✓ When he needed a new refrigerator and dishwasher, he chose an ENERGY STAR refrigerator and dishwasher, and he replaced all lights with high-efficiency LED lights inside and out.
- ✓ The energy audit revealed that oil heat and a seven-year-old central air conditioning system with a failing compressor contributed to high energy use and utility bills. So, when the homeowner was faced with replacing his failing equipment, he knew the best course of action was to invest in energy-efficient upgrades. He upgraded to a new heat pump hot water heater, and replaced the oil furnace and central air conditioner with a super high-efficiency air source heat pump (18 SEER).
- ✓ The homeowner financed this project with a \$15,000, 0.99% low-interest loan and paid an additional \$3,200 to cover all project costs out of pocket. The measures saved the homeowner 37%, or \$1,320 annually, on his utility bill. His monthly utility savings of \$110 nearly cover the \$131 monthly loan payment. Most importantly, says this enthusiastic homeowner, the house is now electrified and ready for the next step: **Go 100% renewable electricity!** He currently purchases 100% *green-e certified* wind power from an electricity generation supplier and, in the future, he plans to add solar panels so he can generate the carbon-free electricity on site. He will then purchase an electric vehicle that will be charged with 100% clean power at home!

5.2.2 Energy-Efficient Commercial Buildings and Multi-Family/Mixed Use Developments

To achieve energy efficiency goals in the commercial and multi-family/mixed use development sectors, business and property owners also need to take proactive measures to reduce energy consumption. Often, financial models permit efficiency upgrades that, in conjunction with low-interest loans, are revenue-neutral or revenue-positive.



Municipal Ordinance Program

A key first step to improve energy performance in commercial buildings is to benchmark energy consumption. This is now being done in cities across the country using the ENERGY STAR Portfolio Manager system.

Portfolio Manager is a reputable, free resource for benchmarking building energy, water and waste consumption. Portfolio Manager scores each building's energy performance from 1 to 100 based on a nationwide comparison with similar buildings. A score of 50 means a building performs on average; a score of 75 earns commercial property owners the ENERGY STAR certification, which is an excellent tool for displaying the property owner's dedication to energy conservation.

In July 2020, Portfolio Manager launched a Higher Institution Benchmarking Initiative (HEBI) to guide colleges and universities in comparing their energy and water performance with peer institutions. This will be a valuable resource for Villanova, Cabrini, and Eastern Universities.

Radnor Township: Pass an ordinance requiring property owners with commercial and institutional buildings >10,000 sf to complete an annual benchmarking report. Report the annual findings to educate the public, measure progress, and highlight high-performing buildings.

This may also present a partnership opportunity to work with organizations like the Delaware Valley Regional Planning Commission and/or the County of Delaware Planning Department to create multi-municipal/county-wide benchmarking programs.

You Can't Manage What You Don't Measure Benchmark to Rank your Commercial Buildings' Energy Use!



In 2013, the City of Philadelphia passed benchmarking legislation requiring commercial and multi-family buildings $\geq 50,000$ square feet to conduct and report annual whole-building energy benchmarking. Since then, participating buildings achieved a 12% reduction in total greenhouse gas emissions and a 5% reduction in overall energy use. Similarly, New York City's benchmarking program found 6% and 14% reductions in building energy use intensity (EUI) after three and four years, respectively.

The Institute for Market Transformation (IMT), a Washington, DC-based nonprofit catalyzing demand for high-performing buildings, offers full resources and support for developing an ordinance and municipally-based programs based on the experiences of 27 cities, one county, and three states across the country.



Benchmarking and Transparency: Resources for State and Local Leaders

This resource guide provides state and local leaders with streamlined access to key existing resources for developing and implementing high-impact building energy benchmarking and transparency programs in their jurisdictions.



Overview

Buildings account for roughly 40% of the energy consumed in the United States.* Recognizing the tremendous opportunity for energy and cost savings and associated health and environmental benefits, state and local leaders are advancing building energy benchmarking and transparency programs to support improved efficiency.

Benchmarking and transparency provide the foundation for improved building energy performance. Building energy benchmarking means measuring a building's energy use and then comparing it to the energy use of similar buildings, its own historical energy usage, or a reference performance level (e.g., based on a building energy code).

FIGURE 1: U.S. Building Energy Benchmarking and Transparency Policies



* U.S. Energy Information Administration, 2018: Consumption and Efficiency. Available at: <https://www.eia.gov/consumption/>

Learn more at betterbuildingsolutioncenter.energy.gov



To download: [https://www.imt.org/wp-content/uploads/2019/02/Benchmarking Transparency Resource PDF Final 2.14.pdf](https://www.imt.org/wp-content/uploads/2019/02/Benchmarking_Transparency_Resource_PDF_Final_2.14.pdf)

Energy Audit Opportunities

Energy Audits are an excellent way to identify opportunities for energy savings.



Radnor Township can exemplify a commitment to energy efficiency and conservation by performing an audit and acting on recommendations. PECO assessments of three Township-owned buildings show 28-38% energy use reduction opportunities through measures like:

- Energy efficient heating and cooling equipment
- Installing efficient lighting
- Modifying of heating and cooling schedules
- Retro-commissioning of building controls
- Adjusting temperature setbacks

At these buildings, PECO identified a potential annual savings of \$37,710, or 29% of current energy costs. Through these measures, the Township could also avoid up to 244 tons of carbon emissions per year. Realizing these savings would show Radnor's commercial sector that energy audits can improve bottom lines.



Municipal Ordinance Program

Require Commercial Energy Auditing & Building Re-tuning

Once the benchmarking process provides property owners with an indication of energy-saving opportunities, the next step is for these property owners to conduct an energy audit. An energy audit includes a survey of major building systems – including the building envelope, mechanical equipment and lighting – and a plan for managing these systems more efficiently through behavior changes, control/operational strategies, and equipment/capital upgrades. A good audit will also address comfort problems and maintenance issues, and the Township should require the audit to include “building re-tuning” recommendations. Together, these recommendations can reduce operational costs due to energy savings, reduced maintenance bills, and increased employee productivity.

Radnor Township: Be a regional leader and increase participation in energy auditing by passing an ordinance requiring commercial, mixed-use, and multifamily residential buildings >10,000 sf to undergo energy audits with active building re-tuning required every 5 years. Exempt buildings with pre-existing ENERGY STAR scores of 75 or higher from the audit, and exempt buildings with newly-installed HVAC systems (i.e., ≤2 years) from the re-tuning requirement. See Appendix B for a model ordinance requiring energy audits and re-tuning of building systems.

WHAT IS BUILDING RETUNING?

*Changing the world . . .
One building at a time*



When most buildings were built, energy efficiency was not a major concern, and this is still the case even today. Further, depending on the quality of construction, building documentation can be incomplete, and components and equipment may be missing or incorrectly installed. And, with time, systems go out of calibration and are often not timed to reflect the actual use of the building.

The result? Buildings typically use *more* energy to accomplish *less*.

Building retuning – an evaluation of existing operations and control systems – will provide building owner/operators with a guide to correct HVAC controls, ventilation rates, and other system operations. The benefit is energy savings without substantial capital outlays. This legislation has the potential to boost the local economy, achieve significant carbon reductions, and cut utility costs for building owners.

The Pacific Northwest National Laboratory (PNNL) is leading the charge to make building retuning common practice among commercial building owners by providing training and best practices and offering case studies. In a PNNL study of 100 office buildings that underwent retuning, building owners benefited from a median annual cost savings of \$0.12 per sf.



Partnership Opportunity

Green Leasing

Landlords who wish to make energy efficiency improvements can face difficulties reaping the financial payback for these projects. Building improvements that produce monthly utility savings can benefit tenants who pay the utility bills, not the landlord. “Green” leases (sometimes referred to as aligned leases, high-performance leases, or energy efficient leases) help address this problem by incorporating legally-binding “green” aspects into the contract. Namely, green leases can specify how the costs and savings of an energy improvement project will be divided between tenant and landlord. For example, if the landlord makes an improvement that lowers the tenant’s monthly utility costs, the tenant can split the savings with the landlord until the improvement is paid off.

By helping to reduce overall energy use, green leases help multifamily and commercial property owners improve energy efficiencies and increase potential to qualify for recognition programs such as ENERGY STAR Certification. These recognitions can differentiate properties on the market and draw environmentally-conscious tenants. For more information on ENERGY STAR certification for buildings, see Appendix C.



CASE STUDY:

Green Leasing for Multifamily Residential Properties

Green leases are gaining popularity for multifamily residential properties and can be rolled out gradually as renewals come up or newly constructed buildings and spaces become available.

Forest City, headquartered in Cleveland, OH, is a leader in multifamily green leasing. The company trains its agents to help them speak with tenants about the building’s sustainability features and communicate value. At their Blossom Plaza apartment building in Los Angeles, ENERGY STAR certification signals to tenants that they are getting the best possible prices on their utility bills. The building is consistently at or around full occupancy.

CASE STUDY: *Green Leasing for Commercial Properties*



Research suggests that green leases have the potential to cut energy use in office buildings by as much as 22%. It also estimates that green leases have the potential to provide the leased U.S. office market \$1.7 billion to \$3.3 billion in annual cost savings ([Source](#)).

In addition to energy savings, the benefits of green leasing for commercial properties include:

- Higher productivity and better occupant health.
- Promotion of a culture of sustainability among all building users, making progress toward green building certifications like ENERGY STAR and LEED.
- Reduced environmental impacts.
- Higher future rent and building occupancy rates.
- Improved public image and marketing tools for both landlord and tenant.

Federal Realty uses green leases to sync its sustainability and health and wellness goals with those of its tenants, while reaping the benefits of green leasing. Federal Realty clearly lays out the main points of their green lease using a welcome book, which also helps build relationships with tenants. The lease’s focus on health and wellness is especially important in light of the COVID-19 pandemic. This aspect of the lease requires regular maintenance of HVAC systems, integrated pest management, and green cleaning. Federal Realty’s goal is to not only improve the quality of the tenants’ environment, but achieve longer-term leases and increase lease renewal rates. Federal Realty’s Pike & Rose mixed-use commercial property in Rockville, MD, features a host of sustainability- and health-focused aspects that accompany the green lease, like a rooftop garden that yields fresh produce. Mixed-use, residential, and commercial properties in Radnor could replicate Federal Realty’s success by appealing to customers who prefer a sustainable and healthy building. ([Source](#))

- For green leasing language for small, non-institutional landlords: [Link](#)
- For green leasing language for commercial properties: [Link](#)

Radnor Township: Promote green leasing through municipal outreach and during developer negotiations.



COMMUNITY ACTION

Fuel Switching

Moving away from on-site fossil fuel combustion (natural gas and oil) used to heat large commercial and institutional buildings is an important step toward decarbonizing our energy supply and meeting the *Ready for 100* goals. This is also a difficult process that requires a deliberately planned, phased transition to all-electric heating systems. For smaller buildings, this can mean replacing an oil or gas furnace with an all-electric heat pump when it comes time to replace aging systems. For larger institutions, such as Radnor's college campuses that currently rely on natural gas-powered central steam plants and underground steam piping systems for heating, it requires intensive planning and a well thought-out, phased transition to all-electric heating systems that can be powered by clean renewable energy.

The technology is available to convert all end-uses within buildings to electricity. Space heating, the highest fossil fuel based end-use, can be generated by an electric heat pump to replace a natural gas or oil fired furnace. Electric heat pumps can be used in either residential or commercial buildings and can also provide space cooling to replace existing air conditioning equipment.

The main obstacle for building electrification is financial, with the local energy rates and the capital costs of the investments being the most important consideration. It is difficult to specifically quantify the potential costs of these investments, as there are many factors to consider. However, the life cycle costs of these investments indicate that this conversion can be completed cost-effectively, when considering the operating and maintenance costs through the life of the system. ([Source](#))

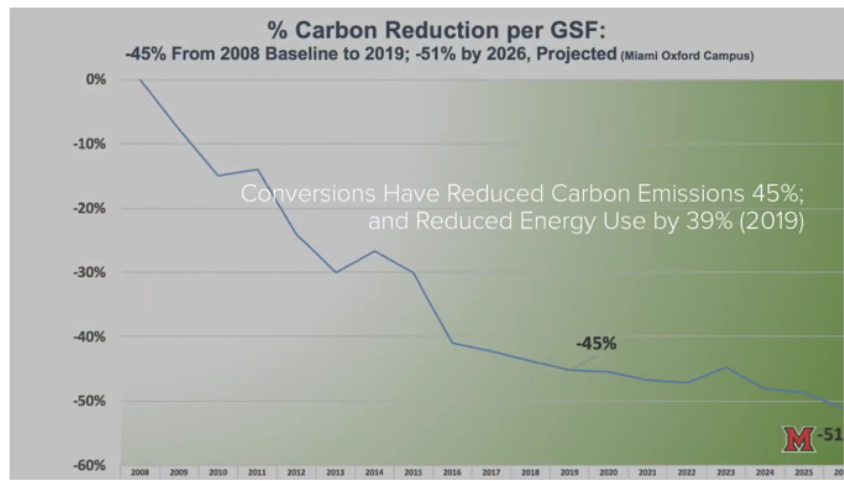
For the Township, building electrification investments will be most impactful for RF100 goals in existing buildings as most of the building stock used in 2050 is already built. Studies have determined that building electrification is relatively cost effective in existing buildings, especially in the Northeast region since heating loads are higher in this region. The cost-effectiveness of electric heat pumps increases if the new system is replacing an oil-fired system since oil prices are typically high and if the air conditioning system is being replaced with the new heat pump system since electric heat pumps have a higher efficiency rating compared to conventional air conditioning equipment. ([Source](#))

Institutions and large commercial entities should begin now by creating a comprehensive, integrated Energy Master Plan to generate an actionable, phased roadmap for this transition.

FROM STEAM TO GEOTHERMAL: It's Happening All Around Us!

In 2014, West Chester University celebrated the decommissioning of its on-campus, coal-fired boiler plant, which for more than 50 years provided steam heat for the campus. The University first initiated an "Guaranteed Energy Savings Project" that yielded energy efficiency savings of more than 12.4 million kWh electricity, 155,000 gallons of fuel oil, 37,000 MMBtu of steam and 500 tons of coal. The University then pursued a four-phase utility conversion to a district geoexchange system, with all the wells at a common location and a central pumping station supplying the geothermal water to the buildings. The approximate 8-year project resulted in half of the campus buildings being heated and cooled by the \$30-million geothermal system, with the other half heated and cooled by high-efficiency natural gas boilers.

Similarly, Miami University in Oxford, Ohio, created and followed a comprehensive Utility Master Plan that calls for substantial increases in efficiency and electrification of heating systems. After nine years, the University cut its fossil fuel-based steam system dependence in half by employing multiple technologies including geothermal heating and cooling, conversion of steam to highly-efficient simultaneous heating/cooling systems, thermal energy storage, and heat recovery. As a result, total energy use has dropped 39% even though total campus gross square footage increased 25%. By 2026, the University's Utility Master Plan calls for a full conversion of the central steam plant to heating hot water supported by efficient, electric-based technologies. The next phase will focus on providing on-site solar electricity and buying renewable electricity through the grid.



Read more [here!](#)

5.2.3 Renewable Energy in All Existing Buildings



COMMUNITY ACTION

Buy Green Energy through the Grid

One of the easiest and most immediate ways for residents and small business to get green energy flowing into their buildings and homes is to buy solar or wind power RECs.

Here's how it works. Electricity enters the grid from many different sources, ranging from nuclear and gas to wind and solar power, making it impossible to know exactly where your energy is coming from at any given time. To solve this problem, property owners can purchase "renewable energy certificates" (RECs) that represent electricity generated by renewable energy sources. RECs, paired with electricity from the grid, represent renewable energy generated and delivered into the grid on your behalf.

A REC is produced when a renewable energy source generates one megawatt-hour (MWh) of electricity and delivers it to the grid. For example, if a wind power facility produces 5 MWh of electricity, they have 5 RECs to keep or sell. If you buy those RECs, you are buying the "renewable" aspect of the electricity from the wind farm, and you can say that 5 MWh of your electricity use came from a clean renewable source.

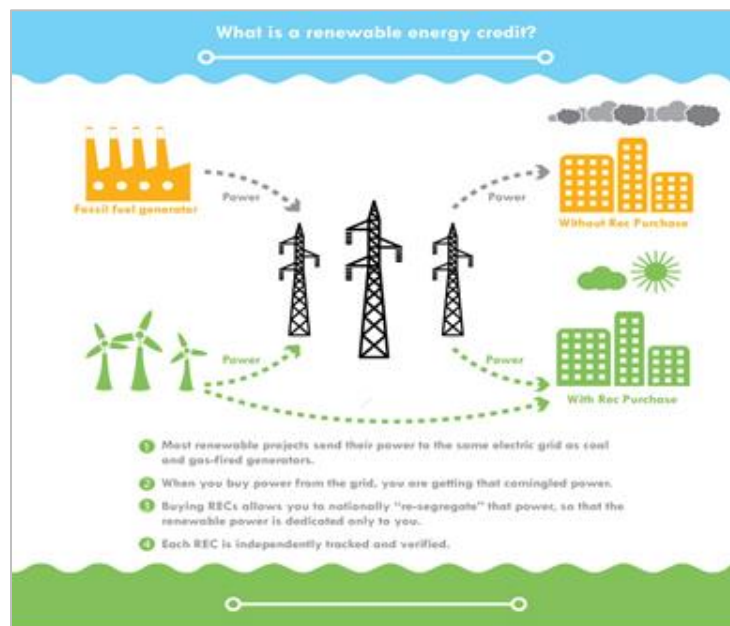


Figure 5.6. Electricity enters the grid from many different sources.

RECs represent renewable clean energy being delivered into the grid. Importantly, not all RECs are created equal. Some create new renewable energy projects. Others do nothing to drive renewable energy development because they come from wind and solar farms that already exist. For this reason, it's important to select RECs that drive new projects. Radnor-based Community Energy is the only electricity supplier in the region that offers such RECs, though its "Solar Builder" and "100% PA Wind & Solar" programs. Sign up [here](#). photo credit: Terrapass.com



CASE STUDY:

Solarize Greater Media

Solarize Greater Media instituted a solar group buy in partnership with the Delaware Valley Regional Planning Commission and the Delaware County Planning Department. To date, 34 solar arrays were installed on residential and commercial properties. Overall, this program added over 300kW of new renewable energy generation to the grid. – [Link](#)



CASE STUDY:

Solarize Philly

In Philadelphia, Solarize Philly makes the process of installing solar as easy and as affordable as possible. The Philadelphia Energy Authority (PEA) selected high quality installers and equipment and negotiated discount prices to grow the Philly solar market. Solarize Philly also features a Solar Savings Grant Program for low- and moderate-income households to participate. PEA covers half of the costs so participants can finance the remainder of the cost, regardless of their credit scores. - [Link](#)



Partnership Opportunity

Start Solarize Radnor!

“Solarize” is a community-led group solar PV purchasing program, which began in Portland more than a decade ago and has since taken hold in communities across the country. With solarize, community members band together to commit to installing solar PV on their homes and small businesses. They make a collective purchasing decision, enabling negotiation of volume discounts, streamlined permitting through the Township, and competitive contractor selection. After three years, Portland added more than 1.7 MW of solar PV arrays to its rooftops – enough to power 270 average homes – and created jobs in the process!

Solarize programs are a true community partnership and typically include a trusted nonprofit, such as an established neighborhood organization, a technical advisor (such as the Delaware Valley Regional Planning Commission or the Delaware County Planning Department), and a project organizer (such as the Township). Additionally, residents with the financial capacity can help subsidize residents who need financial support. Other local partners may include the Radnor Conservancy and the Sierra Club of Southeastern PA.

For a step-by-step guide to getting a Solarize Radnor program off the ground, see the US Department of Energy’s SunShot Solarize Guidebook.

Radnor Township Sustainability Director: Enlist the help of DVRPC, Delaware County Planning Department, and other partners. See: DVRPC Planning Assistance Center; Delaware County Planning Department.



COMMUNITY ACTION

Create Renewable Energy Purchasing Agreements

For larger commercial and institutional enterprises, virtual power purchase agreements (vPPAs) are excellent options for buying clean, renewable energy. Larger organizations across the region are leveraging their high energy demands to competitively bid for new solar projects that supplant their conventional energy use with clean, renewable power.

vPPAs are essentially financial agreements between developers and electricity customers in which the developer builds and finances a renewable energy project off-site (typically a large solar array), maintains ownership of the system, and sells the power and the associated renewable energy certificates (RECs) to the customer at a fixed price. The rate escalates at a fixed amount throughout the term of the agreement (often 20-25 years).

The vPPA is purely a financial mechanism in which the customer agrees to purchase the renewable project's power output and RECs at the contracted price. The solar electricity is not physically delivered to the customer. The customer still purchases electricity from the local utility, and the project owner delivers the solar energy into the grid and sells it in the wholesale market. If the wholesale market price is more than the contracted fixed price, the customer receives the upside. If the wholesale market price is less than the fixed price, the customer is liable for the downside. The

CASE STUDY:

University of Pennsylvania's Virtual PPA Paves the Way for Campus-Wide Carbon Neutrality

The University of Pennsylvania entered into a virtual PPA in April 2020 as part of the University's commitment to achieve carbon neutrality by 2042. The agreement will result in the construction of two solar energy systems with a combined capacity of 220 MW in Central Pennsylvania, generating approximately 450,000 MWh annually, equivalent to 75% of the electricity usage for the academic campus and the University of Pennsylvania's Health System. This agreement was developed with Radnor-based Community Energy and is currently the largest solar power project in the state. [Link](#)



project company and the customer settle the cumulative differences between the fixed price and the wholesale market price monthly or quarterly. Essentially, the vPPA is a contract for the purchase of the RECs and a hedge instrument, aka 'contract for differences'.

vPPAs:

- Generate new renewable energy into the grid to supplant the customer's conventional, dirty energy consumption.
- Allow customers to source electricity from a renewable source without being accountable for upfront costs or maintenance.
- Enable large energy users to achieve renewable energy goals.

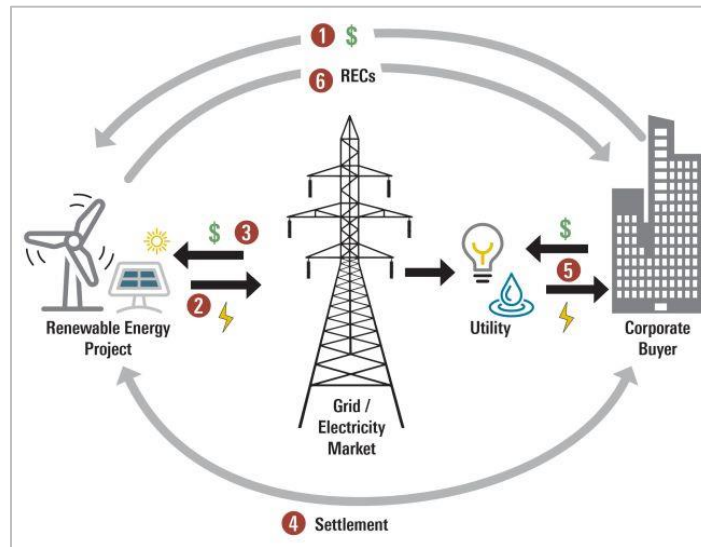


Figure 5.7. The Virtual PPA (vPPA)

1. Customer and project company enter into vPPA for a fixed price.
2. Electricity produced by project delivered into grid.
3. Project company receives wholesale market price.
4. Customer and project company settle the difference between fixed and wholesale market prices.
5. Customer maintains its regular relationship with utility or other retail provider.
6. Customer receives RECs and sells or, preferably, retires them to claim the sustainability benefits.

Source: energycentral.com

CASE STUDY: Villanova Chooses Hydroelectric

In April 2020, Villanova University chose a different path to move toward its environmental goals. The University committed to purchasing 50% of the campus's electricity usage through Holtwood Hydroelectric Power Plant located on the Susquehanna River in Lancaster, PA. This commitment was made to achieve the campus' goal for carbon neutrality by 2050 through investing in regionally and renewably sourced electricity. The power purchased will serve the Main Campus, West Campus, South Campus, and The Inn. Hydropower as an energy source is readily available and supplements wind- and solar- power sources. [Link](#)





JoAnn M. Magnatta
Senior Vice President
Planning Design &
Construction/Real
Estate/Public
Safety/Facilities
Management

“Main Line Health is dedicated to saving lives and advancing the health and safety of our community. Our customers are driving our commitment to sustainability and clean energy. We’re a large part of the community and we want our patients to enter our facilities knowing we have a commitment to our community’s health and the health of our environment.”

CASE STUDY: *Radnor’s Main Line Health Puts It All Together* *Energy Efficiency + Renewables*

Main Line Health is a large presence in the area, employing over 10,000 people throughout their continuum of care. The nonprofit healthcare system operates four acute care Hospitals, a Rehabilitation Hospital, a drug and alcohol treatment center, six health centers, seven corporate buildings, and several medical offices. Main Line Health has been on a mission to reduce energy consumption since 2012 and has been procuring 20% of their energy from green sources since 2010. This journey, while supported by cost savings, is part of a larger goal to be a leader in energy efficiency and clean energy in the area. Main Line Health shows that commercial organizations can achieve sustainable energy production as part of a progressive plan and save money along the way.

A large-scale LED lighting retrofit was executed across all Main Line Health’s locations. They replaced more than 13,500 LED tube lights, including 2,300 tube lights at the Radnor Corporate Office. Through the PECO Smart Ideas incentive program, Main Line Health was able to get the tube lights for free, so savings started accumulating on the day of installation. When the project is complete, the building’s electric consumption will decrease by about 284,277 kWh, or about 3.3% of the site’s total usage.

Main Line Health also hopes to institute HVAC controls and setbacks strategies at the Radnor Corporate Office in the near future. The building is almost 100% electric and is now changing its occupancy patterns due to COVID-19, presenting opportunities for reducing energy consumption while cutting utility costs and carbon emissions.

Main Line Health has purchased wind energy through the electric grid for a decade. In 2019, Main Line Health purchased 32,500 MWh, which covered approximately 33% of the organization’s electricity consumption, spanning across all four main hospitals and Bryn Mawr Rehabilitation Center. Their wind energy contract expires in 2021, however, so Main Line Health is exploring other renewable energy alternatives, including a virtual solar PPA that would cover about 50% of system-wide usage.

For Main Line Health, sustainability means reducing waste in all operations, lowering energy costs, lowering employee commute times, and so much more. Main Line Health is working across the entire organization to create a comprehensive sustainability plan that will reflect its strong desire to find sustainable solutions to energy problems, while cutting costs along the way.

New Construction

As Radnor Township continues to improve and build up its community, it is critical to remember that adding buildings through a conventional land development approval process will *de facto* increase dirty energy demand and consumption. This will increase the Township’s burden of having to eliminate or offset this fuel use in the days to come.

Therefore, if Radnor is to meet its clean energy goals, every effort must be made to meet the goals of energy efficiency and 100% renewable energy generation for all new buildings added to the Township. By negotiating and working with developers as partners, the Commissioners can begin to implement a vision today that will set the Township on the right path.

Keep Up with the Joneses! Right Next Door, People Are Going Net Zero Ready

Not far from Radnor, Bridgeport Borough in Montgomery County has become the regional leader for its new state-of-the-art zero energy-ready residential infill development. This project involved the construction of four twin homes, the first single-family attached homes in the country to be constructed under the DOE's **Zero Energy Ready Home** program. The homes have a classic design and entered the market at a competitive price. This award-winning project is an example of how a small, well-planned development can have a huge, positive impact in a community and become a catalyst for revitalization and positive change.

Take a video tour [here](#) and find resources on DOE's **Zero Energy Ready Home** program [here](#).



Municipal Ordinance Program

Establish *Net Zero* Expectations for All New Construction

Net-zero buildings produce as much clean electricity as they consume in a year. They are built on a foundation of two primary concepts: All-electric high-efficiency systems plus on-site renewable energy generation.

All-electric construction (i.e., electrification with no natural gas use) is essential to achieving the *Ready for 100* goals, because only electricity can be produced using clean renewable sources. Constructing new buildings that rely on natural gas will lock the Township in to increased carbon emissions for many years.

Electrification must be done in concert with energy efficiency, because the lower the electricity load, the more achievable it becomes to produce renewable energy on-site, and the lower the cost of the renewable energy systems and the property owners' utility expenses.

- High-efficiency, all-electric construction can be achieved by implementing the following:
 - High-Performing Building Envelope: The building envelope – walls, roofs, windows and skylights – impacts approximately 25% of all building energy use, but energy loss can be much greater depending on building construction. Designing and constructing an energy-efficient building envelope using innovative, high-performance materials and smart designs (such as stay-in-place insulated concrete forms) will reduce electricity demand substantially and improve comfort. ([Source](#))
 - 100% New Generation LED Lighting: Residential, Energy Star-rated LED lighting systems use at least 75% less energy, and last 25 times longer, than incandescent lighting. ([Source](#))
 - Energy Star Appliances: The Energy Star label certifies that a product is more energy-efficient than others in the marketplace, while achieving the same (or better) performance. ([Source](#))
 - Centralized Geothermal System: Geothermal (ground-source or water-source) heat pumps achieve high efficiencies by transferring heat between the building and the ground or a nearby water source. Although they cost more to install, geothermal heat pumps have low operating costs because the cooling and heating source is the earth, rather than a costly fuel. Geothermal (or ground source) heat pumps can reduce energy use by 30%-60%, control humidity, are durable and reliable, and fit in a wide variety of homes. ([Source](#))
 - Electric Vehicle (EV) Charging Port(s): An EV-ready home or commercial building ensures that the conduit and service panel capacity are ready and available for EV charging station(s). The estimated cost of pre-wiring a 240V outlet is inexpensive (\$50-\$300). ([Source](#))
- Renewable Energy. Once buildings are electrified and using the least amount of electricity possible, the developer can construct on-site solar systems to generate some or all of the remaining load. Site conditions dictate the feasibility of achieving a system large enough to generate the full load, but system size should be maximized within the confines and aesthetics of the development. Roof-mounted solar is an ideal option for homes; additional options, including solar PV parking lot canopies, can work well for commercial establishments.

This real-world case example demonstrates how Radnor Township can begin the negotiation process with developers.



Radnor Township Sustainability Director:

Review all incoming development proposals and create net-zero plans for developers.

CASE STUDY:

The Benefits of a Net-Zero Residential Development in Radnor Township

This Concordia proposal to develop 20 homes on the northeast corner of Radnor Street Road and Walnut Avenue in Radnor Township offers an excellent example of the need to apply the *Ready for 100* goals to today's policy and development decisions, in order to avoid *adding* to the Township's dirty energy burden. Every decision made today will directly determine the Township's ability to actually achieve its clean renewable energy goals.

Negotiating a net-zero development at this site will produce benefits for the Township, developer, and homeowner.

- **Benefits to the Township.** The Concordia development represents an excellent opportunity for the Township to make progress toward its *Ready for 100* goals, and to kick off the Clean Energy Plan with a demonstration project that will draw positive regional, if not national, attention. It will be an excellent demonstration of the Township's commitment to its constituents' health and their economic future, and will generate excitement and momentum.
- **Benefits for the Developer.** Pioneering an environmentally conscious housing project is an ideal marketing and business opportunity for the Concord Group, which has already demonstrated itself to be a cutting-edge, high-quality firm. Currently, 25 municipalities in Southeast Pennsylvania have committed to the *Ready for 100* clean energy goals, initiating a higher consumer demand for energy efficient housing in the entire region. The Concord Group has an opportunity to even further elevate its reputation in our region. (Sierra Club *Ready for 100* Website - [Link](#))
 - According to the 2020 *SmartMarket Brief Report* on Green Single Family and Multifamily Homes, the percentage of dedicated "green" single family home builders has steadily grown from 18% in 2014 to 21% in 2019, indicating the growth of the market. ([Source](#))
 - The Concordia Group can further heighten its visibility as a leader in this market by receiving third-party certification and recognitions for the development, including LEED for New Construction, Zero Energy Certification, Energy Star home certification, and more. See Attachment A for an overview of certification opportunities.
 - *A note about cost premiums:* Research shows net-zero homes carry an average 7.3% cost premium. However, research also shows the monthly mortgage payment increase will be less than or equal to the monthly energy bill savings. Additionally, Radnor Township offers a high-end clientele, and up to half of consumers are willing to pay premiums for resilient, self-sufficient homes. (Source: [RMI](#))
- **Benefits for Homeowners.** In addition to being citizen leaders in the regional transition to a clean energy economy, and proactively protecting the health of their own families and the community, these homeowners will see:
 - **Lower Energy Use and Utility Costs:** Energy costs for these homes will be approximately 50% less than conventional housing. According to the *SmartMarket Brief Report on Green Single Family and Multifamily Homes in 2020*, lower operating costs is the most commonly cited reason to pay a "Green Premium" on housing.
 - **Higher Resale Value:** These houses typically have higher property values compared with conventional houses. According to a study conducted by Zillow, Pennsylvania had the second highest home value solar premium in the country. Homes with solar can sell for 4.9% higher in Pennsylvania ([Source](#)). Coupled with the lower energy bills, the higher property value can ensure the homeowner will receive a positive cash flow in their investments in energy-conscious housing.
 - **Future-proof:** These homes provide protection against power outages in the face of an increasingly unstable electric grid and violent/heavy storms due to climate change. They also eliminate vulnerability to fossil fuel energy price volatility.

5.3 Transportation

The contribution of transportation to greenhouse gas emissions cannot be overstated. While it is the second most common contributor to GHGs in Radnor Township, transportation is the greatest contributor to manmade climate change nationwide and is expected to grow dramatically. With the major thoroughfares that traverse Radnor, the Township has great opportunity to focus on this issue.

While EVs typically have higher upfront costs, financial incentives and lower operating costs make the investment more viable for owners. Financial incentives for EVs are available through the Pennsylvania Department of Environmental Protection and displayed in Appendix D. In a study conducted by Consumer Reports, the latest generation of battery EVs and hybrid EVs were found to be less expensive than the most efficient combustion-engine vehicles on the market, when accounting for the total ownership costs throughout the lifetime of the vehicle. This includes maintenance and energy costs, which is difficult to specifically quantify given the variation of fuel costs and efficiency standards. ([Source](#))

Overview



MUNICIPAL ORDINANCE PROGRAM

- Create Community-Wide EV Infrastructure Plan
 - Municipal Fleet
 - Permitting and Inspections
 - Zoning
 - Utility Engagement
 - Benchmarking
- Emphasize Transit-Oriented Development (TOD)



Municipal Ordinance Program

Create a Community-Wide Electric Vehicle (EV) Infrastructure Plan

EVs reduce fossil fuel use because they're more efficient than combustion engines. Additionally, the more clean renewable energy sources we feed into the grid, the cleaner the EV emissions become, since these cars are typically charged with grid electricity.

Local governments play a critical role in the development of both public and private charging infrastructure due to their authority over zoning, parking, and signage, building codes, and permitting and inspection processes. Local ordinances and procedures can interfere with charging station development, and this can be addressed by amending codes and streamlining processes. There are also opportunities to proactively support incentives for charging station installations. Radnor Township can create an action plan to maximize EV charging infrastructure. Here are several considerations for expanding the EV market in Radnor:



Radnor Station PlugShare
EV Charging Station
247-251 King of Prussia Road

- **Municipal Fleet:** The Township can lead by example by investing in EVs for the municipal fleet. This can be done incrementally by establishing procurement guidelines for vehicle purchasing. Municipal charging stations should also be available for the public, to encourage private investments in EVs.
- **Permitting and Inspections:** The Township can streamline the process for EV charging station installation by developing clear documentation and permitting processes. The documentation should include a defined timeframe for review, a clear set of requirements, and streamlined inspections/reviews. Given the overlap in content, the EV permit process can be incorporated into electrical permit reviews.
- **Zoning Codes:**
 - Add Electric Vehicle Supply Equipment (EVSE) as a permitted use with all or some zoning codes;
 - Require or incentivize new developments to supply a minimum amount of EV parking spaces and EVSE based on occupancy;
 - Provide incentives for developers to install pre-wiring or install EVSE in new construction;
 - Establish design criteria for EV parking spaces, including signage, light levels, curb clearance, and dimensions.
- **Utility Engagement:** Collaboration with PECO is critical to identify areas of high EV demand and ensure sufficient electrical capacity for the charging equipment in the Township. This is especially true along major thoroughfares, where fast charging stations are needed to support EV infrastructure in the ongoing development of so-called “electric highways.” PECO can support alternative rate structures for the electricity, using time-based pricing to encourage vehicles charges in off-peak times, when there is less stress on the electric grid.

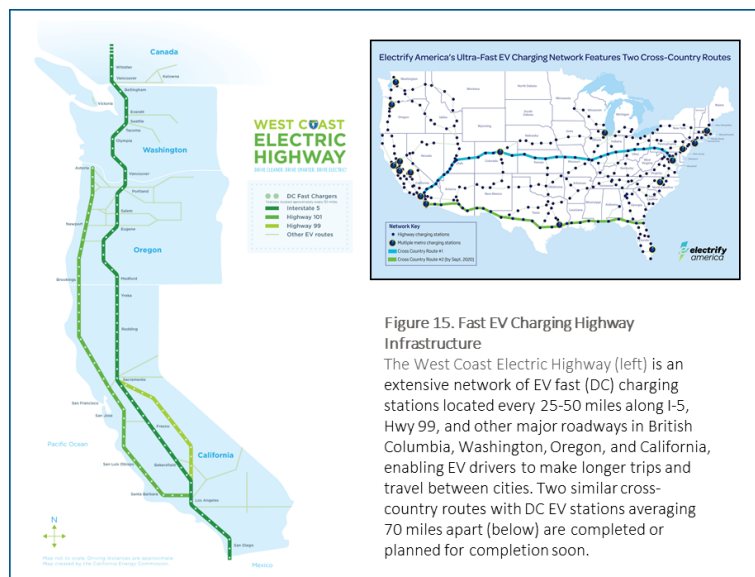


Figure 15. Fast EV Charging Highway Infrastructure

The West Coast Electric Highway (left) is an extensive network of EV fast (DC) charging stations located every 25-50 miles along I-5, Hwy 99, and other major roadways in British Columbia, Washington, Oregon, and California, enabling EV drivers to make longer trips and travel between cities. Two similar cross-country routes with DC EV stations averaging 70 miles apart (below) are completed or planned for completion soon.

- **Benchmarking:** To capture the success of the Township’s growing EV charging stations, it is important to collect usage data from the EVSE. The total electricity used in the charging stations can be used to calculate transportation emissions savings. (There are currently 3 EV charging stations in the Township.)

Radnor Township Sustainability Director: Promote PA's multiple opportunities to lower the cost for EV installation, including DEP's Level 2 EV Charging Rebate Program, which provides grants for EV charging equipment through the Driving PA Forward program. Approximately \$7.7 million is being allocated over a 5-year period to fund the rebates, providing up to \$3,500-\$4,500 per plug, depending on the application.

See Appendix E for a complete list of incentive and rebate programs.

For more information:

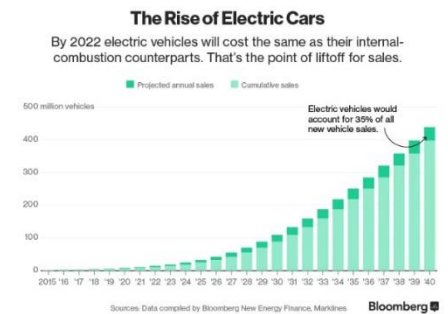
- In 2013, the Delaware Valley Regional Planning Commission (DVRPC) provided a comprehensive road map to transition to EVs in Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties in their Ready to Roll! Southeastern Pennsylvania's Regional Electric Vehicle Action Plan. This roadmap includes specific policy recommendations, a market overview, and ideas for providing financial incentives.
- Additionally, Pennsylvania's Department of Environmental Protection prepared the Pennsylvania Electric Vehicle Roadmap to provide recommendations for expanding the EV market in Pennsylvania.

EV Market Outlook

The EV boom is already here! Take a look at some highlights from the [2020 Bloomberg EV Market Outlook](#):

[Bloomberg EV Market Outlook](#):

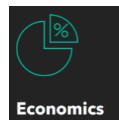
- By 2022 there will be over 500 different EV models available globally, and they will cost the same as their internal-combustion counterparts.
- Passenger EV sales jumped from 450,000 in 2015 to 2.1 million in 2019. Sales are projected to reach 54 million by 2040.
- By 2040, over half of all passenger vehicles sold will be electric.



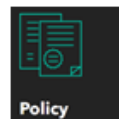
Factors Driving the Market:



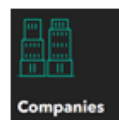
Technology Average battery energy density is rising and new chemistries are hitting the market. Maximum EV charging speeds are also rising. Lithium-ion battery pack prices fell 87% from 2010 to 2019. New manufacturing techniques and simplified pack designs will keep prices falling.



Economics By the mid-2020s EVs will reach up-front price parity – without subsidies – with internal combustion vehicles in most segments, but there is wide variation by region.



Policy Policymakers are pushing the auto market towards lower emissions. Fuel economy regulations, quota systems and city policies all play a growing role. 13 countries and 31 cities/regions have announced plans to phase out sales of internal combustion vehicles.



Companies Automakers and large fleet operators are accelerating their investments in electrification as part of their long-term climate commitments, and to meet near-term policy requirements.

Implications for Energy and Emissions

- EVs add electricity demand, but not as much as you might think. By 2040, EVs will add just 5.2% to global electricity demand. In many advanced economies, EVs prevent overall electricity demand from falling.
- EVs and fuel cell vehicles reduce road CO₂ emissions by 2.57Gt a year by 2040 – and are set for much larger reductions thereafter.
- EVs across all segments are already displacing 1 million barrels of oil demand per day. By 2040, that will be 17.6 million barrels per day



Municipal Ordinance Program

Emphasize Transit-Oriented Development (TOD)



TOD is a compact, mixed-use development within easy walking distance of a transit station. TOD uses thoughtful, pedestrian-oriented design to encourage residents and workers to drive cars less and ride public transit more. It matches existing moderate- to high-density development with public transportation hubs to restrict sprawl and maximize existing infrastructure. Developments in TOD areas are also more likely to qualify for green building certifications. In Chester County, seven municipalities adopted ordinances that call for TOD standards as of 2017.

Radnor Township: Adopt an ordinance that incentivizes, prioritizes, and/or calls for TOD. DVRPC has identified several areas within Radnor Township that exhibit strong future potential for TOD ([view the map here](#)). The Chester County Planning Department's [TOD Toolkit](#) provides additional, valuable resources for developing such an ordinance.

5.4 Incentives

Overview

5.4.1 Financing, Grant and Rebate Opportunities



COMMUNITY ACTION

- Take advantage of the opportunities listed in Appendix D

5.4.2 Recognition and Certification Programs



COMMUNITY ACTION

- Leverage your efforts and get recognized through programs listed in Appendix C

5.4.1 Financing, Grant and Rebate Opportunities



COMMUNITY ACTION

Incentives and financing/rebate programs designed to aid residential and commercial property owners, for both existing building and new construction projects, are available. These programs offer excellent resources for saving money. See Appendix D for a complete listing of all loan, grant, and tax rebate/incentive programs that will help all types of property owners achieve Radnor's *Ready for 100* goals. Energy savings = Utility bill reductions due to reduced energy use.

CASE STUDY: *Villanova Chooses Hydroelectric*

Here's how a commercial property owner can create profitable energy efficiency projects by taking advantage of programs listed in Appendix D, like the Sustainable Energy Fund Commercial Loan Program, The Reinvestment Fund's Sustainable Development Fund, and the Green Energy Loan Fund.

| | |
|---|----------------------|
| Project Cost | \$ 250,000.00 |
| PECO Rebate | \$ 25,000.00 |
| Net Project Cost/Loan Amount | \$ 225,000.00 |
| Annual Lighting Energy Savings (2 year payback) | \$ 25,000.00 |
| HVAC Energy Savings (10 year payback) | \$ 20,000.00 |
| TOTAL Annual Savings | \$ 45,000.00 |
| Monthly Energy Savings | \$ 3,750.00 |
| Monthly Loan Payment (10 year, 3.5%) | \$ 2,224.90 |
| Monthly Net Profit/Revenue | \$ 1,525.10 |
| Annual Net Profit/Revenue | \$ 18,301.20 |
| 10 Year Net Profit | \$ 183,012.00 |

5.4.2 Recognition and Certification Programs



COMMUNITY ACTION

Leverage Your Efforts. Get Recognized.

Third-party recognition and certification programs help property owners and managers gain recognition for energy efficiency and renewable efforts. These programs range from free services, such as the EPA's ENERGY STAR building certification program, to more in-depth programs, such as LEED, that require more documentation and have more holistic "green" goals such as stormwater management, indoor air quality, waste management and water conservation. Appendix C contains a complete listing of these programs for property owners and managers to leverage!

The properties at Three and Five Radnor Corporate Center on Matsonford Road achieved Energy Star-certification for eight years running. This means the buildings are not only more efficient than similar office buildings across the country, but they are in the top 25% percentile as far as energy efficiency goes!

These Radnor Offices are ENERGY STAR Certified: It's Good for Business!



The Three and Five Radnor Corporate Center office buildings are managed by Brandywine Realty Trust, a recognized ENERGY STAR Partner of the Year for its commitment to energy management across its portfolio of buildings. The organization also uses green leasing strategies to drive energy efficiency. The company includes a clause in its standard leases allowing it to pass through the capital costs of efficiency improvements to tenants. It also includes a clause in new and renegotiated leases that requires tenants to submit monthly utility data, or allows the company to install submeters in tenant areas if Brandywine is not already receiving such data. These measures

enable the company to track energy use, implement cost-effective energy efficiency measures, meet energy-saving targets, and save tenants money. Read more [here](#) about how and why Brandywine Realty Trust knows energy stewardship is part of everyone's business!

5.5 Fill the Gap with Carbon Offsets and Carbon Offsetting Initiatives

Carbon offsets, while not a “one-and-done” solution to carbon neutrality, can supplement renewable energy and energy efficiency efforts. Essentially, carbon offsets are any project that reduces GHG emissions; many carbon offsetting projects and programs aim to sequester carbon rather than allow its release into the atmosphere.

Overview



COMMUNITY ACTION

- Purchase third-party vetted carbon offsets



MUNICIPAL ORDINANCE PROGRAM

- Purchase third-party vetted carbon offsets
- Establish a Carbon Fund



COMMUNITY ACTION

Purchase Third-Party Vetted Carbon Offset Certificates

Carbon offset certificates are a market-based mechanism that allows individuals and companies to invest in global carbon-reducing projects to balance out their own carbon emissions. The projects are usually based in developing countries and may include tree planting, investment in clean energy technologies, or other projects.

Carbon offsets should only be used to offset energy use that is difficult to reduce or convert to alternative sources, and they can help an organization achieve carbon neutrality sooner, even while cleaner work to implement long-term fossil fuel energy reduction plans is still underway. Importantly, not all carbon offsets are created equal. Certificates purchased to offset a flight, for example, have no federal oversight, and not all have certificate programs have transparent business practices. Valid offset projects fulfill a concept called “additionality” by proving an additional benefit would not have occurred without money from the carbon offsets themselves. For example, if you were to pay someone to preserve a forest, it would count as an offset if that forest had originally been scheduled for development. A landowner in need of money from the timber would instead be paid to keep the trees standing. If there was never a threat to the forest, your payment to the landowner wouldn’t count as an offset because your money provides no additional benefit—the forest would have remained regardless. Further, to protect a forest from deforestation, revenue from carbon offsets has to be more competitive than the oft-lucrative industries that lead to deforestation, like cattle ranching and soy production. Lands sustainably managed one year could fall under new political will or management the next.



100.5 MW WIND POWER PROJECT IN MADHYA PRADESH, INDIA

\$10.00 USD/TONNE

1

ADD TO CART



TERRACLEAR - CLEAN WATER ACCESS FOR FAMILIES IN LAOS

\$15.00 USD/TONNE

1

ADD TO CART



IMPROVED COOKSTOVES IN GUINEA

\$20.00 USD/TONNE

1

ADD TO CART

Central Baptist Church’s Rooftop Solar Installation (l), LED Bulb Project (r)



“What’s happening to the climate motivates a lot of people in the church to make a change. Creation Care Theology is rooted among our congregants and we have a shared interest in the health of our environment. I believe that if there is proper leadership, a lot of people will follow and support climate action programs at places of worship.”

Chuck Marshall, Central Baptist Church
Volunteer Coordinator

For these reasons, offset certificates should be third-party certified by groups like Gold Standard and Green-e. Find Green-e-certified carbon offsets and a list of projects [here](#); and purchase project-based Gold Standard-certified offsets [here](#).

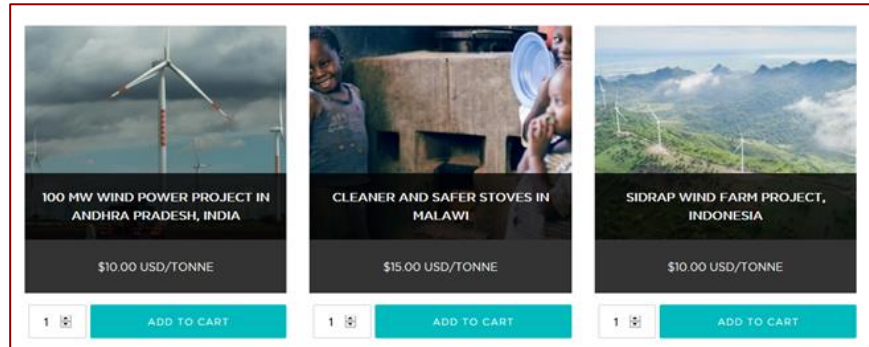


Figure 5.8. Sample Carbon Offset Projects Available Through Gold Standard

CASE STUDY:
From Energy Efficiency to Carbon Offsets
Radnor’s Central Baptist Church Eyes Net Zero in the Name of Stewardship

The principles of stewardship and climate action aren’t new to the congregants of Central Baptist Church in Radnor, PA, where the Ecology Mission Group has been active for 30 years. The church is inspired by creation care theology, the belief that caring for the planet and its inhabitants is essential. After conducting an energy audit in 2003 to reduce utility costs, the church adopted climate change prevention as a goal. The energy audit spurred the installation of a new boiler, programmable thermostats, efficient lighting, and solar photovoltaic panels on the church roof.

The church subsequently embarked on a journey to reach net-zero emissions, which they accomplished in 2015. First, they conducted an emissions inventory and found the transportation emissions from congregants driving to/from church and related events are 48% higher than the building emissions. The inventory showed some 44,000 lbs. CO₂/year are emitted from the church building itself and 65,051 lbs. CO₂/year are emitted from travel emissions.

To offset the building emissions, the church buys wind energy to offset 35,000 lbs. of its footprint per year and sells their solar renewable energy certificates (RECs). The remainder of emissions are offset by donations and purchasing of additional wind energy by congregants.

Offsetting travel emissions is optional for congregants, and Central Baptist distributes a chart to show everyone their portion of the transportation emissions. The church offers three optional offsetting pathways: Wind RECs, LED bulbs, and tree planting. They also encourage members to help offset emissions of congregants who are low-income members or do not participate in the program.

With the LED bulb project, congregants can purchase and donate LED bulbs through the church’s *Bright Idea* project, which facilitates LED bulb donations to the Bernardine Center of Chester and Phoenixville Area Community Services. The bulbs are distributed to the Chester and Phoenixville communities, saving community members money and emissions. Congregants can also buy trees through a partnership with *Trees, Water, People*, a Colorado-based project that plants trees in Central Baptists’ sister church’s

town of Shekina, El Salvador. Offsets purchased by the church cost about \$1.68 per pound of CO₂ emitted.

Central Baptist Church continues to look for new opportunities to reduce its impact on the environment. They engage in ongoing outreach with Pennsylvania Interfaith Power and Light (PA IPL) and hope to expand the *Bright Idea* program to serve more communities.



Municipal Ordinance Program

Purchase Third-Party Vetted Carbon Offset Certificates

To keep carbon offset funds in Radnor and encourage local offsetting, the Township can develop a Carbon Fund that will boost energy projects, jump-start tree planting efforts, and create a long-term funding source for climate action initiatives. Revenue can be raised through new building projects and private donations. In Watsonville, CA (population ~50,000), a Carbon Fund Program adds a carbon impact fee to all new development as a percentage of the building permit fee. Applicants can receive a full or partial refund of the fee if they voluntarily reduce 40%-80% of average annual electricity demand through energy efficiency measures or renewable energy. Private businesses and households can also calculate their carbon footprint and offset a portion of their emissions by paying into the fund, and the Township can recognize everyone who participates as a way to build momentum and community will. Learn more about Watsonville’s Carbon fund and other municipal carbon offset efforts: [Link](#)

The Township can also use carbon fund revenue to support carbon offsetting and other related projects throughout the Township – including subsidizing low-income residents so they can participate in Solarize Radnor, providing financial incentives for energy efficiency projects, developing and enhancing EV infrastructure, and conducting tree planting projects with partners such as Radnor Conservancy, Radnor School District and Villanova’s Student Sustainability Committee.

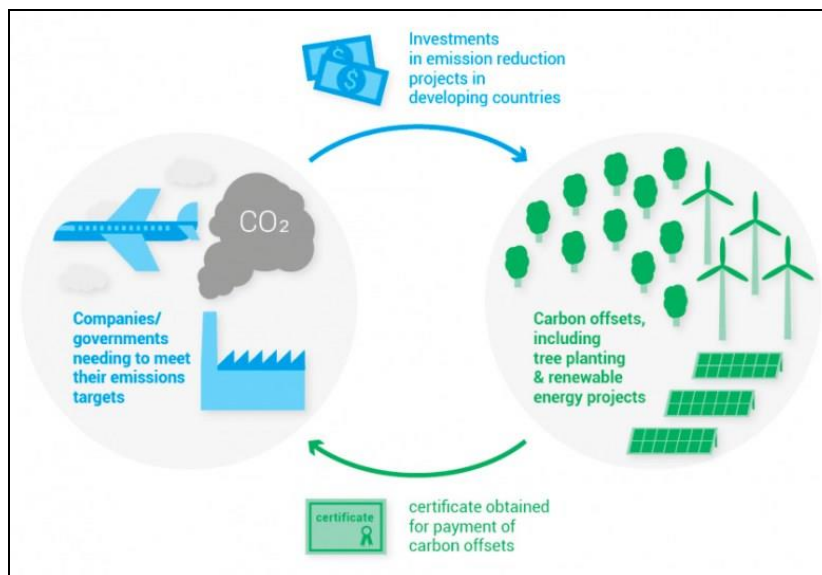


Figure 5.9. How Carbon Offsets Work

Trees are the Great Carbon Absorbers: Bolster Your Tree Program!

Human influences on forests can negatively impact forests' ability to perform carbon storage services, exacerbating local effects of climate change. Trees in urban and suburban areas also influence air temperatures and building energy use. Urban shade trees save anywhere from 11%-40% of air conditioning energy use compared with an unshaded house ([Source](#)).

According to a 2015 land use map from DVRPC, 59% of Radnor Township's area is tree canopy. Radnor's gross sequestration rate is about 20,000 MT of carbon per year. If Radnor gains or loses tree canopy, there will be a direct effect on carbon sequestration/release.

| Change in Tree Canopy | Annual Sequestration change from baseline (MT COS/year) ¹ |
|-----------------------|--|
| 5% | 1046.04 |
| 10% | 2092.08 |
| 15% | 3138.12 |

¹Methodology from [Nowak 2013](#)

Radnor's Shade Tree Commission is responsible for the protection, preservation, and long-term planning for the Township's tree canopy. The Township should support and institutionalize the work of the Shade Tree Commission to address the following issues and appoint the Shade Tree Commission as a stakeholder in the implementation of this *Ready for 100* plan.

| Problem | Potential Solutions |
|---|---|
| Loss in old, large canopy trees | Add to long-term forestry planning by identifying, tracking, and maintaining old trees |
| Lack of interest in tree maintenance and tree planting from private property owners | Engage in education with residents of the Township on the benefits of trees and their connection to <i>Ready for 100</i> goals Create ordinances and incentives to promote tree planting and maintenance in the township |
| Lack of data on tree canopy | Incorporate a repeatable methodology into long term planning to measure canopy and maintain granular measurement of tree health, planting, and loss |

SECTION 6—THE WAY FORWARD

6.1 Radnor’s Data Map

Practical Energy Solutions used historical data, projected data, and data from other states and areas who employed the actions recommended in this plan to develop expected scenarios for the impact of each of the actions in this plan.

The impacts of many of the actions recommended are difficult to predict, especially due to technological and policy developments that will depend on a complex combination of variables. Therefore, it is important to underscore that these predictions are not conclusive. These data maps should be revisited regularly to update progress on goals and reflect technological and market changes to improve accuracy and inform decision-making. Predictions were made using an ambitious, but realistic approach (i.e. this is not the “best case scenario”). They reflect the Township, County, and State’s specific populations, energy use profiles, and political climates.

Estimating the financial impact of each measure was not within the scope of this plan, but could be part of a later analysis to assess the priority level of each action.

In the data maps, local-level actions (i.e. township, county) are shown in orange and state-level actions (i.e. legislative, utility grid mix) are shown in blue.

Finally, it should be noted that the data map follows the Sierra Club’s definition of “clean energy” does not include nuclear, carbon capture, or hydrogen. Therefore, the data map includes only wind, solar, and hydroelectric power sources. Due to Pennsylvania’s rich nuclear portfolio, including nuclear in the analysis would significantly improve Radnor’s clean energy trajectory.

Information on the Sierra Club’s clean energy definition, the feasibility of *Ready for 100*, and other questions may be answered [here](#).

6.1.1 2035 Goal: 100% Clean Electricity

The first *Ready for 100* goal is to reach 100% clean electricity by 2035.

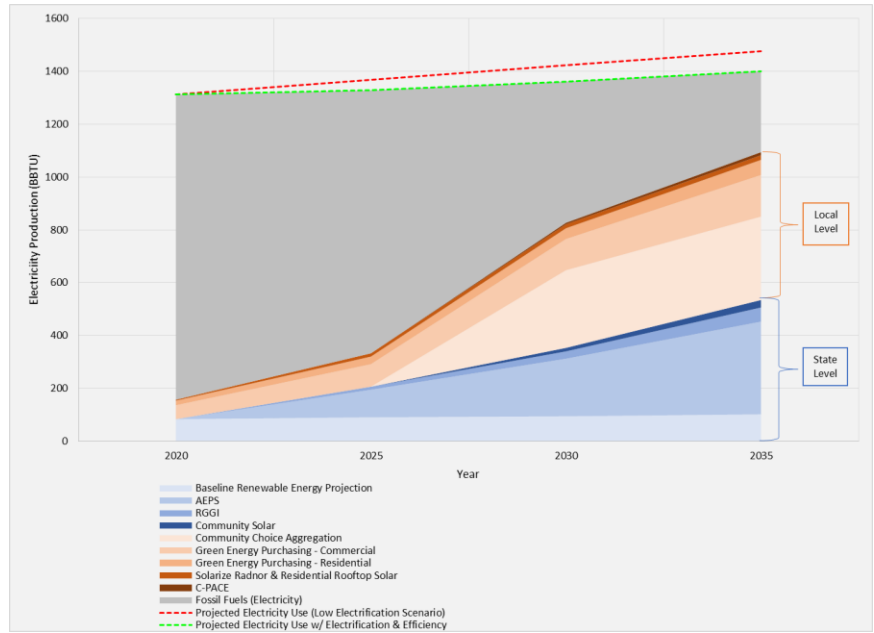


Figure 6.1. Electricity Production: 2020 – 2035

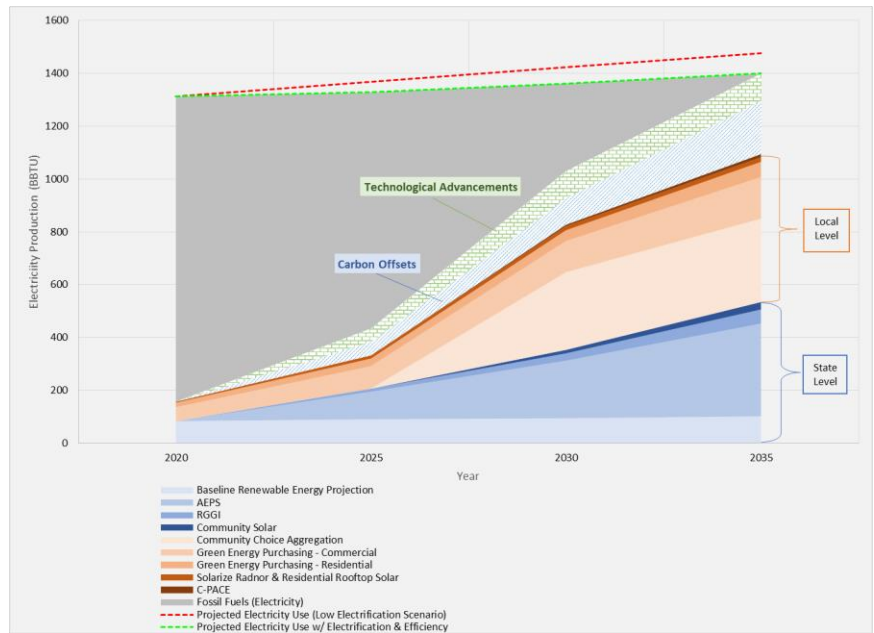


Figure 6.2. Electricity Production: 2020 – 2035 with technological advancements and carbon offsets

Figures 6.1 – 6.2 project the impact of renewable energy measures on the Township’s electricity mix. The data map indicates that under current realistic projections, the Township could reach 100% clean electricity by 2035 with carbon offsets and technological advancements. The Township will be able to reach 100% clean electricity without technological advancements or carbon offsets by 2040 (see Figure 6.3). The data map also indicates that state- and local-level actions are nearly equal in contribution to the goal of 100% clean electricity. This finding emphasizes the importance of pursuing the municipal programs, community actions and partnerships in this plan, while organizing and advocating at the state level.

6.1.2 2050 Goal: 100% Clean Energy

The first *Ready for 100* goal is to reach 100% clean energy by 2050.

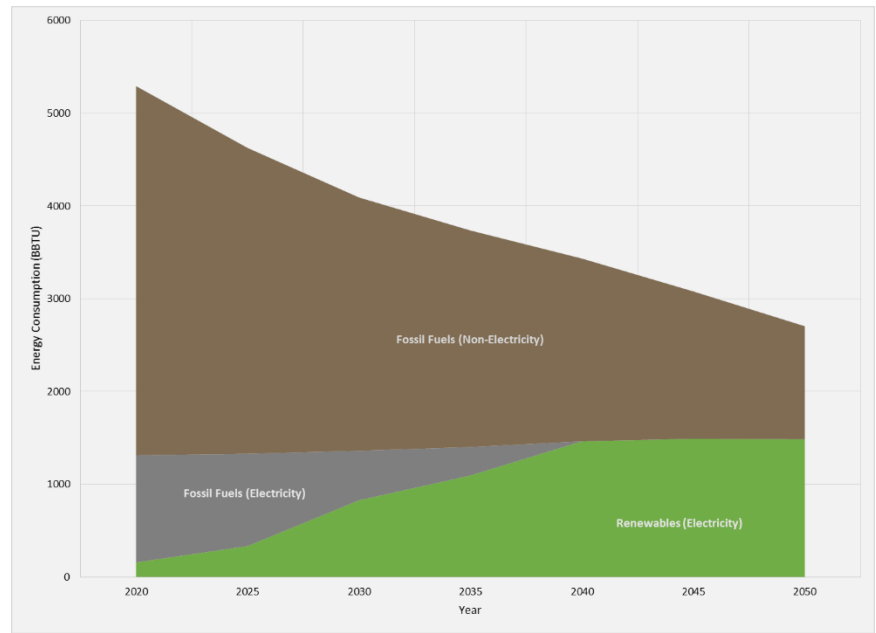


Figure 6.3. Projected Energy Consumption: 2020 – 2050

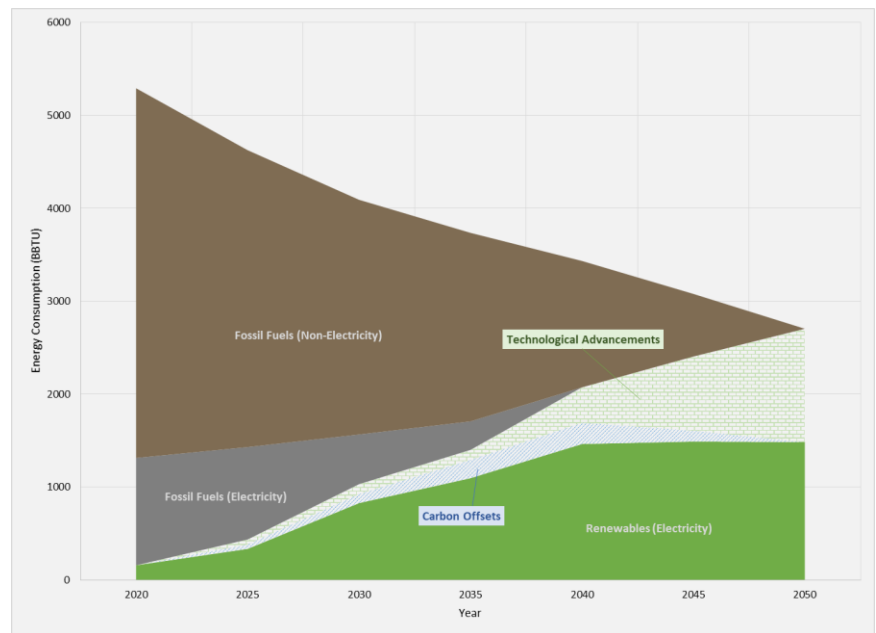


Figure 6.4. Projected Energy Consumption: 2020 – 2050 with technological advancements and carbon offsets

Figures 6.3-6.4 project the Township’s energy consumption considering all of the actions within the plan. These figures reflect that fuel-switching from non-electric energy sources to electric energy sources immediately results in energy savings because electric equipment (including HVAC and cars) is more efficient than non-electric equipment. The data map indicates that under current realistic projections, the Township could reach 100% clean energy by 2050 with carbon offsets and technological advancements. However, more aggressive renewable procurement, electrification, and technological development may be needed for Radnor to reach 100% clean energy by 2050 without the use of carbon offsets.

6.1.3 The Importance of Energy Efficiency and Electrification

Ready for 100 goals will be impossible to reach without energy efficiency and electrification.

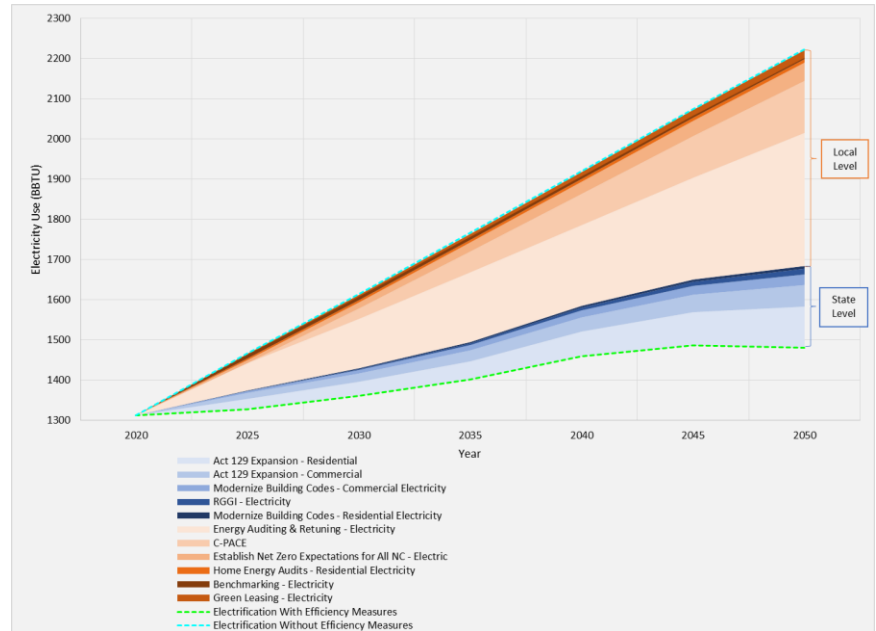


Figure 6.5. Projected Energy Consumption: 2020 – 2050

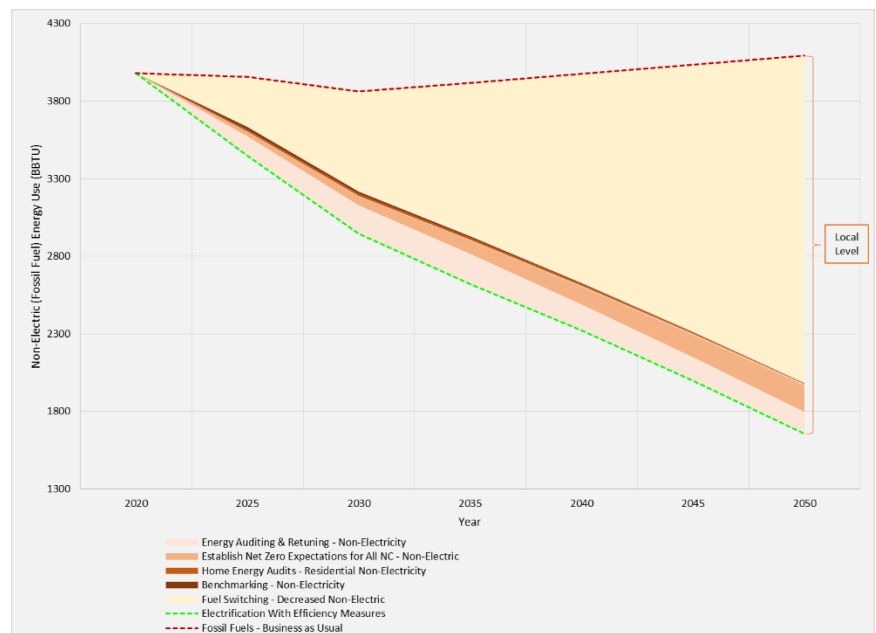


Figure 6.6.* Projected Energy Consumption: 2020 – 2050

**other measures contribute to the reduction in non-electric fuel consumption, but their contributions are not visible on this graph.*

Figures 6.5 – 6.6 convey the importance of pursuing energy efficiency and electrification at the township level. Township-level efficiency actions make up for much of the increased electric load due to electrification. Electrification is the only way to decrease fossil fuel use.

6.2 New and Emerging Technologies

Various clean energy technologies will accelerate the world's path to clean energy. These technologies should excite and inspire the Township. The surge of new technologies highlights that the path to *Ready for 100* will change and evolve based on many factors that operate outside the Township's sphere of influence. The following technologies may accelerate Radnor's clean energy transition and have the potential to play key roles in energy efficiency, renewable energy, and greenhouse gas reductions.

Carbon Sequestration

While the clean energy transition is underway, technologies are being rapidly developed to move to a net-zero society. Carbon capture, utilization and storage (CCUS) is a group of technologies that contributes to reducing emission in key sectors directly and to removing CO₂ to balance emissions that are challenging to avoid. New investment and strengthened climate goals are building momentum behind CCUS technologies. Many innovations are needed to create a broad suite of CCUS technologies that will balance future carbon emissions. Reaching net-zero will be virtually impossible without CCUS.

Renewable Natural Gas (RNG)

RNG is a pipeline-quality gas that is interchangeable with conventional natural gas, and can therefore be used in natural gas vehicles or in other natural gas applications. RNG is essentially a refined biogas (the gaseous product of decomposition). RNG can be used as a transportation fuel in the form of compressed natural gas (CNG) or liquefied natural gas (LNG). Biogas is renewable and can be harvested from a variety of sources and processes, including landfills, livestock operations, wastewater treatment, and more. Harvesting energy from these sources will reduce demand for virgin fossil fuel extraction and increase clean energy use. RNG has been in use in the United States through producing energy through capturing natural gas from landfills and wastewater treatment plants, but these strategies are beginning to be outnumbered by larger-scale RNG projects are being developed throughout the country. Energy companies are beginning to invest in RNG, making it easier for landfills and farms to allow a third party to harness the energy of their operations. Billions of gallons of animal manure and millions of tons of food waste are generated in the U.S. each year. As RNG technology involves and investments in these technologies increase, they will become more accessible as a clean energy technology.

Explore the future of RNG [here](#).

Nuclear Energy

While nuclear energy is not always included in the definition of clean energy due to the nuclear waste produced in the process, it remains a low-carbon energy option and is more prolific in the electricity grid mix than other renewable energy technologies, such as wind and solar. Nuclear energy has the potential to play a role in the clean energy transition by accompanying renewable energy strategies to reduce fossil fuel use as much as possible. For example, nuclear-renewable hybrid energy systems include both nuclear and renewable energy sources to produce

electricity and another commodity product, like fuel, thermal energy, hydrogen, or desalinated water. These systems provide electricity to the grid when it is needed and produce a commodity during other hours. Nuclear energy also provides power system flexibility where other renewables lack such flexibility. The introduction of nuclear energy in many renewable energy transition strategies has reduced costs and increased renewable capacity. New technologies like advanced inverters are paving the way for nuclear solutions within the clean energy transition.

Learn more about the role of nuclear in the clean energy transition [here](#).

Hydrogen Fuel

Hydrogen can be extracted from fossil fuels and biomass, from water, or from a mix of both. Even though at the current moment, less than 0.1% of hydrogen production comes from water electrolysis, declining costs in renewable electricity are increasing interest in electrolytic hydrogen. Building hydrogen capacity at locations with renewable resource conditions could become a low-cost supply option for hydrogen. Hydrogen could become more popular as a low-carbon fuel source for transport and buildings. In transport, fuel cell costs will dictate the accessibility of hydrogen fuel cell cars. In buildings, hydrogen could be blended into existing natural gas networks in multifamily and commercial buildings, and even used in new hydrogen boilers or fuel cells.

Microgrids

Microgrids are small networks that generate electricity for local consumption. As wind and solar become cost competitive with fossil fuel technologies, Microgrids are becoming increasingly important in meeting clean energy goals while ensuring electricity supply reliability. Microgrids are able to disconnect from the larger electricity grid during a power outage, providing stable electricity supply to homes and businesses during an outage. Isolated Microgrids, or island Microgrids, also provide stable electricity to areas that are isolated from the main grid. Microgrids have typically depended on fossil fuel generators, but developments in battery technologies and a need for distributed energy resources are lowering the carbon impact of Microgrids while increasing reliability and reducing the environmental impact.

6.3 Next Steps for Radnor Commissioners and Radnor EAC

To build off the momentum of the initial report, the Green Team should gather a stakeholder group to meet routinely, strategize implementation, and ensure progress is made on the tactics outlined in the report. This group will be crucial to advocate on behalf of the Immediate/Time-Sensitive Advocacy Opportunities, especially if business owners and commercial groups can lend their voice to support.

Although there is a variety of tactics outlined, not every tactic needs to be completed all at once. The following next steps are recommended to begin implementation efforts.

- Identify the Clean Energy Champions who will be leading the efforts in the Township.
- Initiate partnerships with outside organizations to initiate the “Partnership Opportunity” tactics, like Delaware County, DVRPC, among others.
- For the “Community Actions”, the majority of these tactics are already available and the EAC can be a central educational resource to spread awareness and increase participation. As part of the next steps, the EAC can develop communication vehicles to share resources with stakeholders and interested individuals and organizations in the Township.
- Begin the process for passing a municipal ordinance to require property owners to benchmark the energy use of commercial and institutional buildings, greater than 10,000 square feet. This process is a good first step to get property owners more engaged with energy initiatives and will be a good foundation to build future programs.
- Identify if funding is available to support a part or full time Director of Sustainability Position or outside consulting firm, within the Township budget to support implementation efforts.

APPENDIX

Appendix A. Detailed Analysis of Radnor's Energy Use

Table 1. Energy Use in Delaware County

| Rank, Per Capita Residential BBTU | Municipality | BBTUs | \$ | MTCO ₂ e | Population | Households | Median Income | Per Capita BBTU | Residential BBTU | Per Capita Residential BBTU |
|-----------------------------------|-------------------------|---------------|-------------------------|---------------------|----------------|----------------|-------------------|-----------------|------------------|-----------------------------|
| 1 | Brookhaven Borough | 746 | \$ 15,000,000 | 59,814 | 3,740 | 3,374 | \$ 67,300 | 5.0 | 302 | 0.081 |
| 2 | Rose Valley Borough | 101 | \$ 2,010,000 | 7,411 | 949 | 357 | \$ 176,000 | 9.4 | 62 | 0.065 |
| 3 | Haverford | 4,640 | \$ 86,900,000 | 360,607 | 49,057 | 17,450 | \$ 99,000 | 10.6 | 2,440 | 0.050 |
| 4 | Aldan Borough | 331 | \$ 6,240,000 | 26,065 | 4,165 | 1,696 | \$ 63,900 | 12.6 | 197 | 0.047 |
| 5 | Rutledge Borough | 60 | \$ 1,150,000 | 4,611 | 795 | 274 | \$ 83,000 | 13.3 | 37 | 0.047 |
| 6 | Upper Providence | 1,110 | \$ 22,400,000 | 88,176 | 10,448 | 4,030 | \$ 113,000 | 9.4 | 485 | 0.046 |
| 7 | Newtown Twp | 2,150 | \$ 44,200,000 | 178,456 | 12,754 | 4,859 | \$ 83,600 | 5.9 | 591 | 0.046 |
| 8 | Lansdowne Borough | 904 | \$ 16,400,000 | 70,472 | 10,639 | 4,237 | \$ 54,600 | 11.8 | 485 | 0.046 |
| 9 | Springfield | 2,760 | \$ 53,200,000 | 218,265 | 24,401 | 8,334 | \$ 105,000 | 8.8 | 1,102 | 0.045 |
| 10 | Radnor | 5,300 | \$ 96,700,000 | 404,669 | 31,612 | 9,591 | \$ 106,000 | 6.0 | 1,424 | 0.045 |
| 11 | Nether Providence | 1,260 | \$ 25,500,000 | 99,211 | 13,808 | 5,109 | \$ 104,000 | 11.0 | 613 | 0.044 |
| 12 | Marple | 2,810 | \$ 55,800,000 | 221,976 | 23,743 | 8,378 | \$ 82,000 | 8.4 | 1,030 | 0.043 |
| 13 | Sharon Hill Borough | 564 | \$ 10,500,000 | 44,274 | 5,702 | 2,035 | \$ 51,900 | 10.1 | 238 | 0.042 |
| 14 | East Lansdowne | 184 | \$ 3,360,000 | 14,266 | 2,665 | 875 | \$ 58,300 | 14.5 | 111 | 0.042 |
| 15 | Aston | 1,860 | \$ 37,400,000 | 153,912 | 16,799 | 6,030 | \$ 80,000 | 9.0 | 699 | 0.042 |
| 16 | Bethel | 816 | \$ 17,500,000 | 70,376 | 9,166 | 3,094 | \$ 129,000 | 11.2 | 380 | 0.041 |
| 17 | Swarthmore Borough | 711 | \$ 12,500,000 | 54,133 | 6,211 | 1,882 | \$ 92,300 | 8.7 | 253 | 0.041 |
| 18 | Chester Heights Borough | 301 | \$ 6,220,000 | 25,139 | 2,626 | 1,007 | \$ 85,800 | 8.7 | 106 | 0.040 |
| 19 | Ridley Park Borough | 743 | \$ 14,100,000 | 58,387 | 7,035 | 2,810 | \$ 70,800 | 9.5 | 282 | 0.040 |
| 20 | Yeadon Borough | 934 | \$ 16,200,000 | 71,017 | 11,523 | 4,335 | \$ 48,400 | 12.3 | 461 | 0.040 |
| 21 | Upper Chichester | 1,820 | \$ 37,900,000 | 149,253 | 17,003 | 6,739 | \$ 59,800 | 9.3 | 669 | 0.039 |
| 22 | Tinicum | 1,410 | \$ 27,200,000 | 109,926 | 4,109 | 1,585 | \$ 50,400 | 2.9 | 161 | 0.039 |
| 23 | Trainer | 2,080 | \$ 46,400,000 | 706,100 | 1,844 | 527 | \$ 44,800 | 0.9 | 72 | 0.039 |
| 24 | Thornbury | 677 | \$ 13,900,000 | 48,509 | 7,858 | 2,289 | \$ 135,000 | 11.6 | 305 | 0.039 |
| 25 | Chester Twp | 773 | \$ 12,100,000 | 58,583 | 4,103 | 1,562 | \$ 42,600 | 5.3 | 159 | 0.039 |
| 26 | Prospect Park Borough | 552 | \$ 10,500,000 | 43,682 | 6,481 | 2,458 | \$ 57,700 | 11.7 | 250 | 0.039 |
| 27 | Marcus Hook | 1,090 | \$ 25,400,000 | 111,338 | 2,397 | 844 | \$ 38,000 | 2.2 | 92 | 0.038 |
| 28 | Collingdale Borough | 616 | \$ 11,600,000 | 49,251 | 8,792 | 3,124 | \$ 47,400 | 14.3 | 336 | 0.038 |
| 29 | Norwood Borough | 409 | \$ 8,040,000 | 32,460 | 5,898 | 2,060 | \$ 70,300 | 14.4 | 225 | 0.038 |
| 30 | Ridley Township | 2,870 | \$ 58,400,000 | 240,431 | 31,053 | 11,909 | \$ 66,300 | 10.8 | 1,182 | 0.038 |
| 31 | Upper Darby Township | 6,660 | \$ 119,000,000 | 517,562 | 82,878 | 30,315 | \$ 50,600 | 12.4 | 3,142 | 0.038 |
| 32 | Media Borough | 1,130 | \$ 21,200,000 | 90,255 | 5,363 | 2,536 | \$ 68,800 | 4.7 | 200 | 0.037 |
| 33 | Eddystone Borough | 1,060 | \$ 14,700,000 | 74,726 | 2,407 | 804 | \$ 44,300 | 2.3 | 88 | 0.037 |
| 34 | Clifton Heights Borough | 503 | \$ 9,570,000 | 40,113 | 6,684 | 2,530 | \$ 44,700 | 13.3 | 241 | 0.036 |
| 35 | Parkside Borough | 151 | \$ 3,040,000 | 12,476 | 2,334 | 779 | \$ 60,000 | 15.5 | 83 | 0.036 |
| 36 | Upland | 384 | \$ 8,180,000 | 34,584 | 3,251 | 1,140 | \$ 39,300 | 8.5 | 113 | 0.035 |
| 37 | Darby Twp | 690 | \$ 13,600,000 | 57,198 | 9,318 | 3,752 | \$ 48,400 | 13.5 | 321 | 0.034 |
| 38 | Darby Borough | 817 | \$ 14,800,000 | 64,892 | 10,687 | 3,162 | \$ 34,200 | 13.1 | 368 | 0.034 |
| 39 | Middletown | 2,460 | \$ 49,900,000 | 197,635 | 15,998 | 6,145 | \$ 85,200 | 6.5 | 545 | 0.034 |
| 40 | Colwyn Borough | 147 | \$ 2,740,000 | 11,638 | 2,553 | 884 | \$ 40,200 | 17.4 | 86 | 0.034 |
| 41 | Glenden | 656 | \$ 12,200,000 | 52,867 | 7,173 | 2,877 | \$ 60,500 | 10.9 | 240 | 0.033 |
| 42 | Morton Borough | 253 | \$ 4,880,000 | 20,640 | 2,695 | 1,134 | \$ 58,800 | 10.7 | 90 | 0.033 |
| 43 | Folcroft Borough | 590 | \$ 11,100,000 | 47,512 | 6,637 | 2,278 | \$ 60,800 | 11.2 | 221 | 0.033 |
| 44 | Concord Twp | 2,270 | \$ 46,000,000 | 193,160 | 17,663 | 6,228 | \$ 90,800 | 7.8 | 579 | 0.033 |
| 45 | Chester City | 5,240 | \$ 79,100,000 | 382,549 | 34,092 | 11,610 | \$ 27,200 | 6.5 | 1,101 | 0.032 |
| 46 | Lower Chichester | 355 | \$ 7,370,000 | 31,287 | 3,477 | 1,127 | \$ 58,000 | 9.8 | 112 | 0.032 |
| 47 | Edgmont | 445 | \$ 9,970,000 | 34,970 | 4,069 | 1,652 | \$ 110,000 | 9.1 | 119 | 0.029 |
| 48 | Millbourne | 59 | \$ 1,060,000 | 4,763 | 1,162 | 344 | \$ 32,800 | 19.7 | 29 | 0.025 |
| 49 | Chadds Ford | 715 | \$ 14,700,000 | 59,727 | 8,078 | 1,459 | \$ 121,000 | 11.3 | 140 | 0.017 |
| | TOTAL | 65,167 | \$ 1,237,830,000 | 5,709,324 | 563,895 | 203,610 | \$ 60,800 | 10.1 | 250 | 0.039 |

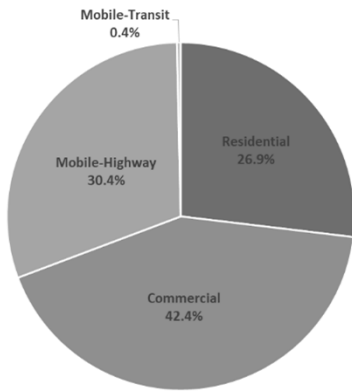
Source: Delaware Valley Regional Planning Commission

Table 2. Radnor Energy Use Landscape

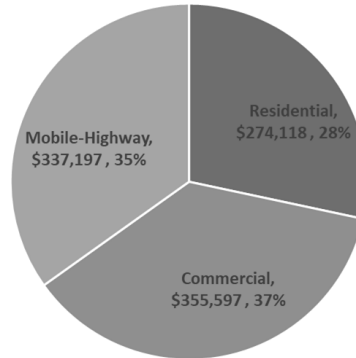
| Overview | | | | | | | | |
|--|-----------------------|---------------------------------|--------------|----------------|-------------------------|--|-------------------------|--------------|
| Consumption [BBTU] | Cost [\$] | Emissions [MTCO ₂ e] | Population | Housholds | Median Income [\$] | Consumption per capita [BBTU per capita] | | |
| 5,300 | \$ 96,700,000 | 404,669 | 31,612 | 9,591 | \$ 106,000 | 0.17 | | |
| Consumption, Emissions, and Cost by Sector | | | | | | | | |
| | | Residential | Commercial | Mobile-Highway | Mobile-Transit | Totals | | |
| Consumption | [BBTU] | 1,424 | 2,244 | 1,608 | 19 | 5,295 | | |
| % Consumption | % | 26.9% | 42.3% | 30.3% | 0.4% | | | |
| Consumption per capita | [BBTU per capita] | 0.05 | 0.07 | 0.05 | 0.00 | | | |
| Emissions | [MTCO ₂ e] | 100,541 | 177,884 | 124,186 | 2,058 | 404,669 | | |
| % Emissions | % | 24.0% | 43.0% | 30.0% | 1.0% | | | |
| Cost | [\$] | \$ 274,118 | \$ 355,597 | \$ 337,197 | | | | |
| Residential Sector | | | | | | | | |
| | | Electricity | Natural Gas | Fuel Oil | Liquefied Petroleum Gas | Totals | | |
| Consumption | [BBTU] | 371 | 896 | 145 | 12 | 1,424 | | |
| % Consumption | % | 26.1% | 62.9% | 10.2% | 0.8% | | | |
| Cost | [\$] | \$14,845,046 | \$ 9,431,131 | \$ 2,805,423 | \$ 330,210 | \$ 27,411,810 | | |
| % Cost | % | 54.2% | 34.4% | 10.2% | 1.2% | | | |
| Commercial & Industrial Sector | | | | | | | | |
| | | Electricity | Natural Gas | Fuel Oil | Liquefied Petroleum Gas | Totals | | |
| Consumption | [BBTU] | 924 | 1090 | 217 | 13 | 2,244 | | |
| % Consumption | % | 41.2% | 48.6% | 9.7% | 0.6% | | | |
| Cost | [\$] | \$22,736,605 | \$ 8,723,802 | \$ 3,900,355 | \$ 198,956 | \$ 35,559,718 | | |
| % Cost | % | 63.9% | 24.5% | 11.0% | 0.6% | | | |
| Mobile Sector | | | | | | | | |
| | | Electricity | Gasoline | Diesel | Totals | | | |
| Consumption | [BBTU] | 18 | 1275 | 332 | 1,625 | | | |
| % Consumption | % | 1.1% | 78.5% | 20.4% | | | | |
| Cost | [\$] | \$ - | \$26,673,300 | \$ 7,046,406 | \$ 33,719,706 | | | |
| % Cost | % | 0.0% | 79.1% | 20.9% | | | | |
| Township-wide Fuel Mix | | | | | | | | |
| | | Electricity | Gasoline | Diesel | Natural Gas | Fuel Oil | Liquefied Petroleum Gas | Totals |
| Consumption | [BBTU] | 1,313 | 1,275 | 332 | 1,986 | 362 | 25 | 5,293 |
| % Consumption | % | 24.8% | 24.1% | 6.3% | 37.5% | 6.8% | 0.5% | |
| Cost | [\$] | \$37,581,651 | \$26,673,300 | \$ 7,046,406 | \$ 18,154,933 | \$ 6,705,778 | \$ 529,166 | \$96,691,234 |
| % Cost | % | 38.9% | 27.6% | 7.3% | 18.8% | 6.9% | 0.5% | |

Figure A.1. Radnor Energy Landscape

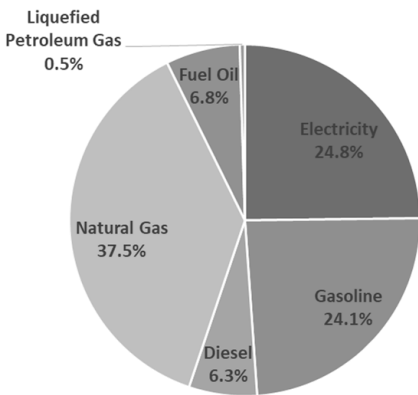
a. Township-wide Energy Use



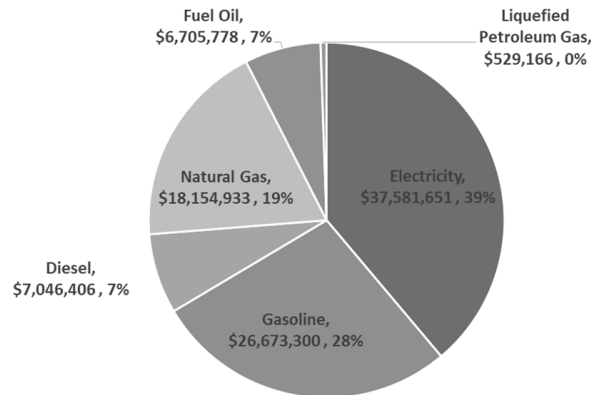
b. Township-wide Energy Expenditures



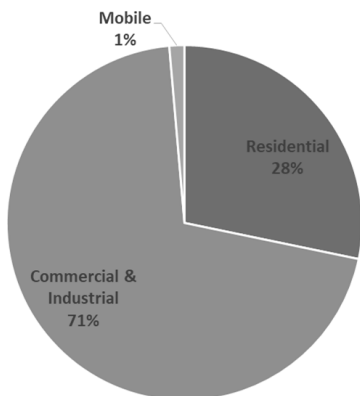
c. Township-wide Fuel Mix



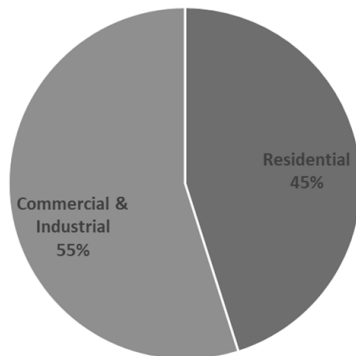
d. Expenditures by Fuel Mix



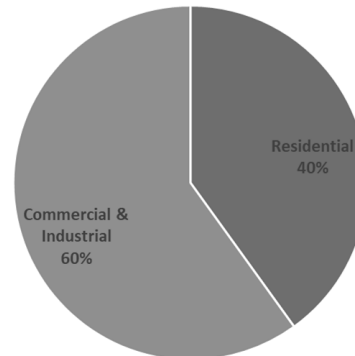
e. Electricity Use by Sector



f. Natural Gas Use by Sector



g. Fuel Oil Use by Sector



Appendix B. Model Ordinance for Energy Audits & Building Re-tuning

The following outlines provide guidance on the essential elements of two ordinances to require benchmarking, regular energy audits, and re-tuning of commercial properties greater than 10,000 square feet in Radnor Township.

i. Benchmarking Ordinance

Purpose: Require benchmarking and reporting of energy and water usage data for certain buildings. Adapted from the City of Philadelphia's Benchmarking Ordinance.

1. Definitions: Define the following terms and/or any other applicable terms.
 - a. Benchmarking application: how buildings will be benchmarked (e.g. "Portfolio Manager," or any successor system, developed by the United States Environmental Protection Agency, to track and assess the energy and water use of a building).
 - b. Covered buildings: buildings that shall be covered under this ordinance.
 - i. Any commercial building with indoor floor space of 10,000 square feet or more.
 - ii. All commercial portions of any mixed-use building where a total of at least 10,000 square feet of indoor floor space is devoted to any commercial use.
 - c. Energy: Electricity, natural gas, steam, and heating oil.
 - d. Statement of Energy Performance: a statement of energy performance generated by Portfolio Manager.
2. Requirement of benchmarking: Require benchmarking of covered buildings. Set an annual deadline (e.g. June 30) for entering the following information in the Benchmarking Application:
 - a. Building energy usage
 - b. Building water usage
 - c. Building characteristics and use attributes required by the Benchmarking Application
3. Tenant Information: If tenants of covered buildings are separately metered by a utility company, require that they comply with building owners by submitting necessary information for benchmarking.
 - a. Set annual timeframes for tenants to report necessary information to building owners (e.g. no earlier than February 1 and no later than March 15). Require that tenants vacating a space submit necessary information to building owners as soon as practicable.
 - b. Specify that failure of tenants to report the information to the owner does not relieve the owner of requirement to benchmark.
4. Electronic Usage Reporting: Some utility suppliers are able to transmit energy usage information to the Benchmarking Tool. This is an optional service, and is not required for all covered buildings to use. Outline how this service can be used by covered buildings.
5. Disclosure of Benchmarking data: Require that benchmarking data be made publicly accessible.
 - a. Ensure that building owners provide the building's most recent Statement of Energy Performance to prospective purchasers or lessees upon request.
 - b. Implement a Township-run online database, so the public can view energy and water usage among comparable buildings and uses.
 - c. If buildings have their energy usage transmitted to the Benchmarking Tool, they must waive all legal action against the utility related to disclosure of energy information in advance of any electronic transmittal of data.
6. Enforcements and Penalties: Set up how this ordinance will be enforced (e.g. fines).
7. Administration: Lay out how the Benchmarking Ordinance will be run.
 - a. Designate a body or office within the Township to manage benchmarking data, deadlines, and regulations.
 - b. Consider convening a collaborative stakeholder working group of building owners, lessees, lessors, utilities, and other interested parties to determine if regulations are necessary to ensure customer privacy under applicable law.
 - c. Designate the creation of an annual report reviewing and evaluating the administration and enforcement of the ordinance and analyzing data obtained from the Benchmarking Application, addressing:
 - i. The energy and water efficiency of Radnor Township's buildings.
 - ii. The accuracy of benchmarked data.
 - iii. Compliance with the requirements of the ordinance.
 - iv. Administrative or legislative recommendations to strengthen the enforcement of the ordinance.
 - v. The effectiveness of the Benchmarking Application to account for different types of buildings.

ii. Energy Audit and Re-tuning Ordinance

Purpose: Require regular energy audits and tune-ups of energy and water systems in certain buildings. Note that energy audits and tune-ups may be performed together, but are not the same. Energy audits identify energy conservation measures through retrofits and equipment replacements. Tune-ups focus on improving practices for existing systems and repairing existing equipment. Adapted from the City of New York's Energy Audits and Retro-Commissioning Article and the City of Philadelphia's Building Energy Performance Policy.

1. Definitions: Define the following terms and/or any other applicable terms.
 - a. Energy Audit: an assessment of the energy needs and efficiency of a building.
 - b. Building tune-up report: a document summarizing the energy and water performance issues identified during an initial inspection and those issues which were subsequently resolved through corrective action.
 - c. Corrective action: adjustments and minor repairs to existing building energy and water equipment.
 - d. Covered buildings: buildings that shall be covered under this ordinance.
 - i. Any commercial building with indoor floor space of 10,000 square feet or more
 - ii. All commercial portions of any mixed-use building where a total of at least 10,000 square feet of indoor floor space is devoted to any commercial use.
 - e. Minor repairs: low-cost repairs to existing equipment
 - f. Qualified energy audit and tune-up specialist: a licensed Professional Engineer or Certified Energy Manager meeting qualifications set by the Township.
2. Energy audits: Require energy audits of every covered building's water and energy systems, identifying measure and capital improvements that would reduce the energy use and/or cost of operating the building.
 - a. Specify the elements of energy audit inspections (e.g. energy conservation measures, cost to implement, simple payback, benchmarking, etc.).
 - b. Specify the systems or standards to which energy audits should be conducted (e.g. ASHRAE Level II Standard).
 - c. Require that energy audits be performed by a licensed energy auditor.
 - d. Require that a final energy audit report be signed and submitted to the Township by a specified date.
 - e. Specify that tenants cannot deny reasonable access to a building owner or energy auditor for inspections.
3. Tune-ups: Require tune-ups of every covered building's water and energy systems, consisting of both an inspection and corrective action. Inspections should include the building envelope, the HVAC (heating ventilating and air conditioning) systems, conveying systems, domestic hot water systems and electrical lighting systems.
 - a. Specify inspections and corrections:
 - i. Bill analysis
 - ii. Sensors
 - iii. Schedules
 - iv. Set points
 - v. Outside air control
 - vi. Equipment controls
 - vii. Maintenance check
 - viii. Design issues
 - ix. Lighting
 - x. Domestic plumbing
 - b. Require that tune-ups are performed by a licensed specialist
 - c. Require that the corrective action component of the energy audit and tune-up resolves all adjustments and repairs identified through the inspection as determined by the Township. The Township may determine and identify low-cost adjustments that maximize savings and return on investment and minimized cost.
 - d. Require that a final tune-up report be signed and submitted to the Township by a specified date.
 - e. Specify that tenants cannot deny reasonable access to a building owner or tune-up specialist for tune-up inspections or corrective actions.
4. Exemptions: Identify buildings that are exempted from energy audits and tune-ups. These exemptions may include, but are not limited to:
 - a. Buildings with an ENERGY STAR Score of at least 75.
 - b. A building that, within some specified time frame of the scheduled tune up, has either:

- i. Received a green building certification.
 - ii. Participated and successfully completed a utility retro-commissioning incentive approved by the Township.
 - iii. Previously completed a full retro- or re-commissioning procedure with documentation.
 - iv. Achieved energy savings of at least 15 percent and provided measurement and verification report to the Township.
 - v. Has undergone an energy audit no less stringent than the ASHRAE Level II standard and implemented all the no-cost/low-cost energy efficiency measures.
 - vi. Received its initial certificate of occupancy (new buildings).
5. Energy audit and tune-up schedule: Provide a timeframe after the ordinance is enacted for which buildings should submit tune-up reports. This may be staggered by building size. Also, provide a regular interval upon which buildings should schedule subsequent tune ups (e.g. every five years). Consider identifying cases in which exceptions for the timeframe shall be granted.
6. Energy audit and tune-up reports: Require that reports summarizing the energy and water performance issues identified during the initial inspection and the issues resolved are submitted in a format designated by the Township.
7. Enforcements and Penalties: Set up how this ordinance will be enforced (e.g. fines).
8. Annual Reports: Identify a body and system for reporting the state of buildings in the Township. This report may include, but is not limited to:
 - a. The energy and water efficiency of buildings in the Township.
 - b. The accuracy of the building energy audits and tune-ups submitted.
 - c. Compliance with the ordinance.
 - d. Administrative or legislative recommendations to improve the administration and enforcement of the ordinance.

Appendix C. Third-Party Certification & Recognition Programs for Energy-Efficient and Green Buildings

See Attached File.

RADNOR TOWNSHIP
RENEWABLE ENERGY & CONSERVATION PLAN

APPENDIX C
Third-Party Certification & Recognition Programs for Energy-Efficient & Green Buildings

| Accrediting Organization | Accrediting Organization Description | Certification | Certification Description | Costs | Benefits | Project Eligibility | | | | | | Information | |
|--|--|--|---|--|---|----------------------------------|------------------|------------------|----------|------------------|----------|---|----------------------|
| | | | | | | Energy Conservation / Efficiency | Renewable Energy | Commercial | | Residential | | | Eligible Properties |
| | | | | | | | | New Construction | Existing | New Construction | Existing | | |
| US Green Building Council (USGBC) | USGBC oversees LEED. LEED is the world's leading green building project and performance management system, delivering a comprehensive framework for green building design, construction, operations and performance: <ul style="list-style-type: none"> Through a comprehensive evaluation, homes must meet baseline minimum program requirements and prerequisites to become certified. Homes are awarded extra credits for going beyond LEED Certified to earn LEED Silver, Gold, or Platinum. Rigorous focus on material selection, human comfort, air quality and human health. Specific focus on social equity ensures that buildings are not considered in isolation of their communities but prioritize access and inclusiveness for all. Ensures buildings are resilient from natural and unnatural disturbances through a comprehensive set of design and construction strategies. | LEED For Residential Design and Construction | LEED certifies new homes that are holistically "green." Using the strategies outlined in LEED, homeowners are having a net-positive impact on their communities. LEED homes are also designed, constructed and operated to be resilient in adverse conditions and are developed with proactive design planning for potential impacts of catastrophic weather. | <ul style="list-style-type: none"> Single family: Registration from \$150, certification from \$225 Multifamily: Registration from \$900, certification from \$0.035 per sq ft | <ul style="list-style-type: none"> Health: Better indoor air quality means better health and indoor comfort. Savings: On average, certified homes use 20 to 30 percent less energy than non-green homes, with some homes saving up to 60 percent. This means lower utility bills. Value: With proper planning, LEED homes can be built for the same cost as non-green homes. Qualifications may be available for financial incentives, and in many markets, certified green homes are selling quicker and for more money than non-green homes. | ✓ | ✓ | ✗ | ✗ | ✓ | ✗ | <ul style="list-style-type: none"> Multifamily Multifamily Core and Shell Single Family | Link |
| | | LEED for Building Design and Construction (BD+C) | This rating system is for buildings that are new construction or major renovations. At least 60% of the project's gross floor area must be complete by the time of certification (except for LEED BD+C: Core and Shell). You must include the entire building's gross floor area in the project. | See Fees Table | <ul style="list-style-type: none"> Health: Improve productivity and health of occupants Savings: Save money on utility bills with decreased water and energy use. Value: LEED-certified buildings earn a plaque, showcasing commitment of builders to sustainability. This can help buildings gain a competitive edge, increase value, and attract tenants. LEED also delivers a comprehensive framework for maintenance after certification. | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> Serves all project types, offering specialty options for: <ul style="list-style-type: none"> Data Centers Healthcare Hospitality Retail Schools Warehouses/ Distribution Centers | Link |
| | | LEED O+M | LEED for Operations and Maintenance (O+M) offers existing buildings an opportunity to pay close attention to building operations, by supporting whole buildings and interior spaces that have been fully operational and occupied for at least one year. The project may be undergoing improvement work or little to no construction. | See Fees Table | <ul style="list-style-type: none"> Health: Improve productivity and health of occupants Savings: Save money on utility bills with decreased water and energy use. Value: LEED-certified buildings earn a plaque, showcasing commitment of builders to sustainability. This can help buildings gain a competitive edge, increase value, and attract tenants. LEED also delivers a comprehensive framework for maintenance after certification. | ✓ | ✓ | ✗ | ✓ | ✗ | ✗ | Options to fit every project, from office spaces and restaurants to data centers and schools | Link |
| | | LEED ID+C | LEED for Interior Design and Construction (LEED ID+C) enables project teams, who may not have control over whole building operations, the opportunity to develop indoor spaces that are better for the planet and for people. | See Fees Table | <ul style="list-style-type: none"> Health: Improve productivity and health of occupants Savings: Save money on utility bills with decreased water and energy use. Value: LEED-certified buildings earn a plaque, showcasing commitment of builders to sustainability. This can help buildings gain a competitive edge, increase value, and attract tenants. LEED also delivers a comprehensive framework for maintenance after certification. | ✓ | ✗ | ✓ | ✓ | ✗ | ✗ | <ul style="list-style-type: none"> Commercial Interiors Retail Hospitality | Link |
| | | LEED Zero | LEED Zero is a complement to LEED that verifies the achievement of net zero goals. <ul style="list-style-type: none"> LEED Zero Carbon recognizes buildings or spaces operating with net zero carbon emissions from energy consumption and occupant transportation. LEED Zero resources recognizes buildings that achieve a zero balance over 12 month of energy, water and/or waste. | See Fees Table | Gain further LEED recognition for an impressive commitment to sustainability. | ✓ | ✓ | ✗ | ✓ | ✗ | ✗ | LEED projects certified under these categories: <ul style="list-style-type: none"> BD+M O+M Registered to pursue LEED O+M | Link |
| US Environmental Protection Agency (EPA) and US Department of Energy (DOE) | The EPA and DOE administer the ENERGY STAR label for products and buildings that are energy efficient. | ENERGY STAR Certification For Homes | Energy Star Certification distinguishes homes that are more energy efficient than typical new construction. Twenty-eight hundred builders, developers, and manufactured housing plants are Energy Star partners, including all of the nation's 20 largest home builders. Over 2 million Energy Star certified homes have been built. | Free | <ul style="list-style-type: none"> Peace of mind: Certified professionals assures homes are built to a high standard Quality: Energy efficiency features deliver better performance. Comfort: Consistent temperatures, fresh air, and superior indoor air quality. Value: ENERGY STAR certified homes are at least 10% more energy efficient than homes built to code Recognition: Buildings are given a blue ENERGY STAR. ENERGY STAR is recognized by more than 90 percent of American households. | ✓ | ✗ | ✗ | ✗ | ✓ | ✗ | <ul style="list-style-type: none"> Single Family Homes Multifamily Homes Manufactured Homes Homes Undergoing Gut-Rehab | Link |

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| | | ENERGY STAR Certification for Commercial Buildings | ENERGY STAR Certification signifies that commercial buildings perform within the top 25% of similar buildings nationwide. On average, ENERGY STAR certified buildings use 35 percent less energy and generate 35 percent fewer greenhouse gas emissions than their peers. To become certified buildings must be tracked using EPA's Portfolio Manager online tool. | Free | <ul style="list-style-type: none"> Health & Comfort: Improve productivity and health of occupants Savings: Save money on utility bills with decreased water and energy use. Value: ENERGY STAR certification shows an ongoing commitment to sustainability. This can help buildings gain a competitive edge, increase value, and attract tenants. Recognition: Buildings are given a blue ENERGY STAR. ENERGY STAR is recognized by more than 90 percent of American households. ENERGY STAR also provides a communications toolkit to help buildings promote their success. | ✓ | ✗ | ✗ | ✓ | ✗ | ✗ | Eligible space types | Link |
| US Department of Energy (DOE) | The DOE administers the Zero Energy Ready Home Program to to recognize builders for their leadership in increasing energy efficiency, improving indoor air quality, and making homes zero energy ready. | Zero Energy Ready Home Program | The program builds upon ENERGY STAR for Homes Version 3, along with proven Building America innovations and best practices. Other special attribute programs are incorporated to help builders reach unparalleled levels of performance with homes designed to last hundreds of years. DOE Zero Energy Ready Homes are verified by a qualified third-party and are at least 40%-50% more energy efficient than a typical new home. This generally corresponds to a Home Energy Rating System (HERS) Index Score in the low- to mid-50s, depending on the size of the home and region in which it is built. | Savings & Cost Estimate Summary | <ul style="list-style-type: none"> Lower ownership and operating costs Stand out among other homes Higher appraisal value Energy efficiency features deliver better performance, consistent temperatures, fresh air, and superior indoor air quality. Partners exhibit a commitment to sustainability and distinguish themselves from other homebuilders. | ✓ | ✓ | ✗ | ✗ | ✓ | ✗ | <ul style="list-style-type: none"> Single Family Homes Units in Multifamily Homes (see Program Requirements for qualifications) | Link |
| Green Building Initiative (GBI) | GBI oversees Green Globes, a nationally recognized green rating assessment, guidance and certification program. Green Globes is known for swiftness in certification and being very broad in eligibility, making it more accessible and cost-effective certification in some circumstances. | Green Globes for New Construction (NC) | The Green Globes NC tool is a user-friendly web application that helps architects, engineers, construction professionals, owners, and building operators to evaluate, quantify, and improve the environmental friendliness and sustainability of new building projects including core & shell, as well as major renovations. Green Globes Core and Shell (C&S) is designed specifically for new construction limited to the core and/or shell of the building only. | Cost varies by building | <ul style="list-style-type: none"> Reduce operating costs Qualify for tax incentives and utility rebates Meet government regulations Attract and retain employees Increase your property's marketability | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> Commercial properties at least 400 gross sq. ft. Major Renovation Projects | Link |
| | | Green Globes for Sustainable Interiors (SI) | Green Globes SI certification may be pursued by building owners and individual tenants of commercial and institutional spaces who want to improve their workspace sustainability through elements within the interior design team's domain. Green Globes SI provides a healthier, more productive space through a dual-pathway approach to interior build-outs, utilizing either lifecycle assessment (LCA) or environmental product declarations (EPDs). | Cost varies by building | <ul style="list-style-type: none"> Comprehensive environmental assessment road map Best practices guidance for sustainable interiors, tenant improvements and operations Evaluation of design measures that fall solely within relevant scope of work Review by licensed, independent third-party assessors with green building expertise | ✓ | ✗ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> Commercial or Institutional Interiors | Link |
| | | Green Globes for Existing Buildings (EB) | The Green Globes EB tool is a user-friendly, web-based application with options for attaining your building's highest potential. Using the EB assessment process enables building teams to focus on sustainability and gives them choices when considering capital improvements or implementation of best practices. | Cost varies by building | <ul style="list-style-type: none"> Comprehensive environmental assessment road map Benchmark your facility and rate the benefits of various building attributes Personalized guidance for green construction and building operations' best practices Online software tools that speed and simplify assessment process Qualified assessors with green building expertise verifying project achievements on site | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> Commercial or Institutional | Link |
| | | Green Globes for Multifamily: New Construction or Existing Buildings | Green Globes Multifamily (New Construction or Existing Buildings) provides a certification option that meets the needs of owners and project teams with multifamily projects pursuing financial incentive. To certify with Green Globes Multifamily, projects must achieve all minimum requirements for Ventilation and either Energy or water. In addition, projects must also achieve a minimum of 35% of applicable points in the Green Globes Multifamily program. | Cost varies by building | <ul style="list-style-type: none"> Comprehensive environmental assessment road map Earn recognition to qualify for low interest rates and other financial incentives for your building Qualified assessors with green building expertise verifying project achievements on site | ✓ | ✓ | ✗ | ✗ | ✓ | ✓ | *Multifamily only | *Multifamily only |
| Residential Energy Services Network (RESNET) | RESNET's mission is to make the energy use for all homes transparent, thereby driving residential sector energy use toward net zero. | Home Energy Rating System (HERS) Index | The HERS Index measures and rates a home's energy efficiency. A certified Home Energy Rater assesses the energy efficiency of a home, assigning it a relative performance score. The lower the number, the more energy efficient the home. The public can now access the following information on rated homes. | Dependent on RESNET rater prices. Inspection and assessment prices may vary. | <ul style="list-style-type: none"> Better indoor air quality, improving health and comfort Lower ownership and operating costs Stand out among other homes Higher appraisal value Lower Mortgage default risks | ✓ | ✗ | ✗ | ✗ | ✓ | ✗ | <ul style="list-style-type: none"> Single Family Homes Multifamily Homes Homes Undergoing Gut-Rehab | Link |

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| PHIUS (Passive House Institute US, Inc.) | PHIUS is a non-profit 501(c)(3) organization committed to making high-performance passive building the mainstream market standard. PHIUS trains and certifies professionals, maintains the PHIUS+ climate-specific passive building standard, certifies and quality assures passive buildings, and conducts research to advance high-performance building. | Passive Building Standard (PHIUS +) | The PHIUS+ Certification Program is the leading passive building certification program in North America. It is the only passive building certification that combines a thorough passive house design verification protocol with a stringent Quality Assurance/Quality Control (QA/QC) program performed onsite by highly skilled and specialized PHIUS+ Raters and Verifiers. | See Fees Table | <ul style="list-style-type: none"> Climate-specific and cost-optimized performance metrics Comprehensive design and energy model review Rigorous Quality Assurance Earn DOE Zero Energy Ready Home Status Earn U.S. EPA Indoor airPLUS label Rigorous quality assurance RESNET HERS Index Score Listing on the PHIUS+ Certified Projects Database | ✓ | ✗ | ✓ | ✗ | ✓ | ✗ | <ul style="list-style-type: none"> Single Family Homes Multifamily Homes Campuses / Communities Commercial / Non-residential Dorms & Hotels Mixed-Use Properties | Link | |
| Home Innovation Research Labs | Home Innovation Research Labs created National Green Building Standard (NGBS) as the first residential green building rating system approved by the American National Standards Institute (ANSI) as an American National Standard. The NGBS provides practices for the design and construction of all types of green residential buildings, renovations, and land developments. | NGBS Green Multifamily & Mixed-Use Building Certification | A new green multifamily building or the residential portion of a mixed-use building can earn Bronze, Silver, Gold, or Emerald certification, depending on the number of green practices successfully incorporated in its design and construction. Existing multifamily buildings can also attain one of the four levels of NGBS Green certification when remodeled according to the NGBS requirements. | See Fees Table | <ul style="list-style-type: none"> Better indoor air quality, improving health and comfort Lower ownership and operating costs Promote a sustainable lifestyle and stand out among other homes | ✓ | ✗ | ✗ | ✗ | ✓ | ✗ | *Multifamily only | <ul style="list-style-type: none"> Multifamily Homes Residential portion of mixed-use buildings Assisted living facilities | Link |
| | | NGBS Green Single-Family Home Certification | Builders seeking NGBS Green certification for their homes have two options: Homes can earn Bronze, Silver, Gold, or Emerald certification, depending on the number of green practices successfully incorporated into its design and construction. Alternatively, homes can earn the Certified level by following the streamlined single-family certification path in the 2020 NGBS. In order to be eligible for the Certified path, homes must successfully incorporate all applicable practices in Chapter 12 of the 2020 NGBS. | See Fees Table | <ul style="list-style-type: none"> Better indoor air quality, improving health and comfort Lower ownership and operating costs Promote a sustainable lifestyle and stand out among other homes | ✓ | ✗ | ✗ | ✗ | ✓ | ✗ | <ul style="list-style-type: none"> Single Family Homes Townhouses Duplexes | Link | |
| | | NGBS Green + | NGBS Green+ bestows special recognition for NGBS Green Certified homes that go "above and beyond" in certain areas of green practices: Net Zero Energy, Resilience, Smart Home, Universal Design, Wellness, and Zero Water. | See Fees Table | <ul style="list-style-type: none"> Show further commitment to sustainability Lower ownership and operating costs Earn additional badges, certificates, and plaques | ✓ | ✓ | ✗ | ✗ | ✓ | ✗ | <ul style="list-style-type: none"> Single Family Homes Townhouses Duplexes | Link | |
| International Living Future Institute (ILFI) | ILFI oversees many programs and certifications to lead the transformation toward a civilization that is socially just, culturally rich, and ecologically restorative. ILFI certifications are rigorous and prestigious. Through certifications, buildings gain access to an elite network of buildings around the world that are global examples of green building. | Zero Energy (ZE) Certification | This program, the only international zero energy certification, certifies that one hundred percent of the building's energy needs on a net annual basis must be supplied by on-site renewable energy. No combustion is allowed. Certification is based on actual, not modeled, performance. | See Fees Table | Since the ZE Certification is based on actual performance data, and not an energy model, it verifies that your building is performing as you'd expect. ILFI ZE certification gives your project a stamp of approval from one of the world's most prestigious sustainability organizations and helps maintain integrity of the zero energy ideal. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Nearly all buildings can be certified | Link | |
| | | Core Green Building Certification Basics (CORE) | CORE is a simple framework that outlines the 10 best practice achievements that a building must obtain to be considered a green or sustainable building. CORE seeks to diminish the gap between the highest levels of established green building certification programs and the aspirations of the Living Building Challenge. | See Fees Table | The Imperatives of the Core Green Building Certification fit seamlessly into the requirements in the Living Building Challenge; it is both a stand-alone program and an integral part of the Living Building Challenge. This certification signifies that buildings are aspirational and have a strong commitment to green building principles. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | There are three typologies: <ul style="list-style-type: none"> New Building Existing Building Interior | Link | |
| | | Living Building Challenge | Living Buildings must demonstrate that they have achieved Net Positive Energy, Net Positive Water, and Net Positive Waste. As a result, Living Buildings generate more energy than they consume. In other words, Living Buildings are regenerative; in that they generate sufficient benefits to the building's site, to the project's community, and to the environment at large to offset any negative impacts that the project may incur. | See Fees Table | Living Buildings surpass many other certifications. It is assumed that to achieve this aspirational standard, typical best practices are already being met and championed by the team's expert consultants. The implementation of this Standard requires leading-edge technical knowledge, an integrated design approach, and design and construction teams well versed in advanced practices related to green building. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | There are four typologies: <ul style="list-style-type: none"> New Building Existing Building Interior Landscape or Infrastructure | Link | |
| International WELL Building Institute | IWBI delivers the cutting-edge WELL Building Standard™, the leading global rating system and the first to be focused exclusively on the ways that buildings, and everything in them, can improve our comfort, drive better choices, and generally enhance, not compromise, our health and wellness. | WELL v2 | The WELL Building Standard is the premier standard for buildings, interior spaces and communities seeking to implement, validate and measure features that support and advance human health and wellness. WELL is an evidence-based certification that takes into consideration air, water, nourishment, light, movement, thermal comfort, sound, materials, mind, community, and innovation. WELL Core is also offered for building core and shell projects. | <ul style="list-style-type: none"> Enrollment fee: \$2500 Program fee: \$0.16/sq ft (starting at \$6,500 and capped at \$98,000) Onsite performance testing starting at \$6,500 | <ul style="list-style-type: none"> Better indoor air quality, improving health and comfort Attract and retain employees, clients, and investors Earn recognition for your commitment to occupant health and safety | ✗ | ✗ | ✓ | ✓ | ✓ | ✗ | *Multifamily only | <ul style="list-style-type: none"> Commercial Multifamily | Link |

Appendix D. Loan, Grant, Tax Rebate/Incentive Programs for All Property Owners

See Attached File.

RADNOR TOWNSHIP
RENEWABLE ENERGY & CONSERVATION PLAN

APPENDIX D
Loan, Grant, Tax Rebate/Incentive Programs for All Property Owners

| Program | Administrator | Offerings | | | | | | Description | Project Eligibility | | | | | | | | Information |
|---|---|-----------|--------|---------|----------------|--------------------------|--|--|----------------------------------|------------------|------------------|----------|------------------|----------|-----------------------|--|----------------------|
| | | Loans | Grants | Rebates | Tax Incentives | Other Financial Benefits | Building Evaluations/ Technical Services | | Energy Conservation / Efficiency | Renewable Energy | Commercial | | Residential | | Builders/ Contractors | Property Owners | |
| | | | | | | | | | | | New Construction | Existing | New Construction | Existing | | | |
| High-Performance Building Program | PA Dept Community & Economic Development, PA Department of Environmental Protection, Commonwealth Financing Authority | ✓ | ✓ | | | | | Loans and grants for high-performance certified buildings (Green Globes, LEED, Nat'l Green Building Standard): <ul style="list-style-type: none"> Loans to \$100,000 for residences, \$2 million for small businesses. Grants to \$1/2 million or 10% of eligible building construction/renovation costs. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | <ul style="list-style-type: none"> Small business owners (100 or less) Homeowners | Link |
| Alternative & Clean Energy Program | PA Dept Community & Economic Development, PA Department of Environmental Protection, Commonwealth Financing Authority | ✓ | ✓ | | | | | Loans and grants for the utilization, development, and construction of alternative and clean energy projects: <ul style="list-style-type: none"> Loans range from \$40,000 for equipment or components to \$5 million or 50% of total project cost for alternative or clean energy projects and High-Performance Building projects. Grants range from \$175,000 to \$2 million or 30% of the total project cost, depending on the type of project. | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> Business Economic Development Organization Political Subdivision | Link |
| Sustainable Energy Fund Commercial Loan Program | Sustainable Energy Fund | ✓ | | | | | | Loan financing solutions for 100% of a renewable energy or energy efficiency project (ex. envelope improvements, HVAC, lighting, etc.) <ul style="list-style-type: none"> Loans meeting eligibility requirements will receive financing for projects ranging in size from \$5,000 - \$1 million. For projects exceeding \$1MM, projects are evaluated on a case by case basis to evaluate financing opportunities | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> Commercial Industrial Municipal Agricultural Nonprofit | Link |
| 179D Commercial Energy-Efficiency Tax Deduction | Federal Office of Energy Efficiency and Renewable Energy | | | | ✓ | | | A tax deduction of \$1.80 per square foot is available to owners of new or existing buildings who install (1) interior lighting; (2) building envelope, or (3) HVAC systems that reduce the building's total energy and power cost by 50% or more in comparison to buildings meeting relevant ASHRAE requirements. <ul style="list-style-type: none"> Deductions up to \$0.60 per square foot are available for individual improvements towards single energy end-use. Systems and buildings must have been placed in service by 12/31/2020, which is when 179D expires, but it may be renewed. | ✓ | ✗ | ✓ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> Commercial Municipal | Link |

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|---|---------------------------|---|--|--|---|---|---|--|---|---|---|---|---|---|---|--------------|----------------------|
| PECO New Homes Rebates | PECO | | | | ✓ | | | PECO offers rebates for new homes achieving high energy performance. The available rebates are up to \$1,750 per home, or through a per unit basis for multifamily projects. <ul style="list-style-type: none"> • Incentives are offered on a tiered basis, depending on the level of energy performance. • Technical resources are available to participating builders free of charge. | ✓ | ✗ | ✗ | ✗ | ✓ | ✗ | ✓ | N/A | Link |
| Home Builder Tax Credits | Internal Revenue Service | | | | | ✓ | | Home builders are eligible for a \$2,000 tax credit for a new energy efficient home that achieves 50% energy savings for heating and cooling over the 2006 International Energy Conservation Code (IECC) and supplements. <ul style="list-style-type: none"> • At least 1/5 of the energy savings has to come from building envelope improvements. • The tax credit expires at the end of this year but has been successively renewed for many years and is likely to be renewed again. | ✓ | ✗ | ✗ | ✗ | ✓ | ✗ | ✓ | N/A | Link |
| PECO Home Energy Assessments | PECO | | | | | | ✓ | PECO Energy Company sponsors low cost home energy assessments to identify personalized opportunities to save energy, including: <ul style="list-style-type: none"> • Home visit • Utility bill analysis • Potential opportunity to receive free energy efficient products | ✓ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | • Homeowners | Link |
| Community Action Agency of Delaware County (CAADC) Assistance | CAADC, Inc. | | | | | | ✓ | CAADC provides a suite of energy services to assist Delaware County residents with: <ul style="list-style-type: none"> • Weatherization assistance for income-eligible households • Utility Assistance • Fuel Assistance • Water Conservation Assistance • Energy Education | ✓ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | • Homeowners | Link |
| HEELP | PA Housing Finance Agency | ✓ | | | | | | HEELP offers loans between \$1,000 and \$10,000 at a fixed-rate of one percent (1%); (APR 1%) for ten years with no prepayment penalties for specific energy efficiency repairs: <ul style="list-style-type: none"> • Air sealing, insulation and ductwork • Energy efficient windows and doors • Energy efficient heating or cooling system repairs or replacements • Roof replacements | ✓ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | • Homeowners | Link |
| Equipment Tax Credits for Primary Residents | Internal Revenue Service | | | | | ✓ | | The Federal Government provides tax credits for installing energy efficient equipment in a homeowner's primary residence, including air source heat pumps and central air conditioning, among others. The tax credit is 10% of the total project cost, to \$500. The tax credit expires on December 31, 2020, but may be renewed. | ✓ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | • Homeowners | Link |

| | | | | | | | | | | | | | | | | | |
|---|---------------------------------------|---|--|---|--|---|---|--|---|---|---|---|---------------------|---------------------|---|--|----------------------|
| PECO Smart Ideas | PECO | | | | | ✓ | | PECO complies with Act 129 through the Smart Ideas Program. This program provides financial incentives for energy efficient equipment and new construction. Discounts, rebates, and incentives are available for equipment and efficiency upgrades. | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✗ | <ul style="list-style-type: none"> Commercial + Industrial Small businesses Multi-family Homeowners | Link |
| National Energy Improvement Fund | National Energy Improvement Fund, LLC | ✓ | | ✓ | | | | There are three potential financial arrangements through NEIF: <ul style="list-style-type: none"> The financing agreement is between the customer and NEIF, with pre-funding for equipment before the physical work begins. The financing agreement is between the contractor and NEIF, provided as working capital up to \$200,000 NEIF can provide rebate advances to expediate cash flow, rather than waiting for rebate payments. | ✓ | ✗ | ✓ | ✓ | ✗ | ✗ | ✓ | <ul style="list-style-type: none"> Commercial Non-profit Government | Link |
| Fannie Mae Green Rewards | Federal National Mortgage Association | ✓ | | | | | ✓ | Fannie Mae provides low-interest loans for existing and new construction projects that include green building improvements. The eligible projects include but not limited to installing new ENERGY STAR appliances, energy efficient HVAC systems, WaterSense labeled low-flow fixtures, LED lighting, and solar photovoltaic systems. Free energy and water audit reports and technical solar assessments are also available. | ✓ | ✓ | ✗ | ✗ | ✓ | ✓ | ✗ | <ul style="list-style-type: none"> All asset classes with at least 12 months of Stabilized Residential Occupancy | Link |
| Sustainable Energy Fund Stipulated Energy Savings Agreement | Sustainable Energy Fund | | | | | ✓ | | The Stipulated Energy Savings Agreement is a unique financing structure to install energy efficiency projects. This is agreement is between the customer, the contractor and the SEF. The initial capital costs will be paid by SEF, and a portion of the electricity savings will be used to pay SEF over a specified period of time. | ✓ | ✗ | ✓ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> Commercial Industrial Municipal Agricultural Non-profit | Link |
| TRF Sustainable Development Fund | The Reinvestment Fund | ✓ | | | | | | SDF's affordable, flexible financing products include: <ul style="list-style-type: none"> Commercial debt Subordinated debt Lease financing Energy Performance contract financing | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> Commercial Non-profit Local government | Link |
| TRF Green Energy Loan Fund | The Reinvestment Fund | ✓ | | | | | | The GELF program can finance energy efficiency projects in existing and new construction through low-interest loans. It is also possible to support financing of on-site renewable energy systems and/or combined-heat-and-power systems, if apart of a larger efficiency project. The available loan amounts are between \$100,000 through \$2,500,000, with interest rates variable between 4-5%. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | <ul style="list-style-type: none"> Commercial Non-profit Local government Multi-family Industrial | Link |
| | | | | | | | | | | | | | (only multi-family) | (only multi-family) | | | |

| | | | | | | | | | | | | | | | | | |
|--------------------------------|---|--|---|--|---|--|--|---|---|---|---|---|---|---|---|--|----------------------|
| Federal Residential Tax Credit | Internal Revenue Service | | | | ✓ | | | Tax credits for residential energy efficiency have been extended retroactively, through December 31, 2020. The tax credit for builders of energy efficient homes and tax deductions for energy efficient commercial buildings have also been retroactively extended, through December 31, 2020. The tax credits for residential renewable energy products are still available through December 31, 2021. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | <ul style="list-style-type: none"> • Commercial • Small businesses • Multi-family • Homeowners | Link |
| IRS Business Tax Credit | Internal Revenue Service | | | | ✓ | | | Available for the installation of solar water heater, solar photovoltaics, geothermal heat pumps, fuel cells using renewable fuels. Tax Credit is 26% of the capital costs for systems placed in service by December 31, 2021. Tax Credit is 22% of the capital costs for systems placed in service after December 31, 2021 and before January 1, 2022, and is 10% of the capital costs for systems placed in service after January 1, 2022 and before January 31, 2023. | ✗ | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> • Commercial • Industrial • Agricultural | Link |
| Small Business Advantage Grant | PA Department of Environmental Protection | | ✓ | | | | | The Small Business Advantage Grant provides 50% matching grants, up to a maximum of \$7,000 to enable Pennsylvania small businesses to purchase energy efficient or pollution prevention equipment, or adopt waste reduction processes. Energy efficiency and pollution prevention projects must save the small business a minimum of \$500.00 and at least 25% annually in energy consumption or pollution related expenses. Pennsylvania-based, registered, for-profit small business with 100 or fewer FTE employees are eligible. | ✓ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> • Commercial • Non-profit • Local government • Multi-family • Industrial | Link |

Appendix E. Incentive and Rebate Programs for Efficient and Clean Transportation

See Attached File.

RADNOR TOWNSHIP
RENEWABLE ENERGY & CONSERVATION PLAN

APPENDIX E
Incentive & Rebate Programs for Efficient & Clean Transportation

| Program | Administrator | Offerings | | | | | Description | Project Eligibility | | | | | Information | | | |
|---|--|-----------|--------|---------|----------------|--------------------------|---|---|-------------------|---------------------|--------------------------------------|-----------------------|---|--|---|----------------------------|
| | | Loans | Grants | Rebates | Tax Incentives | Other Financial Benefits | | EV/AFV Infrastructure | EV/AFV Purchasing | Truck and Bus Fleet | Transportation Planning and Projects | Innovative Technology | | Eligible Applicants | Eligible Project Types | Eligible Project Locations |
| DC Fast Charging and Hydrogen Fueling Grant Program | PA Department of Environmental Protection (Driving PA Forward Program) | | ✓ | | | | This grant program is designed to assist with the installation or expansion of strategically significant electric vehicle (EV), alternative fuel vehicle (AFV), and/or zero emission vehicle (ZEV) fueling projects: <ul style="list-style-type: none"> • DC Fast Charging: up to 70% may be reimbursed (max \$250,000 per award). • Hydrogen Fueling (>250 kg/day): up to 33% may be reimbursed (max \$500,000 per award). • Hydrogen Fueling (>250 kg/day): up to 25% may be reimbursed (max \$500,000 per award). | ✓ | ✗ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> • Businesses • Incorporated Nonprofits • State/Local Governments • Planning Organizations • Air Quality or Transportation Organizations • Federal Government Organizations | <ol style="list-style-type: none"> 1. Publicly accessible DC Fast Charging projects for light-duty EVs. 2. Publicly accessible DC Fast Charging projects for light-duty EVs combined with Level 2 charging at the same location. 3. Publicly accessible hydrogen fuel cell supply equipment projects for light-duty hydrogen fuel cell vehicles. | EV Fast chargers must be installed in: <ul style="list-style-type: none"> • Community Charging Hubs • Transportation Corridors • Destination Locations. Hydrogen Fuel Cell must be installed in a place available to the public. | Link |
| Level 2 EV Charging Rebate Program | PA Department of Environmental Protection (Driving PA Forward Program) | | | ✓ | | | Approximately \$7.7 million is being allocated over a 5-year period to fund a rebate program for the installation of level 2 electric vehicle (EV) charging equipment. <ul style="list-style-type: none"> • Full Public Access, Networked: up to \$4,500 per plug (or up to 90% of total project costs for government-owned/up to 70% for non-government-owned) • Full Public Access, Non-Networked: up to \$4,500 per plug (or up to 80% of total project costs for government-owned/up to 60% for non-government-owned) • No/Limited Public Access up to \$3,500 per plug (or up to 50% of total project costs) | ✓ | ✗ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> • Businesses • Incorporated Nonprofits • State/Local Governments • Planning Organizations • Air Quality or Transportation Organizations • Federal Government Organizations | <ol style="list-style-type: none"> 1. Full Public Access, Networked 2. Full Public Access, Non-Networked 3. No/Limited Public Access Maximum of 20 total plugs | <ul style="list-style-type: none"> • Public use at government owned property • Public use at non-government owned property • Non public use at workplaces • Non public use at multi-unit dwellings | Link |
| Alternative Fuels Incentive Grant Program (AFIG) | PA Department of Environmental Protection | | ✓ | | | | Through the program, DEP solicits applications for innovative, advanced fuel and vehicle technology projects resulting in cleaner advanced alternative transportation within the Commonwealth. Approximately \$5 million in grants is made available annually. The grant expires in 2020, but is typically renewed. Priorities for 2020 funding included: zero emission vehicle (ZEV) projects, renewable natural gas (RNG) vehicle projects, projects in Environmental Justice (EJ) areas, and publicly accessible refueling projects. | ✓ | ✓ | ✓ | ✗ | ✓ | <ul style="list-style-type: none"> • School Districts • Municipal Authorities • Political Subdivisions • Nonprofit Entities • Private Companies | <ul style="list-style-type: none"> • Vehicle Retrofit or Purchase Projects • Alternative Fuel Refueling Infrastructure Projects • Innovative Technology Projects | Dependent on project type, see AIFG Guidelines. | Link |
| Truck and Bus Fleet Grant Program | PA Department of Environmental Protection (Driving PA Forward Program) | | ✓ | | | | There is \$3,000,000 available for reimbursement grants to replace or repower fleets of 6 or more Class 4-8 trucks, port drayage trucks, school buses, shuttle buses, and/or transit buses. Replacing or repowering vehicles containing older diesel engines with new technology can reduce emissions by up to 90%. | ✗ | ✗ | ✓ | ✗ | ✗ | <ul style="list-style-type: none"> • Businesses • Incorporated Nonprofits • State/Local Governments • Planning Organizations • Air Quality or Transportation Organizations • Federal Government Organizations | <ol style="list-style-type: none"> 1. Replace or repower eligible Class 4-8 trucks, school buses, or shuttle buses with a MY 2019 or newer diesel or alternative fueled engines, including all-electric engines. 2. Replace or repower eligible drayage trucks with a MY 2017 or newer diesel or alternative fueled engines, including all-electric engines. 3. Replace or repower eligible transit buses with MY2019 alternative fueled engines, including all electric engines. Diesel replacements or repowers of transit buses are not eligible for funding under this program. | N/A | Link |
| Onroad Rebate Program - Trucks and Buses | PA Department of Environmental Protection (Driving PA Forward Program) | | | ✓ | | | The primary goal of the Onroad Rebate Program is to improve Pennsylvania's air quality by reducing oxides of nitrogen (NOX) emissions from diesel-powered mobile sources through funding diesel emission reduction projects. Eligible diesel emission reduction solutions include: certified engine repowers and/or certified vehicle or equipment replacements. | ✗ | ✗ | ✓ | ✗ | ✗ | <ul style="list-style-type: none"> • Businesses • Incorporated Nonprofits • State/Local Governments • Planning Organizations • Air Quality or Transportation Organizations • Federal Government Organizations | <ol style="list-style-type: none"> 1. Current vehicles or engines must be scrapped or rendered permanently inoperable for all eligible project types. 2. Replace or repower eligible Class 4-8 trucks, school buses, or shuttle buses with a MY 2019 or newer diesel or alternative fueled engines, including all-electric engines. 3. Replace or repower eligible drayage trucks with a MY 2017 or newer diesel or alternative fueled engines, including all-electric engines. 4. Replace or repower eligible transit buses with MY2019 alternative fueled engines, including all electric engines. Diesel replacements or repowers of transit buses are not eligible for funding under this program. | N/A | Link |
| Small Business Advantage Grant | PA Department of Environmental Protection | | ✓ | | | | The Small Business Advantage Grant provides 50% matching grants, up to a maximum of \$7,000 to enable Pennsylvania small businesses to purchase energy efficient or pollution prevention equipment, or adopt waste reduction processes. Grants for anti-idling technologies or tire inflation systems are available. | ✓ *for anti-idling or tire inflation | ✗ | ✓ | ✗ | ✗ | Pennsylvania-based, registered, for-profit small business with 100 or fewer FTE employees | Energy efficiency and pollution prevention projects saving the small business a minimum of \$500.00 and at least 25% annually in energy consumption or pollution related expenses. | N/A | Link |

| | | | | | | | | | | | | | | | | |
|--|--|--|---|---|---|---|--|---|---|---|---|--|--|---|----------------------|----------------------|
| Plug-in Electric Vehicle (PEV) Rebate | Philadelphia Electric Company (PECO) | | | ✓ | | | Through the Smart Driver Rebates programs, PECO offers rebates for residential and business customers investing in new electric vehicle technology. PECO customers can earn \$50 per car when they purchase an electric vehicle. | ✗ | ✓ | ✗ | ✗ | ✗ | <ul style="list-style-type: none"> You are the account holder who currently receives electric service from PECO or live at the same address as the account holder You are a tenant of an apartment that is in the PECO service territory and you pay for your residential electric service as a part of the rent you pay your landlord Your primary place of recharging your vehicle is or will be located in the PECO service territory | Only plug-in vehicles qualify for a rebate. | N/A | Link |
| Transportation and Community Development Initiative (TCDI) | Delaware Valley Regional Planning Commission (DVRPC) | | ✓ | | | The Transportation and Community Development Initiative (TCDI) is a grant opportunity that supports smart growth initiatives that implement the Connections 2045 Plan for Greater Philadelphia. To date, the TCDI has given out 295 awards and invested \$20.27 million throughout the Delaware Valley. | ✗ | ✗ | ✗ | ✓ | ✗ | Municipalities including cities, townships, or boroughs, or offices within those entities. | Projects should link land use and transportation by: Improving the overall character and quality of life, enhancing existing transportation infrastructure capacity, promoting active and public transit methods, building capacity in schools and neighborhoods, reinforcing and implementing improvements in designated Centers and/or protecting our environment. Past project types have included feasibility studies, trail and sidepath maintenance, TOD strategic plans, and much more. See link for a list of past projects and funding amounts. | Any municipality within the DVRPC region can apply. | Link | |
| Regional Trails Program | Delaware Valley Regional Planning Commission (DVRPC) | | ✓ | | | DVRPC's Regional Trails Program provides planning assistance and financial support to trail developers, counties, municipalities and nonprofit organizations to complete the Circuit, Greater Philadelphia's 800-plus-mile network of multi-use trails. With financial support from the William Penn Foundation, the Regional Trails Program has provided \$20 million in funding to over 110 trail planning, design, and construction projects to date. | ✗ | ✗ | ✗ | ✓ | ✗ | Municipalities including cities, townships, or boroughs, or offices within those entities. | Trail planning, design, or construction projects | Any municipality within the DVRPC region can apply. | Link | |
| Congestion Mitigation and Air Quality Improvement Program (CMAQ) | Delaware Valley Regional Planning Commission (DVRPC) | | | | ✓ | DVRPC's Competitive Congestion Mitigation and Air Quality Improvement Program (CMAQ) seeks to fund transportation projects that will improve air quality and reduce traffic congestion in the DVRPC Region. The CMAQ Program is not a grant program. The sponsor does not receive grant funds to start the project; rather, the sponsor is reimbursed for costs incurred after receiving funding authorization for the project and a notice to proceed. Costs incurred prior to project selection and notice to proceed are not reimbursed. All awarded projects must authorize federal CMAQ funds by the deadline stated in their award letters. | ✗ | ✗ | ✗ | ✓ | ✗ | All public agencies, incorporated private firms, or nonprofit entities, including municipalities, Transportation Management Associations (TMAs), and transportation system operators are eligible. Private firms and nonprofits must partner with a local public agency sponsor and have a formal agreement in place with the public agency at the time of funding award. Private individuals are not eligible to apply. Please refer to DVRPC's latest CMAQ Guidance for details. | Trail planning, design, or construction projects | Any eligible applicant within the DVRPC region can apply. | Link | |

Appendix F. Actions Summarized by Tactic

5.1 Advocacy Opportunities

5.1.1 Immediate/Time Sensitive Advocacy Work



LEGISLATIVE/REGULATORY ADVOCACY

- Radnor Green Team take on task of identifying and issuing advocacy alerts to the community, branded Clean Energy Champions.
- Current time-sensitive targets include:
 - RGGI
 - AEPS
 - Act 129 Expansion
 - Community Solar
 - Coronavirus Relief for Public Transit
 - Public Transportation Trust Fund (Act 44)



COMMUNITY ACTION

- Ensure C-PACE Passage and Implementation in DelCo



LEGISLATIVE/REGULATORY ADVOCACY

- Ongoing support is needed to advance:
 - Community Choice Aggregation
 - Modernized energy efficiency building codes
 - PA Clean Transportation Legislation (SB 596, HB1908)

5.1.2 Ongoing Advocacy Work

5.2 The Built Environment

5.2.1 Energy-Efficient Homes



COMMUNITY ACTION

- Get a Home Energy Audit.
- Take advantage of programs and financial incentives.

5.2.2 Energy-Efficient Commercial, Multi-Family, and Mixed-Use



MUNICIPAL ORDINANCE PROGRAM

- Benchmarking Ordinance
- Require Commercial Energy Auditing and Building Retuning



COMMUNITY ACTION

- Fuel Switching



PARTNERSHIP OPPORTUNITY

- Fuel Switching

5.2.3 Renewable Energy in All Existing Buildings



PARTNERSHIP OPPORTUNITY

- Solarize Radnor!



COMMUNITY ACTION




- Buy green energy through the grid (RECs)
- Create Renewable Energy Purchasing Agreements (vPPAs)





MUNICIPAL ORDINANCE PROGRAM

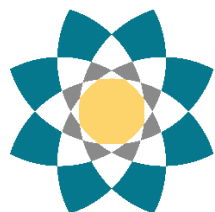
- Net Zero Expectations for All New Construction

5.2.4 New Construction

| 5.3 Transportation | 5.4 Incentives |
|---|--|
| <p data-bbox="110 325 548 409"> MUNICIPAL ORDINANCE PROGRAM</p> <ul data-bbox="159 424 511 724" style="list-style-type: none">• Create Community-Wide EV Infrastructure Plan<ul style="list-style-type: none">• Municipal Fleet• Permitting and Inspections• Zoning• Utility Engagement• Benchmarking• Emphasize Transit-Oriented Development (TOD) | <p data-bbox="669 262 1177 294">5.4.1 Financing, Grant and Rebate Opportunities</p> <p data-bbox="597 346 1019 430"> COMMUNITY ACTION</p> <ul data-bbox="646 445 1291 476" style="list-style-type: none">• Take advantage of the opportunities listed in Appendix D <p data-bbox="669 535 1136 567">5.4.2 Recognition and Certification Programs</p> <p data-bbox="597 598 1019 682"> COMMUNITY ACTION</p> <ul data-bbox="646 697 1409 749" style="list-style-type: none">• Leverage your efforts and get recognized through programs listed in Appendix C |

5.5 Carbon Offsets & Offsetting Initiatives

| | |
|--|---|
| <p data-bbox="376 955 803 1039"> COMMUNITY ACTION</p> <ul data-bbox="425 1054 763 1106" style="list-style-type: none">• Purchase third-party vetted carbon offsets | <p data-bbox="859 955 1286 1039"> MUNICIPAL ORDINANCE PROGRAM</p> <ul data-bbox="907 1054 1245 1138" style="list-style-type: none">• Purchase third-party vetted carbon offsets• Establish a Carbon Fund |
|--|---|



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Practical Energy Solutions

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