

**DRAFT
ENERGY TRANSITION PLAN
FOR
EAST MARLBOROUGH TOWNSHIP**



April 7, 2021

Updated August 16, 2023

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Executive Summary

The need for this Energy Transition Plan for East Marlborough Township was established under Township Resolution 2020-32, which called for the reduction of greenhouse gas (GHG) emissions. This Plan establishes benchmarks for current GHG emissions, identifies some of the largest emitters, discusses potential leadership and partners, and provides some initial specific tasks. This plan addresses GHG emissions from both municipal operations and the Township community.

The benchmarks for total annual GHG emissions were found to be as follows:

- 520 metric tons for municipal operations.
- 98,000 metric tons for the Township community.

For municipal operations, most GHG emissions were from sewage-related facilities and fuel usage by vehicles as follows:

- 69% sewage-related facilities.
- 28% from gasoline and diesel fuel.
- 3% buildings and other facilities.

For the community, most GHG emissions were attributed to the following sectors:

- 39% commercial and industrial
- 32% highway
- 24% residential.
- 5% other

The Plan is intended to be broad with the understanding that the goal of reducing GHG emissions is clear and that there will be multiple paths to be pursued to accomplish the goal.

Specific initial recommendations are provided in the Recommendations section of this report.

1.0 Introduction

East Marlborough Township passed Resolution 2020-32 on August 3, 2020, which called for the development of an Energy Transition Plan (ETP or Plan). Quantitative goals stated in the resolution are to transition to 100% clean, greenhouse-gas (GHG)-free electricity by 2035 and 100% clean, GHG-free energy for heat and transportation by 2040. A copy of Resolution 2020-32 is provided in Appendix A. This Plan meets the resolution objective of developing an energy transition plan for municipal operations and for the community. Implementation of this ETP is also consistent with goals stated in the Township's "Open Space, Recreation, and Environmental Resources Plan 2020" (November 9, 2020). The strategies outlined in this ETP will help our community reduce greenhouse gas emissions, effectively deploy taxpayer dollars, and advance community goals for health and safety, economic vitality, and energy independence.

The terms "GHG-free energy," "GHG-neutral energy," and "clean energy" are used interchangeably in the 2020-32 Resolution and in this Plan. The resolution defines GHG-neutral energy as generated by sources that are either:

- Carbon-free and pollution-free, including both that generated sustainably from renewable sources such as wind, solar, hydro, tidal, fuel cells, geothermal, biomass, nuclear; or
- Technologies that capture carbon and use or sequester it.

This Plan is designed to support public officials, community leaders, and residents in selecting actions, which support the following:

- Increased efficiency of energy use, which will not only reduce the amount of energy needed but will also reduce the costs of energy.
- The transition to efficient electric energy for both heating of buildings and operation of motor vehicles.
- The transition from fossil fuel-generated electricity to electricity generated by GHG-free sources.

The scale of intervention required to reduce and adapt to the effects of climate change will require action at all levels of government and society. International accords to limit overall carbon emissions will involve national governments. More than 160 municipalities, 10 counties, and 8 states with similar targets are now in line with the international agreement on climate change mitigation. In total, over 100 million people in the United States now live in a community with an official 100% clean electricity target. East Marlborough Township is an early leader in the national municipal movement to set aggressive emissions reduction targets.

There is increasing unanimity from every level of government regarding the need for a transition to clean energy:

- The Paris Climate Agreement signed by 197 countries pledges to achieve the emission reductions needed to limit the global temperature rise to less than 2.0 degrees Celsius and make every effort to keep the increase below 1.5 degrees Celsius.
- The United States is seeking to achieve net zero emissions of greenhouse gases by 2050 with interim dates for partial progress. The current initiative is described in the Inflation Reduction Act of 2022, which is a 10-year plan.
- Pennsylvania has set aggressive energy and climate goals, including meeting 26 percent reduction in GHG emissions by 2025, and 80 percent reduction in GHG emissions by 2050.
- The Delaware Valley Regional Planning Commission's (DVRPC) long-range plan supports a goal to reduce regional greenhouse gas emissions by 60 percent by 2040, which will put our region on track to achieve the latest scientific recommendation of an 80 percent reduction in greenhouse gas emissions by 2050. DVRPC's Office of Energy and Climate Change Initiatives leads, supports, and coordinates efforts to reduce energy consumption and greenhouse gas emissions in our region.
- Chester County advocates an 80% reduction in GHG emissions by 2050.
- East Marlborough Township passed Resolution 2020-32 committing to reach 100% clean, GHG-free energy by 2035 for electricity and 2040 for heat and transportation.

This Plan acknowledges the challenges and opportunities of the coming decades related to public and private investment, jobs creation, public health concerns, energy reliability and independence, and climate disruption as it applies to our current energy consumption patterns. The Plan includes recommendations for change that will support East Marlborough Township and its residents, businesses, and other community stakeholders in recognizing the breadth of these challenges and then pursuing the steps outlined to enhance the economic, social, and environmental foundations of the community, and by extension the region, state, nation, and the world.

The conversion to clean, GHG-free energy will provide direct and indirect benefits to East Marlborough Township. Early steps include energy efficiency measures to be assessed and implemented where the return on investment is within an acceptable range. Typically, these measures will provide net savings within a few years, savings that can then be rolled back into further efficiency investments as well as GHG-free energy installations. It will create investments in local infrastructure that will improve sustainability and create jobs. And, at the national level, the transition to clean, GHG-free energy will save U.S. citizens hundreds of

billions of dollars annually in reduced cost of air pollution¹, which will translate to billions of dollars annually and improve the health of residents in southeastern Pennsylvania.

Portions of this plan were prepared by a Chester County-based working group that developed a Clean Energy Planning Series for multiple townships in southeastern Pennsylvania. The planning included guidance from local and regional experts, to consider what will be most effective for the municipal government and the stakeholders within East Marlborough Township. The plan was initially shared with the Township's EAC in November 2020 (slides in Appendix B). The plan was subsequently reviewed with the EAC in April 2021 and August 2023.

1.1 Scope of Work

Townships are limited in the extent that they can address energy transition issues because many of the legislative and regulatory powers needed to address these issues reside in the county, state, and federal governments. Approaches to transition, such as the creation of large-scale energy policy, vehicle efficiency standards, and state-approved building energy efficiency standards, are beyond the jurisdiction of local government.

None the less, East Marlborough Township is committed to playing its role at the local level to promote energy efficiency and the transition to GHG-free energy resources through the best means at its disposal. These include:

- Leading by example: The Township will implement energy efficiency measures and shift its energy sources to GHG-free energy as expeditiously as possible.
- Support and guidance: The Township will undertake changes to its planning, zoning code, road system, and other aspects of local governance that impact energy usage throughout the community.
- Reducing roadblocks: The Township will consider implementing changes to reduce roadblocks for climate-positive investments and encourage adoption of energy transition programs and investments by residents, institutions, and businesses.
- Public education: The municipality will provide information and encouragement to all stakeholders in the community to use energy efficiently and transition to the use of GHG-free energy.
- Financial incentives: Municipal governments can seek grants and “elective pay” from nonprofits or state/federal programs that subsidize some aspect of projects for energy transition. (Elective pay is a funding mechanism under the Inflation Reduction Act of 2022.)

¹ How much does air pollution cost the U.S.?, Center for Air Quality, Climate, and Energy Solutions (CACES) at Carnegie Mellon University (CMU), 2016, <https://earth.stanford.edu/news/how-much-does-air-pollution-cost-us#gs.2xjx59>.

The focus of this plan is on the mitigation of greenhouse gas emissions within municipal operations and community uses related to current fossil fuel use. We recognize that these are not the only contributors to GHG emissions. We also recognize that there are other strategies that will need to be undertaken to complement those recommended in this plan.

Although this plan focuses on mitigation, we recognize the importance of preparing to adapt to climate disruption already affecting us. Adaptation, which refers to adapting to life in a changing climate, is not addressed in this Plan. A separate plan may be considered that will help our community reduce our vulnerability to the harmful effects of climate change (droughts, flooding, power outages, and damages from more intense extreme weather events).

1.2 Guiding Principles for Clean Energy Planning

The following are the guiding principles and goals of this Energy Transition Plan, which provide an integrated approach for planning and actions.

- **Stewardship of energy resources:** This ETP suggests the incorporation of best practices in energy conservation and energy efficiency. Best practices are intended to include cost-effective ways to reduce energy consumption. Conservation and efficiency approaches can significantly reduce energy use in our municipal buildings as well as those buildings in the wider community and in our transportation systems. These strategies comprise the early steps of this ETP and are central to its structure.
- **Redirection in capital investment:** This ETP suggests changes in our energy consumption patterns to adopt efficient, clean sources of energy.
- **Public health:** This ETP strives to maximize the health benefits provided by the transition from our fossil fuel-based economy to a GHG-free energy economy. Elimination of air contaminants by reducing and replacing polluting energy sources is one of the goals of this ETP. Decisions made in this decade will have a lasting impact on the health and well-being of current and future residents.
- **Social fairness:** This ETP considers the impacts of the energy transition on local economic and environmental conditions community wide. Many people do not have the financial stability or resources to qualify for loans needed to invest in home weatherization improvements and GHG-free energy installations. They will require support, which must be seen as maintaining the overall public good. Another group of citizens that will need fair and equitable treatment are those whose livelihoods are eliminated by the transition, such as workers in energy extraction and refining and related support industries.
- **Climate stabilization:** This ETP addresses the need to immediately reduce and ultimately eliminate human-generated greenhouse gases enabling East Marlborough Township to

do its part in the world-wide effort to reign in the continuing increase in average global temperature, which has destabilized our climate.

- Energy independence: This ETP endeavors to make the municipality and the larger community more self-reliant through energy efficiency and conservation and on-site GHG-free energy development, allowing for reductions of imported fuels.
- Inclusion of all stakeholders: This ETP invites and welcomes the participation of all stakeholders within the municipality and is designed to integrate their input as part of the development process.
- Coordination with other governments: This ETP has been prepared in a manner that will enable multiple communities in conjunction with East Marlborough Township, either individually or in groups at the county or regional levels, to develop aggregated planning strategies.

1.3 Electricity

Electrification is the essential action towards the transition to clean energy. The electricity used in East Marlborough Township is generated within the regional electricity grid, and several entities are collectively responsible for providing electricity:

- PJM Interconnection: PJM operates the regional electricity grid and wholesale electricity marketplace, ensures reliability of the electricity grid, and conducts long-term planning for the future of electricity generation and transmission across 13 states and the District of Columbia.
- Pennsylvania Public Utilities Commission (PUC): Electricity is regulated at the state level by the PA PUC. The PUC sets rates (which influence how much your electricity costs) and manages programs to improve energy efficiency and promote GHG-free electricity.
- PECO: PECO is the distribution company in our area. While all customers can choose electricity suppliers through the PUC's PA Power Switch website, PECO is the sole distributor to area homes and businesses.
- For the Township municipal facilities, the electricity generation supplier is PECO.

A solar panels at the Township building also generate electricity for use by the municipal building.

2.0 Identification of Energy Champions

To meet the relatively aggressive goals to achieve GHG-free energy in the Township, leadership is needed that will identify initiatives, form coalitions, and initiate changes. Such leadership in this Township is often a volunteer or group of volunteers, but could also be paid Township staff or an outside consultant. The Township's Board of Supervisors will select an Energy Champion or Champions.

The Energy Champions will oversee the implementation of this Energy Transition Plan and plans that subsequently develop. The Energy Champions are anticipated to perform as follows:

- Educate itself on the actions necessary to efficiently transition the municipality and community to GHG-free energy.
- Seek assistance from the EAC.
- Plan for and coordinate energy transition initiatives approved by the Township Manager and/or Board of Supervisors.
- Monitor the implementation of adopted initiatives.
- Prepare and undertake procedures to maintain the effectiveness of changes made.
- Track and document the progress made.
- Research and plan for new initiatives as the energy transition proceeds.

The Energy Champions serve at the pleasure of the Board of Supervisors and report to them on a quarterly basis. Alternately, the Board of Supervisors may choose to have the quarterly reporting go to the Township's Environmental Advisory Council (EAC) instead.

East Marlborough Township through the Energy Champions is anticipated to consult and coordinate with the following:

- Board of Supervisors.
- Township departments, including Public Works, Code Enforcement and Zoning, Trash and Recycling, and Police.
- Township Environmental Advisory Council (EAC).
- Chester County departments.
- Delaware Valley Regional Planning Commission.
- Pennsylvania Department of Environmental Protection.
- PECO.
- Non-governmental organizations that specialize in energy (e.g., Solsmart, referenced later in this Plan).

3.0 Energy Profiles

The purpose of creating energy profiles is to establish both a municipal energy baseline and a community energy baseline, as well as to identify the significant energy users in the area. These baselines include relevant sectors and serve as starting points for the analysis of potential program and policy recommendations.

The data for this baseline was assembled from the Township's municipal accounts with PECO and third-party vendors, consultations with Township staff, and information available from the Delaware Valley Regional Planning Commission (DVRPC). For the municipal accounts, the data is specific to 2019. For the community, the data from DVRPC is for 2015. DVRPC updates its data every 5 years, and as of the writing of this plan, the data for 2020 was not posted.²

3.1 Energy Profile for Township Municipal Operations

For municipal operations, this Section provides the energy use and GHG emissions for calendar year 2019. This data serves as the baseline year for the Energy Transition Plan for East Marlborough Township. The review includes usage of and GHG emissions from electricity, natural gas, gasoline, and diesel fuel in the buildings, the wastewater treatment system, motor vehicles, and outdoor and traffic lighting.

Energy usage and emissions can be thought of as from 1) buildings and facilities, 2) sewage-related facilities, and 3) liquid fuels (gasoline and diesel fuel). These divisions are highlighted in Table 1 for energy usage and Table 2 for emissions. Table 1 presents the 2019 usage of electricity and natural gas for all Township facilities. (Because streetlights and traffic lights are operated through PECO lines and billed to the Township on a unit basis, further investigation is needed to determine whether they are included in Table 1.) Table 2 presents the 2019 GHG emissions from municipal sources.

The energy review found that in the 2019 year, municipal operations generated a total of 520 metric tons of carbon dioxide equivalent (MTCO₂e) from three sectors: buildings and facilities (15 MTCO₂e, 3%), sewage-related facilities (358 MTCO₂e, 69%), and gasoline and diesel fuel (146 MTCO₂e, 28%).

The three major processes were identified as generating the most GHGs representing 92% of emissions from Township operations. The three processes were the following:

- Wastewater Treatment Plant. The largest energy user and source of GHG emissions from municipal operations is East Marlborough Township Sewer Company wastewater treatment plant located on Wollaston Road near West Street Road. In 2019, it

² DVRPC database was checked in August 2023, and the 2020 GHG emissions data was not posted.

consumed 749 megawatt-hours of electricity, resulting in the emission of 284 metric tons of GHGs or 55% of the total emissions from municipal sources.

- Motor vehicles. The second largest energy user and source of GHG emissions consists of the motor vehicles that use the fuel storage tank owned and operated by the Township. The storage tanks are located at the Township office building. In 2019, 4,880 gallons of gasoline and 10,570 gallons of diesel fuel were consumed, resulting in the emissions of 146 metric tons of GHGs or 28% of total emissions.
- Wastewater Spray Irrigation Facility. The third largest energy user and source of GHG emissions from municipal operations is the spray irrigation facility located near the intersection of State Street and Byrd Road. In 2019, 121 megawatt-hours of electricity were consumed, resulting in the emissions of 46 metric tons of GHGs or 9% of total emissions.

The remainder of the energy usage by Township operations consists of electrical service to minor Township installations and various sewer pump stations.

**Table 1: Municipal Energy Usage
East Marlborough Township**

Facility Nickname	Total Annual Electric Consumption (kWh)	Total Annual Gas Consumption (Ccf)	Liquid Fuels (gallons)	Facility Type	Street Address	Group Code
Motor Vehicle - Gasoline			4,880	Tank Farm	721 Unionville Road	
Motor Vehicle - Diesel			10,570	Tank Farm	721 Unionville Road	
Sewage Plant	748,511			Other-Utility	701 Wollaston Road	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH
Spray Irrigation Facility	120,827			Other-Utility	Street and Byrd Roads	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH
Trailer	31,102			Government Office	721 Unionville Road	ELECTRIC: EAST MARLBORO TOWNSHIP
Pump Station	21,236			Other-Utility	Not listed	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH
Pump Station	14,983			Other-Utility	123 Soltner Drive	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH
Pump Station	13,430			Other-Services	517 N Walnut Road	
Pump Station	9,269			Other-Utility	545 Schoolhouse Road	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH
Township Office Building	9,056	1,518		Government Office	721 Unionville Road	GAS: EAST MARLBORO TOWNSHIP, ELECTRIC: EAST MARLBORO TOWNSHIP, ELECTRIC: EAST MARLBORO TOWNSHIP
Pump Station	7,678			Other-Utility	0 Doe Run Road	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH
Pump Station	6,770			Other-Utility	0 Meadowbank Road	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH
Bathrooms	25			Property Management	1722 W Doe Run Road	
Receptacles	17			Property Management	1722 W Doe Run Road	
Lighting	2			Government Office	1754 Doe Run Road	ELECTRIC: EAST MARLBORO TOWNSHIP
Total	982,906	1,518	15,450			

Buildings and
Facilities



Sewage-related
Facilities



Liquid Fuels



**Table 2: Municipal Greenhouse Gas Emissions
East Marlborough Township**

Facility Nickname	Street Address	Group Code	Carbon Emissions from Electricity (metric tons)	Carbon Emissions from Natural Gas (metric tons)	Liquid Fuel Emissions (metric tons)	Total Carbon Emissions (metric tons)
Motor Vehicle - Gasoline	721 Unionville Road				39.1	39.1
Motor Vehicle - Diesel	721 Unionville Road				107.3	107.3
Sewage Plant	701 Wollaston Road	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH	284			284.5
Spray Irrigation Facility	Street and Byrd Roads	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH	45.9			45.9
Trailer	721 Unionville Road	ELECTRIC: EAST MARLBORO TOWNSHIP	11.8			11.8
Pump Station	Not listed	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH	8.1			8.1
Pump Station	123 Soltner Drive	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH	5.7			5.7
Pump Station	517 N Walnut Road		5.1			5.1
Pump Station	545 Schoolhouse Road	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH	3.5			3.5
Township Office Building	721 Unionville Road	GAS: EAST MARLBORO TOWNSHIP, ELECTRIC: EAST MARLBORO TOWNSHIP, ELECTRIC: EAST MARLBORO TOWNSHIP	3.4	0.078		3.5
Pump Station	0 Doe Run Road	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH	2.9			2.9
Pump Station	0 Meadowbank Road	ELECTRIC: EAST MARLBORO TWP WATER&SEWER AUTH	2.6			2.6
Bathrooms	1722 W Doe Run Road		0.010			0.010
Receptacles	1722 W Doe Run Road		0.0064			0.0064
Lighting	1754 Doe Run Road	ELECTRIC: EAST MARLBORO TOWNSHIP	0.00076			0.00076
Total			374	0.078	146	520

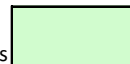
Buildings and
Facilities



Sewage-Related Facilities



Liquid Fuels



The energy review of municipal facilities for the 2019 year found that most emissions were from sewage-related facilities and fuel usage by vehicles as follows:

- 69% sewage-related facilities.
- 28% from gasoline and diesel fuel.
- 3% from buildings and facilities.

The top three emitters, accounting for 92% of emissions, were from vehicle use and two of the sewage-related facilities as follows:

- 55% from the Township sewage treatment plant.
- 28% from motor vehicles supplied by the municipal fuel storage tanks.
- 9% from spray irrigation of sewage effluent.

Total estimated annual carbon emissions from municipal operations was 520 metric tons.

A summary of the municipal operations was prepared in the form of a flyer, which is provided in Appendix C.

3.2 Energy Profile for Township Community

For the community profile, data was obtained from the Regional Greenhouse Gas Inventory of the Delaware Valley Regional Planning Commission (DVRPC). The most recent and comprehensive assessment of the energy usage and emissions of GHGs in the southeastern Pennsylvania area was conducted for the year 2015 by the DVRPC. The GHG emissions in East Marlborough Township are presented in Table 2. Table 3 presents detailed information on fuel usage, fuel costs, and GHG emissions by fuel type for each of the residential, commercial & industrial, highway, and rail transit sectors. Figure 1 provides a chart of the GHG emissions data for East Marlborough Township. A summary is also provided in the 2021 Community Energy Report provided in Appendix D.

As shown in Table 3, the emissions from energy use in buildings and in transportation together account for 95% of the GHG emissions in East Marlborough Township. (Solid waste generated in the area accounts for 2.2% of the emissions, which represents gas emitted from landfills to which East Marlborough Township's waste is sent.) Aside from reducing our generation of solid waste, virtually all of the GHG emissions in East Marlborough Township come from building energy usage and highway vehicles. A further breakdown of the emissions presented in Table 3 are provided Table 4. The total GHG emissions for the Township was 98,042 metric tons.

Figure 1
2015 GHG Emission Inventory of East Marlborough Township

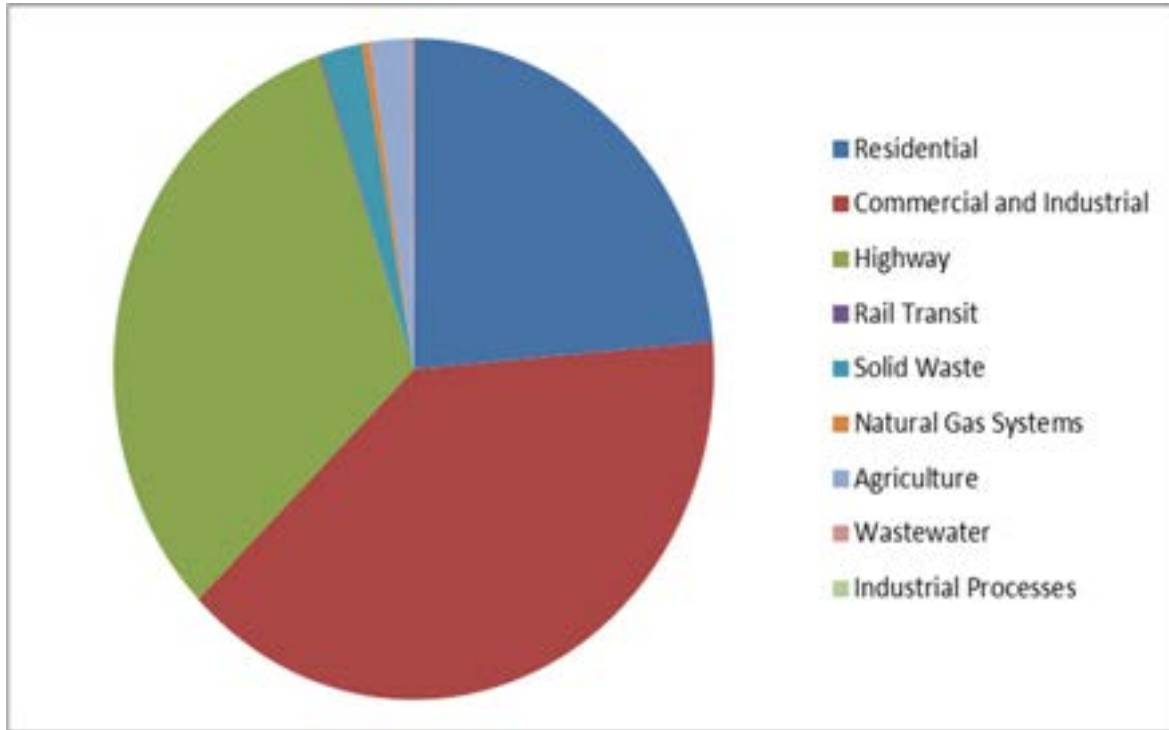


Table 3

2015 Emission Inventory of East Marlborough Township

Sector	Metric Tons CO ₂ e	Percent of Total
Residential	23,202	24%
Commercial and Industrial	38,319	39%
Highway	31,485	32%
Rail Transit	135	0.14%
Solid Waste	2,169	2.2%
Natural Gas Systems	419	0.43%
Agriculture	2,088	2.1%
Wastewater	224	0.23%
Industrial Processes	0	0.00%
TOTAL	98,041	100%

Table 4
2015 Fuel Information for
Residential, Commercial & Industrial, Highway, and Rail Transit Sectors

Residential	Electricity	Natural Gas	Fuel Oil	LPG	Total
Energy Content - Billion BTU	89	102	75	36	303
Energy by Physical Units	26,166,302	973,766	545,258	429,789	--
Physical Units	kilowatt-hr	therms	Gallons	gallons	--
Emissions (MTCO ₂ e)	9,946	5,440	5,568	2,249	23,202
Energy Expenditure (\$)	\$3,569,391	\$1,076,644	\$1,447,070	\$1,012,793	\$7,105,899
Commercial and Industrial	Electricity	Natural Gas	Fuel Oil	LPG	Total
Energy Content - Billion BTU	196	157	81	32	468
Energy by Physical Units	57,554,822	1,499,086	593,074	384,102	--
Physical Units	kilowatt-hr	therms	gallons	gallons	--
Emissions (MTCO ₂ e)	21,876	8,374	6,059	2,010	38,319
Energy Expenditure (\$)	\$4,832,839	\$1,259,232	\$1,465,969	\$481,173	\$8,039,213
Highway	Gasoline	Diesel			Total
Energy Content - Billion BTU	307	101			407
Energy by Physical Units (gal.)	2,545,308	734,116			--
Emissions (MTCO ₂ e)	--	--			31,485
Energy Expenditure (\$)	\$6,414,177	\$2,148,757			\$8,562,934
VMT (1,000 miles/day)	178				
Rail Transit	Diesel	Electricity			Total
Energy Content - Billion BTU	0.1	1.2			1.2
Energy by Physical Units (gal./KWh)	586	340,201			--
Emissions (MTCO ₂ e)	--	--			135
Energy Expenditure (\$)	--	--			

Residential Summary: East Marlborough Township's residential buildings consume 24% percent of fossil fuel energy (see Table 3). East Marlborough Township is a predominantly residential community of single-family dwellings. The home ownership rate in East Marlborough Township is approximately 87%. The remainder of the population lives in rental properties. To promote efficiency, the replacement of fossil fuel heating and cooling systems to electric and the purchase of clean electricity, the Township will need to reach and engage all its residents.

Non-Residential Summary: Commercial, industrial, and institutional buildings consume 39% percent of fossil fuel energy (see Table 3). Potential large East Marlborough Township energy users resulting in GHG emissions include the following:

- Longwood Gardens
- Unionville High School and District Administration
- Charles F. Patton Middle School
- Unionville Elementary School
- Tri-M Group
- Walmart Super Center
- Shoppes at Longwood Village shopping center
- Marlborough Square shopping center
- New Bolton Center, University of Pennsylvania

4.0 Community-wide Transition

Those of us that live and work in East Marlborough Township have a permanent stake in this community, and the Township government is charged with planning for the best interest of the community over the long term. This responsibility should be used to convene stakeholders to develop a shared vision regarding how best to undertake mutually beneficial actions to accomplish the transition to building efficiency, the electrification of buildings and vehicles, and the increase in clean energy use.

The Township government plays a unique role as a neutral convener. The leadership role of the Township can be applied to enable voluntary private action through convening and planning partnerships with private-sector leaders, as well as programs to address barriers to action. Coordinated, community-driven efforts to promote energy-saving programs may increase involvement in voluntary programs and lead to significantly higher participation rates and levels of energy savings for residents and commercial consumers. Such efforts to organize action can help to identify and cultivate “champions for efficiency” who can use, in turn, their roles in the community to lead.

Influencing the practices and business models of a few building owners with large holdings as well as those of major service providers, such as construction firms and management companies, can change expectations and transform local markets. Real estate and construction markets often operate at a wider scale, so improved practices in East Marlborough Township can have regional impacts.

4.1 Consultation with Community Partners

While Energy Transition plans are often, but not always, led by local governments, effective climate action plans will engage the spectrum of energy consumers and community stakeholders. Inclusion of community partners helps to ensure that the plan is relevant, meeting a range of community goals with broad-based support for implementation. Inclusive stakeholder engagement can also generate ownership, encourage cross-sector collaboration, inspire complementary action, increase general awareness, and build capacity related to energy management.

A community-wide transition needs vigorous and enthusiastic leadership to succeed. The role of the previously discussed Energy Champions, the Township Manager and staff, Board of Supervisors, and the Environmental Advisory Council as supporters of a GHG-free energy future is essential to catalyzing action. Support from key private sector and non-governmental high energy users can be vital as they too set an example for others in the community. By recognizing the achievements of leaders and innovators in the broader community, the

Township can help publicize and mainstream the adaptation and mitigation measures that they have pioneered. ‘Bottom-up’ leadership from proactive community groups can also galvanize township-scale climate action.

The key sectors in East Marlborough Township include education, health, small business and non-profits, larger business, homeowners, and PECO. Consultation with each stakeholder group is encouraged and should be on-going. By meeting with each sector, the Township equips stakeholders with the information and access to program planners needed to be involved in a meaningful way and encourage a role in implementation. As importantly, such participatory processes capture relevant local knowledge and ensure that it is reflected in program design. Participation can take various forms, from formal consultations, outreach, and education programs to individual actions and public private partnerships designed to achieve ambitious community goals.

Unionville-Chadds Ford School District: The public schools in Pennsylvania are independent entities recognized by the Commonwealth. Each is administered under the authority of an elected school board which appoints the administrative official, sets policy, and approves the budget. All initiatives and actions to transition to GHG-free energy must be approved by the school board. Energy transition opportunities directly applicable to the public schools are include the following:

- Energy efficiency improvements in heating, cooling, and hot water supply.
- Energy conservation measures to minimize electrical and fuel usage, especially when the school is closed or out of session.
- Purchase of GHG-free electricity through power purchase agreements in coordination with other school districts and other large institutions.
- Geothermal systems and rooftop solar arrays.
- Gradual electrification of the school bus fleet as old buses are retired.
- Inclusion of sustainable energy practices in school curricula and vocational education.
- Inclusion of energy efficiency and GHG-free energy in new building construction.
- Inclusion of carbon drawdown initiatives wherever possible, primarily in appropriate landscaping techniques.

In addition, our schools provide a valuable function in educating and engaging their staff, students, and their families to take a leadership role in promoting energy conservation and efficiency and the implementation of GHG-free energy systems.

Local Businesses: Businesses are often in the forefront of energy efficiency efforts because these actions have demonstrated favorable returns on their investments for decades, saving them money while burnishing their image as companies that run sustainable operations. They

depend to some degree on maintaining solid relationships with their municipal officials, which might be the leading edge in gaining even further commitment to the larger energy transition goals of this plan. The Tri-M Group, with its current use of solar power, is an example of an energy champion business leader.

Nonprofits and Private Schools: Non-profit organizations and small private schools are medium-to-large energy users and have a stake in reducing their energy costs, since they often operate on limited funding. As with large institutions and businesses, it is in their interest to work with their municipality to reduce their energy use and costs, while contributing to the long-term sustainability of the community. Longwood Gardens, with its use of solar power, is an example of an energy champion non-profit leader.

Large Properties and Institutions: Owners and operators of institutions (such as universities, religious organizations, and retirement homes and continuing care facilities) are large energy users and have a stake in reducing their energy costs. They often have productive relationships with their municipal officials that may be leveraged to obtain their interest and cooperation.

Residents: The residents of the community are critical to the success of the plan and, as constituents of their municipal officials, can exert influence over this process. The operation of their homes and their activities within the community represent a significant portion of the energy consumed by the community as a whole, giving them not only the opportunity to reduce that consumption, but also emphasizing the major role they all play in providing a safe, healthy, progressive, and forward-looking community.

PECO: PECO is the utility which distributes electricity and natural gas to East Marlborough Township and the surrounding communities. It must be involved in the transition to GHG-free energy. PECO is part of the PJM regional grid, which operates under a deregulated system. In a deregulated system, the electrical generating companies, transmission companies, and distribution utilities must be independent entities. Any customer within the distribution utility's service area may purchase electricity directly from any electrical generation company or from the distribution utility. This allows for direct purchase of GHG-free electricity by the customer. The electricity is delivered through the distribution utility's electric grid and that particular utility is compensated for the distribution service.

Examples of the ways in which the distribution utility can assist in energy conservation and the conversion to GHG-free energy include the following:

- They can participate in rebate programs for energy efficiency measures and energy efficient equipment. Energy Star, a government-backed cooperative, is one of those rebate programs.
- They can facilitate easy and fast approval of connection of solar arrays to their system.

- They can use their influence with the PA Public Utilities Commission (PUC) to implement changes to purchasing of GHG-free electricity.
- They can upgrade their system to accommodate and take advantage of distributed energy resources (DERs).
- In conjunction with regional planning initiatives, they can facilitate the development of regional microgrids and storage applications.

County, Regional, and State Government: County, regional, and state governments have buildings, motor vehicle fleets, outdoor lighting, etc. which can be made greener. And county or regional planning groups (like the DVRPC, which has gathered greenhouse gas emissions data) pull together information on best practices in terms of technology adoption, zoning and building code model statutes (as Montgomery County has done) and provide wider forums for discussion of solarization and other sustainability goals. Counties can also put resolutions on the ballot, including visionary resolutions to promote change, resolutions for climate-positive administrative actions or tax or bond measures to finance GHG-free or weatherization programs. Another goal of coordination is to encourage higher levels of government, especially at the county level, to help coordinate the efforts of the municipalities that have taken the lead in this effort. This will both strengthen the planning process and assist in achieving increased uniformity and coordination between municipalities.

4.2 Greenhouse Gas Emission Reduction Strategies

Four basic strategies can eliminate manmade greenhouse gases in East Marlborough Township. Not all of these strategies can be carried out on the municipal level; however, Township government will be involved in or affected by all of them.

- Increase energy efficiency of electrical systems, such as for domestic hot water, stovetop cooking, and clothes washing and drying.
- Electrify building systems that currently use fossil fuels.
- Electrify transportation systems that currently use fossil fuels.
- Transition electricity generation away from methods that emit GHG.

4.2.1 Energy efficiency

According to the American Council for an Energy-Efficient Economy (ACEEE)³, energy efficiency can get us 50% of the way to the elimination of emissions of GHGs from energy sources. Stated alternatively, it would take twice as much clean energy to get to zero GHG emissions without

³ American Council for an Energy-Efficient Economy; Halfway There: Energy Efficiency Can Cut Energy Use and Greenhouse Gas Emissions in Half by 2050; September 2019; <https://aceee.org/research-report/u1907>.

implementing energy efficiency measures. The following is a list of the energy efficiency measures that will achieve this dramatic reduction in energy demand.

Energy efficient residential, commercial, and industrial buildings

- Building efficiency: The energy usage in homes and commercial and industrial buildings today can be substantially reduced through weatherization measures (air sealing and improved insulation of the building envelope) and increased efficiency of building heating and cooling systems, hot water heating, appliances, and lighting.
- New construction: The efficiency of new construction can be significantly improved through zero-energy, passive house and living building design and construction practices.
- Heat pumps: A substantial reduction in energy usage in building heating and hot water heating can be achieved by replacing fossil fuel-fired systems with heat pumps when the fossil fuel furnace or heater must be replaced. A heat pump uses considerably less energy than oil, propane, or natural gas due to its efficiency.
- Elimination/reduction of electrical resistance elements:
 - Incandescent lighting: About 5% of the electrical use provides light with the remainder expended as heat. It has become common to replace incandescent lights with light-emitting diodes (LEDs), which are more energy efficient.
 - Hot-water heater: Traditional water heaters use electrical resistance or fossil fuels to heat water. Newer energy efficient hot water heaters use an electric heat pump often with electrical resistance as a backup system.
 - Clothes drier: Traditional clothes driers use electrical resistance and a fan to exhaust the heated water vapors. Newer energy efficient driers use a heat pump to extract the moisture with no heated vapor discharge.
 - Cooking stoves: Traditional stovetops use electrical resistance or gas burners. New energy efficient stovetops use electrical induction.

Energy efficient transportation

- Reduction in travel by cars and light-duty trucks (LDTs). Reductions in travel can be achieved by:
 - Diversion of trips in cars and LDTs to public transit and by elimination of the need for trips in the first place through telecommuting for work and meetings,
 - Gradual but steady changes in land-use patterns that favor walking, bicycling, and public transit, and
 - Consolidation of trips for greater efficiency.

These strategies decrease the vehicle miles of travel (VMT) and associated energy usage.

- Replacement of ICE vehicles with electric vehicles. A substantial reduction in energy usage in motor vehicles can be achieved simply by replacing internal combustion engine (ICE) vehicles with electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs) when it is time to purchase a new car. An EV is conservatively 68% more efficient than an ICE vehicle. An ICE vehicle is only about 17%–21% efficient in converting energy to power, whereas an EV is over 77% efficient⁴.
- Energy efficiency in medium- and heavy-duty trucks (MDTs and HDTs). According to a review of the literature, the Union of Concerned Scientists has determined that a 50% reduction in energy usage can be achieved in MDTs and HDTs through efficiency measures such as improvements in engines and drive trains, aerodynamics, and tire and wheel design⁵. Tesla has developed a long-distance, electric-powered tractor trailer that demonstrates it meets all industry technical and economic requirements.⁶ Volvo and Freightliner are also developing electric powered trucks.⁷

4.2.2 Electrification

Electrification of building heating systems. The use of heat pumps and geothermal for heating and cooling buildings facilitates the conversion to electric sources of energy, which can be powered by GHG-free energy. Heating by oil, propane, or natural gas can never emit fewer GHGs due to the nature of the process, nor can they also provide air conditioning. A heat pump can.

Electrification of transportation. The conversion from ICE vehicles to EVs facilitates the conversion to electric sources of energy, which can be powered by GHG-free energy. Use of gasoline or diesel fuel can never emit fewer GHGs due to the nature of the process.

4.2.3 Conversion to clean energy generation

The final step in the transition to a clean energy future (not in time but in process) is to replace the generation of electricity by fossil fuels with alternate sources, such as solar, wind, nuclear, geothermal, and hydro power.

4.3 Resulting Emission Reductions

⁴ U. S. Department of Energy, Office of Energy Efficiency and Renewable energy, <https://www.fueleconomy.gov/feg/evtech.shtml>

⁵ Union of Concerned Scientists, <https://www.ucsusa.org/resources/heavy-duty-truck-fuel-efficiency>.

⁶ <https://www.tesla.com/semi>

⁷ Electrification: Opportunities in many but not all applications <https://www.aceee.org/blog-post/2020/02/electrification-opportunities-many-not-all-applications>

Close to 100% emission reduction of greenhouse gases can be achieved through currently existing technologies by 2040 as shown in Figure 2. One of the difficulties of considering a transition is the challenge to show what it will mean for the residents, the businesses, and the institutions that make up East Marlborough Township. The following is an effort to place the transition into more tangible terms, where government statistics make it possible to calculate the rate of transition. Table 5 shows the average rate at which the transition needs to occur for homes and for motor vehicles. It is important to point out that such changes would start gradually and extend over a period of twenty years. Consequently, the rate of change at the start will be considerably less than the average.

Figure 2
Graph Showing Path to Zero Emissions by 2040

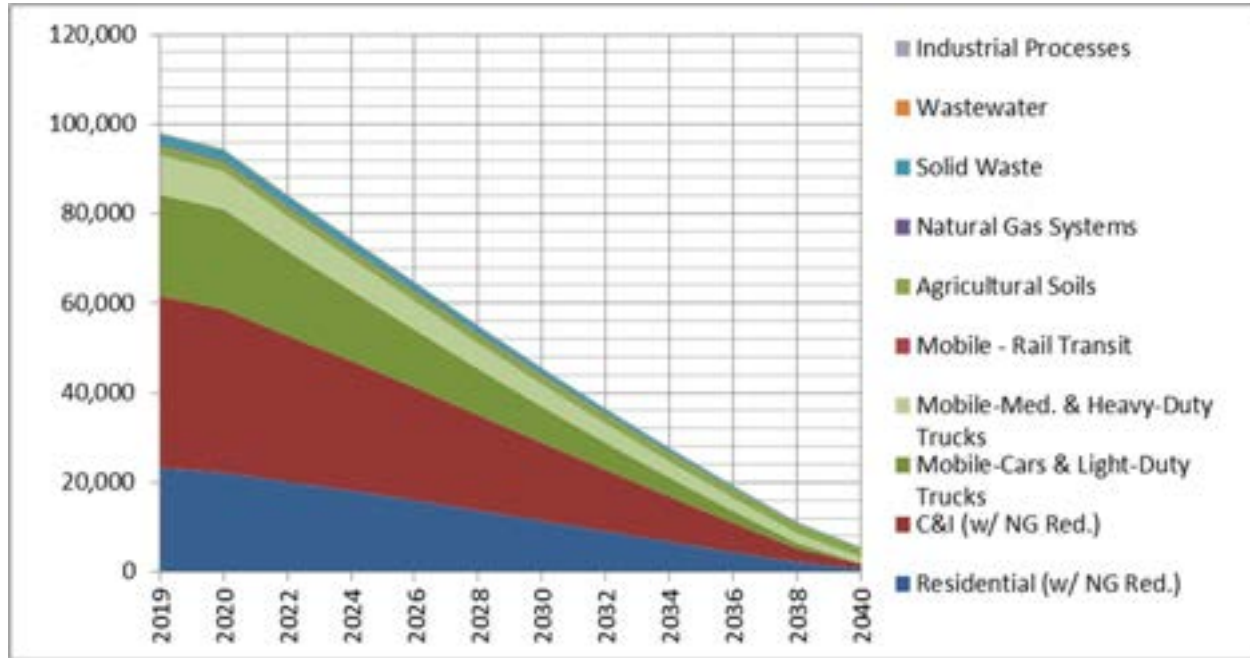


Table 5
Rate of Change in East Marlborough Township: Residential

Sector	Strategy	Initial Assumptions for Modeling	For East Marlborough Township	
		Description	Quantity Change/Yr.	Units
Residential (houses and apartments)	Existing Houses	Increased thermal efficiency through weatherization	4.0% of bldgs./year make 24% decrease	135 Housing Units
		Increase in electrical efficiency through energy eff. Lighting and Energy Star appliances	4.0% of bldgs./year make 24% decrease of a combination of buildings	135 Housing Units
		Oil and LPG heating replaced with heat pumps when existing furnace dies	Convert oil and LPG furnaces at 3.5%/year	53 Housing Units
		Natural gas heating replaced with heat pumps when existing furnace dies	Convert gas furnaces at 3.5%/year starting 2026	49 Housing Units

The residential changes shown in Table 5 indicate that on average 135 out of the approximately 2,700 housing units in East Marlborough Township would undergo weatherization improvements each year, many with funding and rebates from governmental agencies and PECO. The equivalent of on average 135 housing units would be upgraded each year with more efficient Energy Star appliances and LED lighting as the existing appliances and light bulbs need to be replaced, receiving rebates for these purchases. Fifty-three oil and propane furnaces would be replaced each year (when the furnace needs to be replaced) with high efficiency heat pumps, saving money on operating costs. Forty-nine natural gas-fired furnaces would be replaced each year (when the furnace needs to be replaced) with high efficiency heat pumps saving money on operating costs starting later (for instance in 2026), because of the economics of the conversion. (Note: While propane and natural gas are both gas fuels, natural-gas usage is tracked by a public utility (PECO) and propane use is independent.)- All of these changes would start at lower levels than the average as the residents and the businesses become familiar with the transition.

Although the purchase of EVs will start up slowly, on average from 2020 to 2040, more vehicles owned by residents and businesses in East Marlborough Township will be EVs. Finally, telecommuting and land use planning will eliminate the need for more people over the years to use a car. The great changes that we need to make are relatively easy when started now and made over a period of 20 years.

Improvements will be made through weatherization and electrical efficiency following the Energy Star methods and conversion of heating systems fired with oil, propane, and natural gas. Figure 3 provides a conceptual look at the change between 2020 and 2040 for homes that switch to electrical heat pumps. Figure 4 provides a conceptual look at the conversion to EVs between 2020 and 2040. Figures 5 and 6 show the projected amount of savings from efficiency measures in commercial and residential buildings, which can be used to offset the costs of energy transition.

Figure 3
Homes Switch to Electric

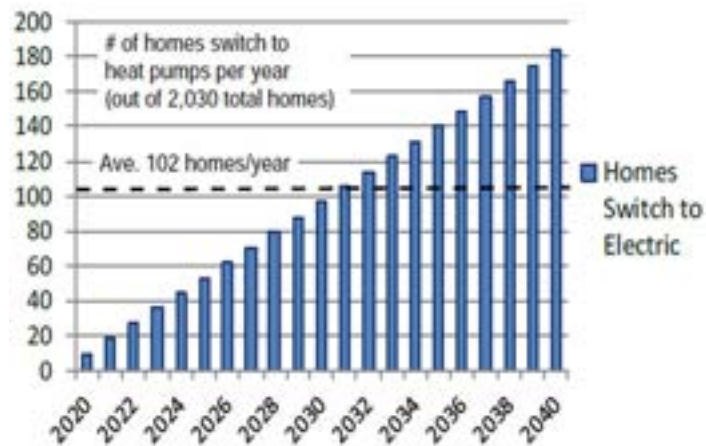


Figure 4
Increase in EVs Each Year

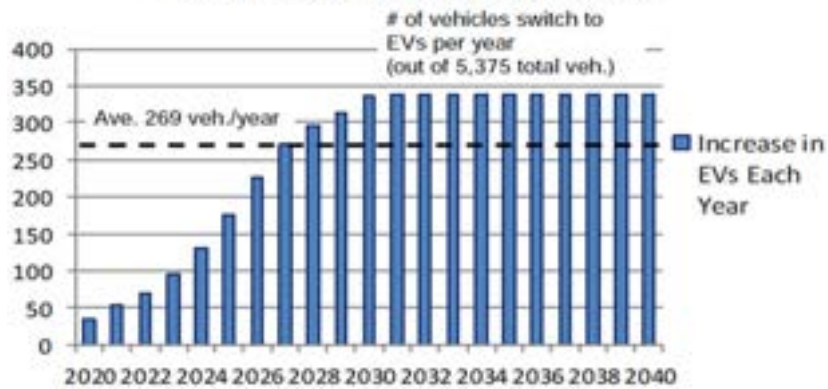


Figure 5
Savings from Energy Efficiency Measures in Buildings - Residential

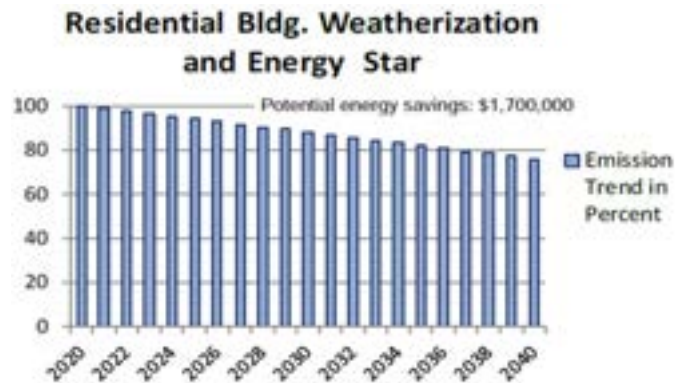
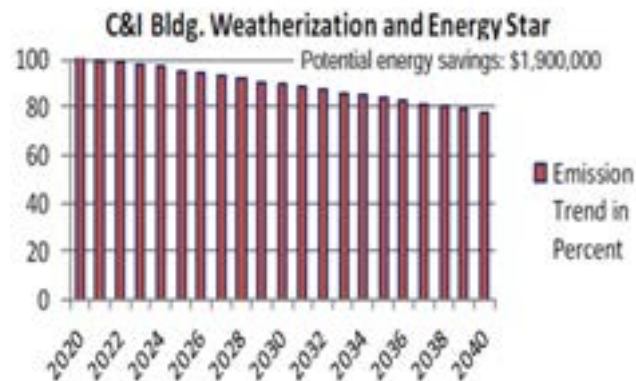


Figure 6
Savings from Energy Efficiency Measures in Buildings – Non-Residential



Additional benefits of energy efficiency in buildings. In addition to the GHG benefit, energy-efficient buildings powered by clean fuels and electricity do far more than reduce emissions.

- Health benefits. Improving energy efficiency in buildings creates conditions that support improved health and well-being for occupants. The reduction in use of heating oil and gas reduces local air pollution that translates to improved public health. Energy-efficient buildings also have better thermal quality and less mold caused by dampness. Positive health outcomes from better air quality and thermal comfort are consistently strongest among vulnerable groups, including children, the elderly, and those with pre-existing illnesses.
- Support for the local economy. The hundreds of retrofits required for East Marlborough Township to achieve carbon neutrality will also result in job creation and will increase the asset value of buildings.

4.4 Plan Implementation for Community

Public education

The Township will provide information and encouragement to all stakeholders in the community to use energy efficiently and transition to the electrification of HVAC, appliances and vehicles, and the use of GHG-free energy.

As a preliminary step towards public education, three flyers have been developed based on the results of this Energy Transition Plan as follows:

- 2021 Municipal Energy Report provided in Appendix C.
- 2021 Community Energy Report provided in Appendix D.

- Planning for a Healthier, Safer, Cleaner Future provided in Appendix E.

A unified national and statewide effort to reduce greenhouse was established with the Federal Inflation Reduction Act of 2022 (IRA 2022). While the IRA 2022 is not the only tool for reducing GHG emissions, it provides clear financial incentives that are now, or will soon be, available. As the IRA 2022 program evolves, the intent is to disseminate the information to Township stakeholders and encourage energy transitions.

A long list of potential energy transition methods is provided in Appendix F (Information Available for Energy Efficiency Measures and Energy Transition Methods). The list indicates who might benefit from various methods. However as mentioned above, IRA 2022 process is evolving to address many of the more vital methods for energy transition. The list is provided as an additional resource.

Residential Voluntary Efforts

Goal: Help Township Residents Increase Efficiency of Their Homes.

Actions: Inform residents of programs available to both homeowners and renters.

Tax credits up to 30% are available to homeowners under IRA 2022. The financial incentives are consistent with the primary strategies for existing houses listed above in Table 5, and a factsheet regarding the credits is provided as Appendix G. The annual caps for tax credits are as follows:

<u>Item</u>	<u>Annual Credit Cap</u>
Heat pump	\$2,000
Heat pump water heater	\$2,000
Insulation	\$1,200
Doors	\$500
Windows	\$600
Electrical Panel	\$600
Energy Audit	\$150

Informing the community that the above-list credits are available should be one of the most effective methods of encouraging action. Other factors of interest to homeowners include:

- Timing. If an aging heating and cooling system is soon to be replaced, do so with a more efficient heat pump system.
- Cost savings. Being more energy efficient corresponds to less energy usage and lower energy bills, especially if the system being replaced was not very efficient.

A rebate program under IRA 2022 will be administered by the Commonwealth of Pennsylvania, but was not available at the writing of this Plan. Rebates will include some of the items that qualify for the above-listed tax credits, but also specifically include efficient stovetops and heat pump clothes dryers. Qualification for rebates will be based on income eligibility. A factsheet regarding rebates is provided in Appendix H.

PECO also has rebate programs for heat pumps, Energy Star appliances (e.g., refrigerators, heat pump clothes dryers), and other items.

Existing homeowners are encouraged to participate in Home Performance with Energy Star programs.

- Promote residential energy efficiency PECO audits for all households.
- Collaborate with PECO to provide free audits for low-income households.
- Promote energy efficiency opportunities through outreach, workshops, and neighborhood challenges with a focus on:
 - A complete transition to high efficiency LED lights,
 - Weatherization and insulation,
 - Building controls (thermostats),
 - Replacing appliances with Energy Star appliances, and
 - Replacing boilers and furnaces with electric heat pumps.
- Promote energy efficiency improvements, such as adding insulation and pipe wrap to water heaters for residents.
- Sponsor activities related to the nationwide Energy Efficiency Day.⁸
- Promote workshops and programs offered by regional Green Building United.⁹

Goal: Help Township Residents Transition to Efficient Heating and Cooling

- GHG-free Heating and Cooling Marketing and Educational Campaigns. Establish and/or strengthen marketing and educational campaigns to raise awareness and understanding of building electrification technologies.
- GHG-free Heating and Cooling Group Purchasing Campaigns. Host or support a community group purchasing campaign that aims to raise awareness, educate residents,

⁸ Energy Efficiency Day (the first Wednesday in October) is a collaborative effort of dozens of energy efficiency advocacy groups around the United States, including the American Council for an Energy-Efficient Economy (ACEEE), Advanced Energy Economy, Alliance to Save Energy, Natural Resources Defense Council, the Regional Energy Efficiency Organizations and many others. <https://energyefficiencyday.org/>

⁹ Green Building United is based in Philadelphia. <https://greenbuildingunited.org/>

and connect prospective customers with qualified contractors that may be able to offer heat pump installations at a discounted rate.

- GHG-free Heating and Cooling Financial Incentives. Identify and provide incentives to reduce the upfront costs of building electrification technologies.

Business/Commercial Specific

East Marlborough Township's commercial buildings range from small buildings that use residential heating equipment to campuses, office buildings, and medical facilities. The Township also has a range of commercial heating systems, which primarily use natural gas. Building owners should be encouraged to consider the following actions to reduce energy consumption and obtain the remainder of the energy they use from GHG-free sources:

Energy Disclosure, Benchmarking and Audits

- Promote the use of Energy Star Portfolio Manager through a coordinated outreach program for different stakeholder groups within the commercial sector.
- Coordinate with PECO regarding aggregated efforts for benchmarking training and support.
- Consult with PECO on audits for major stakeholders (school district, multifamily housing, businesses, etc.).
- Encourage local businesses and business associations (Chambers of Commerce, etc.) to enroll in the U.S. Department of Energy, Better Building Challenge for the commercial sector.¹⁰

Energy Efficiency and Electrification

- Promote energy efficiency opportunities through outreach, workshops, and neighborhood challenges.
- Identify and provide incentives for energy efficiency retrofits.
- Collaborate with PECO to provide rebates and incentives to replace old or inefficient boilers and furnaces with air-source and geothermal heat pumps.
- Improve access to Commercial Property Assessed Clean Energy (CPACE) and other specialized financing mechanisms.¹¹
- Support CPACE to fund GHG-free installations and energy efficiency.
- Promote energy efficiency improvements such as adding insulation and pipe wrap to water heaters for businesses.

¹⁰ U.S. Department of Energy, Better Buildings Challenge. <https://betterbuildingssolutioncenter.energy.gov/challenge/about>

¹¹ U.S. Department of Energy, Better Buildings. <https://betterbuildingssolutioncenter.energy.gov/financing-navigator/option/cpace>

- Facilitate peer-to-peer information sharing among building owners.
- Facilitate education and accreditation for contractors, architects, and property managers.
- Expand participation in voluntary incentive programs for upgrading old or inefficient equipment.
- Educate regarding the benefits of cool roofs to reduce heating and cooling needs.
- Sponsor activities related to the nationwide Energy Efficiency Day.¹²
- Promote workshops and programs offered by regional Green Building United.¹³

School Specific

- Encourage enrollment in the [Better Building Challenge for K-12 school districts](#) for local school district. Coordinate with other townships in the school district.¹⁴
- Promote the use of Energy Star Portfolio Manager through a coordinated outreach program for different stakeholder groups.
- Coordinate with PECO regarding aggregated efforts for benchmarking.
- Promote education and outreach to schools about the Local Government efforts to save costs and reduce greenhouse gas emissions, as well as best practices that can be implemented in the schools.
- Encourage any post-secondary institutions to join the Better Building Challenge.¹⁵

¹² First Wednesday in October. <https://energyefficiencyday.org/>

¹³ Green Building United is based in Philadelphia. <https://greenbuildingunited.org/>

¹⁴ <https://betterbuildingssolutioncenter.energy.gov/challenge/sector/k-12-school-districts>

¹⁵ U.S. Department of Energy, Better Buildings Challenge.
<https://betterbuildingssolutioncenter.energy.gov/challenge/about>

5.0 Municipal Transition

Energy transition for municipal operations is in some ways easier than for the Township's Community. For one, the Board of Supervisors has committed to energy transition as stated in Resolution 2020-32 (see Appendix A). Also, the municipality has already taken certain actions, such as the following.

- Solar Power Generation. The Township has installed and put into use the solar panels located at the Township building.
- Street lighting. The municipality has been replacing street lighting with LED lamps.

Most of the GHG emissions (92%) were from three sources: the wastewater treatment plant, wastewater spray irrigation, and motor vehicles. The baseline for total carbon emissions from East Marlborough Township municipal operations was established in Section 3.1 (Energy Profile for Township Municipal Operations).

- Wastewater Treatment Plant (55% GHG emissions). The wastewater treatment plant has significant electrical usage compared to other municipal operations. Much of the energy usage is attributed to fans and pumps, such as for aeration and the movement of wastewater and sludge. A great deal of research into energy efficiency at treatment plants in general has been conducted by federal and state agencies and others. Selection of pipe sizes, pumps, and pump controls is a key process towards energy efficiency. Options for energy efficient treatment plants include upgrading pump controls to Adjustable Speed Drives (ASDs) also referred to as Variable Frequency Drives (VFDs).

An energy audit of the treatment plant has been conducted, and a report is provided in Appendix I. The audit report provides several recommendations including for the installation of VFDs.

- Motor Vehicles (28% GHG emissions). Emissions from municipal motor vehicles were calculated from the 2019 volume of gasoline and diesel fuel purchases (4,880 and 10,570 gallons, respectively). Municipal "motor vehicles" use internal combustion engines (ICE), and may include mowers, tree chippers, police cruisers, and snowplow/dump trucks. Where technically practical and cost effective, ICEs should be replaced with electrical vehicles (EVs) or hybrids (combined ICE and EV) as vehicles reach their expected lifetime or lease termination. Additionally, biodiesel should be considered as an alternative to standard diesel fuel.

- Wastewater Spray Irrigation (9% GHG emissions). The high energy usage by the spray irrigation systems is likely related to pump usage. Approaches to energy transition for spray irrigation should be evaluated simultaneously with the wastewater treatment plant.

Tax incentives are available to the municipality under a program initiated in 2022. The program under the IRA 2022 is called “elective pay” and results in direct payment to tax-exempt government agencies (and other) based on filed tax returns. A factsheet from the Federal Internal Revenue Service is provided as Appendix J, and some of the listed elective pay credits include the following:

- Production Tax Credit for Electricity from Renewables, such as solar power. The credit is based on the kilowatts produced.
- Credit for Qualified Commercial Clean Vehicles, for vehicles used on public streets and roads. The qualifications for such vehicles are very specific and may not apply to many vehicles that seem energy efficient. For example, certain EVs may qualify, but not hybrids. The credit is up to \$40,000 with a maximum of \$7,500 for vehicles less than 14,000 pounds.

6.0 Conclusions

This Energy Transition Plan was developed as a starting point to benchmark current GHG emissions, identify our largest emitters, identify potential leadership and partners, provide some initial specific tasks, and outline broader outreach goals for community participation. The Plan is intended to be broad with the understanding that the goal of reducing GHG emissions is clear and that there will be multiple paths to be pursued to accomplish the goal.

7.0 Clean Energy Transition Recommendations

A few initial recommendations to consider that are specific to municipal operations include the following.

- **Energy Champion(s):** Identify energy champions as described in Section 2.0 (Energy Identification of Energy Champions). The intent is to move energy transition forward for the municipality and the Township stakeholders forward in a timely manner. Township Resolution 2020-32 sets goals for the year 2035 and 2040. The Energy Champion will be identified by the Township's Board of Supervisors.
- **Energy Star:** Benchmark Township-owned facilities on a regular basis using Energy Star Portfolio Manager. The U.S. Environmental Protection Agency developed this program as a secure online tool to measure and track energy usage and GHG emissions. The program is designed for tracking non-residential buildings and includes benchmarking for wastewater treatment plants.
- **Energy Audit:** Have an energy audit completed on the municipal facilities. PECO has a free high-level facilities audit program, but it is not likely to be available indefinitely. In addition to or in place of the PECO audit, contract with an energy consultant for an operational audit of municipal facilities. The audit should generate a set of site-specific recommendations.
- **Implement Recommendations from Wastewater Treatment Plant, Energy Audit:** A Utility Energy Audit was completed for the wastewater treatment plant, and the report is provided in Appendix I.¹⁶ The treatment plant is the municipality's largest cause for GHG emissions and, therefore, implementation of the recommendations provided in the report are hereby recommended as well. The recommendations include the addition of Variable Frequency Drives to lagoon aerators. The report also provides information for potential funding sources.

¹⁶ The Utility Energy Audit Report was prepared by PA Rural Water Association. The report has no date and was completed in or around 2020.

- Solsmart: Consider seeking assistance from Solsmart. Solsmart is a national organization that provides no-cost technical assistance to local governments that want to increase the use of solar power in their communities. The program has five areas of focus:
 - Permitting and inspection.
 - Planning and zoning.
 - Government operations.
 - Community engagement.
 - Market development.
- Fleet: Conduct a fleet-wide inventory of vehicles and identify those that could be replaced with hybrid or electric vehicles. Also, consider the purchase of biodiesel instead of standard diesel fuel.

8.0 Acknowledgements

This Energy Transition Plan was made possible through the volunteer services of many dedicated individuals including:

- East Marlborough Township, Board of Supervisors
- East Marlborough Township, Environmental Advisory Council (EAC)
- Clean Energy Planning Series coordinators and participants.

To develop this Plan, the Township committed to participation in an innovative Clean Energy Planning Series, which was a cooperative effort between multiple municipalities in southeastern Pennsylvania. Township representatives included Mr. Eric Matuszak of the Board of Supervisors and Mr. Andy Jenkins of the EAC.

We express our appreciation to Ms. Paula Kline as the lead facilitator, Mr. Henry Alexander as lead data evaluator, and many other contributors. During the planning process, Ms. Kline was recognized by Green Building United as a 2020 Groundbreaker Award Finalist, “For envisioning and leading the Clean Energy Planning Series for Ready For 100 Communities in southeastern PA.”

**DRAFT
APPENDICES**

**ENERGY TRANSITION PLAN
FOR
EAST MARLBOROUGH TOWNSHIP**

**APRIL 7, 2021
Updated August 16, 2023**

APPENDIX A

Resolution 2020-32

**EAST MARLBOROUGH TOWNSHIP
CHESTER COUNTY, PENNSYLVANIA**

RESOLUTION 2020-32

A VISION FOR A 100% CLEAN ENERGY FUTURE

WHEREAS, disruption of the natural climate by emissions of Greenhouse Gases (GHG) poses an existential threat to the world;

WHEREAS, we are already experiencing violent weather arising from the rise in GHG pollution from the use of fossil fuels and that weather poses immediate risks to the Township;

WHEREAS, climate disruption will test our infrastructure, emergency and social services; impact our access to food, water and energy supplies; and heighten disruption of services, commerce and quality of life;

WHEREAS, the 2015 United Nations Climate Change Conference in Paris resulted in a consensus among all 195 countries to limit the increase in global average temperatures to well below 2° C, ensure that GHG emissions will not exceed sinks (total carbon capture) by the second half of this century, and become carbon neutral between 2050 and 2100;

WHEREAS, the most recent report of the Intergovernmental Panel on Climate Change ("IPCC") concluded that exceeding a temperature increase from GHG pollution of 1.5° C would result in severe adverse impacts in terms of species extinction, severe weather, sea level rise;

WHEREAS, Article I, Section 27 of the Pennsylvania Constitution makes the Commonwealth and all of its constituent units, including the Townships, trustees of the Commonwealth's public natural resources for all Pennsylvanians, including future generations;

WHEREAS, the United Nations Framework Convention on Climate Change ("UNFCCC"), a treaty to which the United States is a party, requires that the nations of the world take action to prevent dangerous anthropogenic interference with the climate system and requires the developed world to take the lead;

WHEREAS, the Township's duty as a trustee includes taking all measures within its authority to reduce GHG pollution to the levels necessary to avoid the worst ravages of climate disruption;

WHEREAS, the Township is committed to being a community characterized by health, safety, livability, prosperity and equity;

WHEREAS, the Township has joined with others in petitioning the Pennsylvania Environmental Quality Board to have Pennsylvania initiate a GHG auction-cap-and-trade program that will reduce GHG emissions in all sectors of the economy to achieve the reductions that the IPCC and the nations of the world have found necessary to meet the goals of the UNFCCC;

WHEREAS, achieving the GHG emissions reductions necessary to avoid the worst ravages of climate disruption will require decarbonization of the electricity generation sector and electrification of the transportation sectors, heating and cooling of buildings, and the industrial sector, while encouraging maintenance and enhancement of forests and soils;

WHEREAS, achieving the GHG emissions reductions necessary to avoid the worst ravages of climate change will require and “all-of-the-above” strategy that employs all technologies that do not release GHGs into the atmosphere from fossil sinks and technologies that return GHGs to fossil sinks;

WHEREAS, strategies for achieving a cost effective, even cost saving, energy source transition include collaboration with state and local energy leaders and participating in aggregated procurement contracts for electricity that do not emit greenhouse gases, and increase the deployment of electric vehicles and electric vehicle infrastructure as well as collaboration in establishing entities such as sustainable energy utilities that will facilitate investment by individuals in energy conservation and efficiency and non-emitting electricity generation;

WHEREAS, A GHG-free energy initiative can produce energy cost savings for residents and local businesses while stimulating new economic activity and local jobs while providing life-protecting benefits for everyone;

NOW, THEREFORE, BE IT RESOLVED, East Marlborough Township will join other leading municipalities in the national movement to transition to 100% clean GHG-free energy community-wide, and complete this transition for 100% clean GHG-free electricity by 2035 and 100% clean and GHG-free energy for heat and transportation by 2040;

The Board of Supervisors will provide guidance for the EAC, with the help of a contractor, if necessary, to draft an energy transition plan for achieving these goals by the Township and its residents to include interim milestones, financial impacts, equity metrics, potential financing mechanisms and percentage of clean energy that is locally produced;

The Report shall include recommended changes in Township ordinances and practices in order to promote the use of GHG-neutral energy sources, energy conservation and efficiency, electrification of the transportation and building sectors, and preservation and enhancement of carbon sinks in forests and soils, and use of carbon sequestration as well as measures that the Township can take in its own infrastructure to further these goals;

The GHG-neutral energy will be defined as energy generated by sources that are either: carbon-free and pollution-free energy, including both that generated sustainably from renewable sources such as wind, solar, hydro, tidal, fuel cells, geothermal, biomass, nuclear; or technologies which capture carbon and use or sequester it;

- Locally produced and distributed energy is prioritized whenever feasible for the many advantages it provides to the community;
- All East Marlborough Township stakeholders will have the opportunity and will be encouraged to participate in the planning and implementation process;

- The Board of Supervisors of East Marlborough Township call on the Commonwealth of Pennsylvania to take measures to facilitate the ability of the Township and other municipalities to achieve these goals and to establish a goal to reach GHG neutrality by 2050.

Approved this 3rd day of August 2020 by the Board of Supervisors of East Marlborough Township.

Attest:



Neil Lovekin, Secretary / Manager

BOARD OF SUPERVISORS



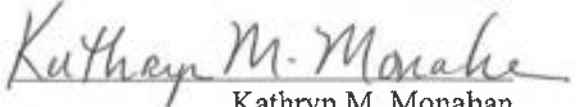
Robert B. McKinstry, Jr., Chair



John Sarro, Vice-Chair



Eric Matuszak



Kathryn M. Monahan



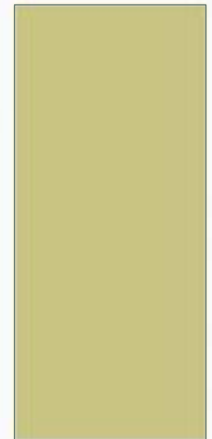
Burling Vannote

APPENDIX B

Presentation to EAC, November 2020

ENERGY TRANSITION PLANNING

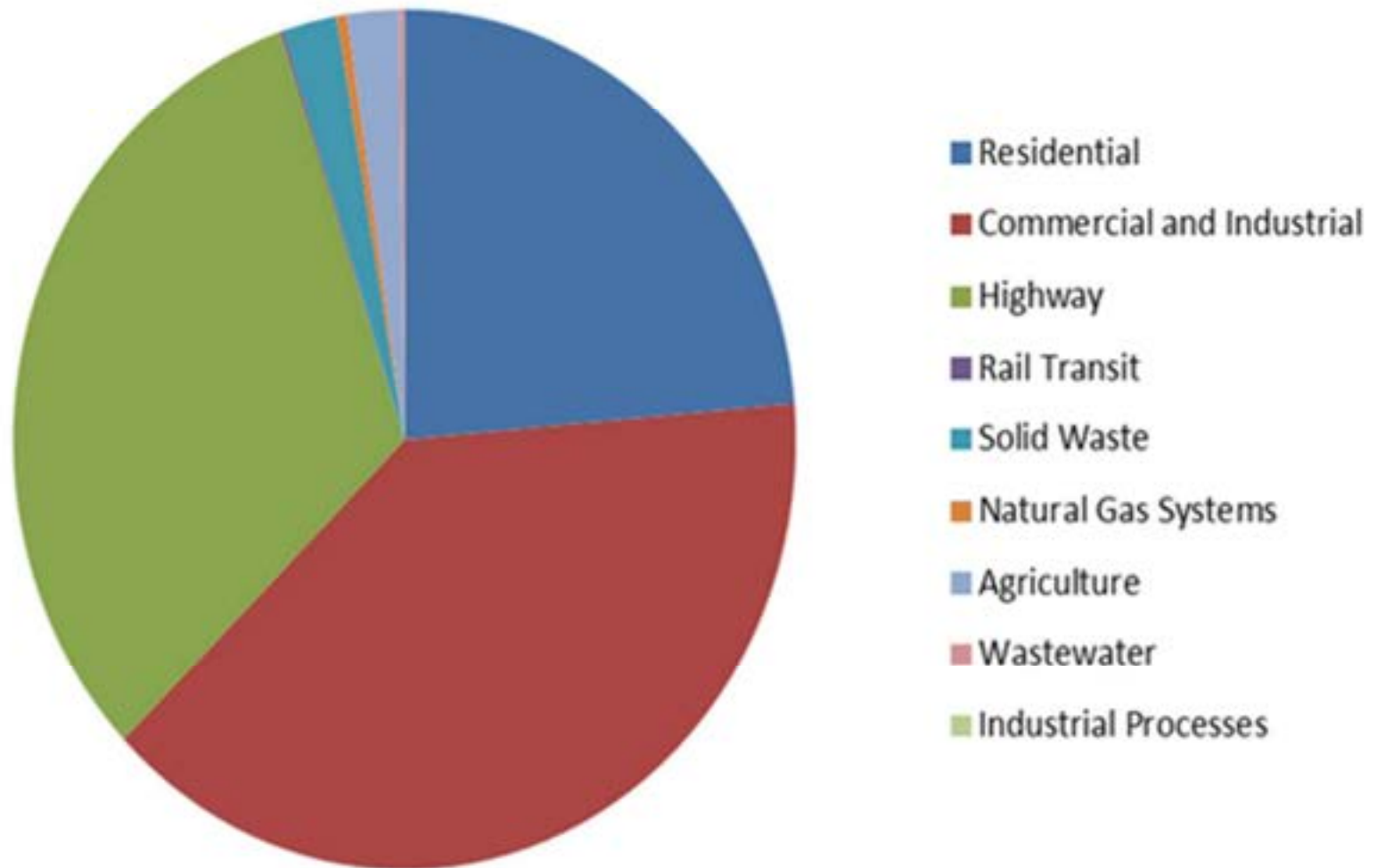
EAST MARLBOROUGH TOWNSHIP
NOVEMBER 2020



A VISION FOR A 100% CLEAN ENERGY FUTURE

- Township Resolution 2020-32
- Community-wide, 100% GHG-free:
 - Electricity by 2035 and
 - Heat and transportation by 2040.
- EAC to draft an Energy Transition Plan

2015 GHG Emission Inventory of East Marlborough Township



East Marlborough

Facility Nickname	Total Annual Electric Consumption (kWh)	Total Annual Gas Consumption (Ccf)	Facility Type	Street Address	Carbon Emissions from Electricity	Carbon Emissions from NG	Liquid Fuel Emissions	Total Carbon Emissions	% of Total Emissions
Motor Vehicle Fuel							??	??	
EAST MARLBOROUGH TWP	748,511		Other-Utility	701WOLLASTON RDPMP STATION	284.50			284.50	76.1%
EAST MARLBOROUGH TWP	120,827		Other-Utility	OSTREET RDPUMP ST BYRD RD	45.92			45.92	12.3%
EAST MARLBOROUGH TWP	31,102		Government Office	721UNIONVILLE RDTRLR	11.82			11.82	3.2%
SUPV OF E MARLBOROUGH	21,236		Other-Utility	0PUMP STAPUMP STA	8.07			8.07	2.2%
EAST MARLBOROUGH TWP	14,983		Other-Utility	123SOLTNER DRPMP STA	5.69			5.69	1.5%
EAST MARLBOROUGH TWP	13,430		Other-Services	517N WALNUT RDPUMPING STATION	5.10			5.10	1.4%
EAST MARLBOROUGH TWP	9,269		Other-Utility	545SCHOOLHOUSE RDPMP STA	3.52			3.52	0.9%
SUPV OF E MARLBOROUGH TOWNSHIP	9,056	1,518	Government Office	721UNIONVILLE RDRS-INOUT	3.44	0.08		3.52	0.9%
EAST MARLBOROUGH TWP	7,678		Other-Utility	0DOE-RUN RDPUMP STN	2.92			2.92	0.8%
SUPV OF E MARLBOROUGH T A PUMP	6,770		Other-Utility	0MEADOWBANK RDPUMP	2.57			2.57	0.7%
EAST MARLBOROUGH TWP	25		Property Management	1722W DOE-RUN RDBATHROOM	0.01			0.01	0.0%
EAST MARLBOROUGH TWP	17		Property Management	1722W DOE-RUN RDRECEPTICLES	0.01			0.01	0.0%
EAST MARLBOROUGH TWP	2		Government Office	1754DOE-RUN RDLTG	0.00			0.00	0.0%
Total	982,906	1,518			373.59	0.08	??	373.66	100.0%

PATH AHEAD

- Draft Energy Transition Plan.
- Part I – Municipal
 - Buildings
 - Street and traffic lights
 - Wastewater treatment
 - Procurement (fleet, HVAC, equipment, etc.)
- Part II – Policy/Code development
 - Municipal
 - Community – Construction. Encourage solar. Promote clean energy upgrades.

INTERIM STEPS

- Municipal facilities
 - Self audit utility bills
 - Free energy audits by PECO
 - Consult with SolSmart...free help to local governments for advancing solar.
- Community
 - Quantify number of buildings and houses to upgrade



APPENDIX C

2021 Municipal Energy Plan



East Marlborough Township

East Marlborough Township is taking leadership to make the clean energy choices necessary to protect the best of our Township for future generations. Clean energy is about good public policy, responsible resource stewardship and enhancing the quality and resilience of our community.

In August 2020, East Marlborough Township Supervisors made a resolution, a Vision for a 100% Clean Energy Future, to declare its commitment to a transition to clean energy, upholding the terms of the 2015 Global Climate Agreement. There are now more than two dozen renewable energy resolutions in southeastern PA and more than 170 municipal resolutions across the country along with 10 county and 8 state resolutions. This report is the work of the planning group charged with developing an Energy Transition Plan in 2021. East Marlborough is leading by example by undertaking variety of activities aimed at reducing greenhouse gas emissions.

How does East Marlborough use energy?

East Marlborough Township invests in, owns, and manages physical infrastructure used to provide public services. This infrastructure includes the Township office building, police department offices, the sewage treatment plant, outdoor lighting, and fleet vehicles. There are approximately a dozen vehicles in the Township fleet. East Marlborough's roadways are lined by a relatively low number of streetlights and traffic signals that manage traffic flow at seven intersections. This public infrastructure enables the Township government to efficiently manage administrative responsibilities and provide the services, amenities, and leadership that East Marlborough residents have come to expect. These physical assets also provide an opportunity for East Marlborough to lead by example through taking actions to improve the efficiency of energy use directly under its care.

In 2019, East Marlborough spent roughly \$ 123,000 on energy—about 4% of the total Township budget. Understanding how these costs break down is the first step towards being able to reduce them.

2019 EAST MARLBOROUGH TOWNSHIP OPERATIONS BASELINE INVENTORY RESULTS

Measuring emissions facilitates strategic efforts to reduce them. An understanding of our current energy use and spending represents the first step in a planning process to identify activities to increase municipal energy efficiency and invest in renewable energy.

The data for this baseline was assembled from Township accounts with PECO, third party vendors, consultations with municipal staff, and from the Delaware Valley Regional Planning Commission (DVRPC) Greenhouse Gas (GHG) Emission Inventory.



FACILITIES

40

MEGAWATT-HOURS
OF ELECTRICITY

1,520

CUBIC FEET OF
NATURAL GAS

15

METRIC TONS
TOTAL GHG EMISSIONS

\$3,400

TOTAL ENERGY COST



WASTE WATER

943

MEGAWATT-HOURS
OF ELECTRICITY

0

CUBIC FEET OF
NATURAL GAS

358

METRIC TONS
TOTAL GHG EMISSIONS

\$80,100

TOTAL ENERGY COST


FLEET VEHICLES
& EQUIPMENT

4,880

GALLONS OF
GASOLINE

10,570

GALLONS OF
DIESEL FUEL

146

METRIC TONS
TOTAL GHG EMISSIONS

\$43,360

TOTAL FUEL COST

OUR
HIGHEST
EMITTERS

WASTEWATER
TREATMENT PLANT
284 TONS

MUNICIPAL
VEHICLES
146 TONS

WASTEWATER
SPRAY
IRRIGATION
46 TONS

55%

28%

9%

East Marlborough Township: Leading by Example

Our Approach

Energy efficiency in
buildings and operations

Electrification of heating
systems and vehicles

What We've Done - Municipal

- ✓ Solar panels installed at Township Complex.
- ✓ In the process of replacing existing street lighting with light emitting diode (LED) lamps, which will save both money and energy.

What We Want to Do - Municipal

- Upgrade Wastewater Treatment System
- Retrofit Township Building
- Complete Public Lighting Conversion to LEDs
- Transition Fleet to Hybrids and Electric Vehicles
- Feasibility Study for Additional Solar Installations

APPENDIX D

2021 Community Energy Plan

East Marlborough

Our goal is to offer more and better choices for citizens to live, work, and play in the heart of East Marlborough. We envision a future that increases the availability of clean energy and creates new jobs. A future that minimizes the costs of operating buildings while maximizing the health and productivity of their occupants. A future that reuses existing infrastructure, sends less waste to landfills, and builds a clean transportation network that supports walking, biking, and electric vehicles.

After passing a Clean Energy Resolution, East Marlborough Township undertook a municipal and community-wide energy profile, including a greenhouse gas (GHG) emissions inventory as a first step. A GHG emissions inventory is an audit of activities that contribute to the release of polluting emissions.

WHERE DO OUR POLLUTING EMISSIONS COME FROM?



Combustion of oil and natural gas in buildings



Gasoline and diesel combustion in vehicles used to transport people and goods



Emissions from the electricity we use



Local industrial process and product use including refrigerant gas loss (leaks) from buildings and vehicles and natural gas loss from local distribution systems



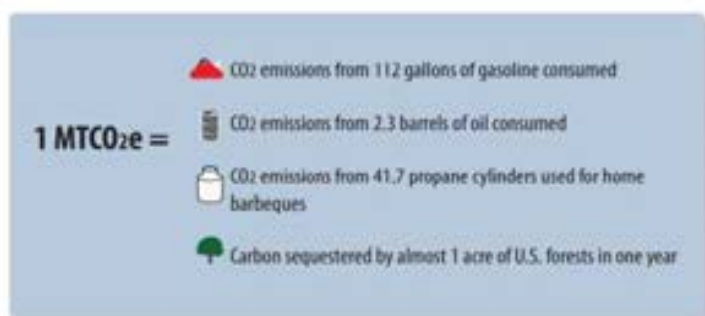
Waste, including landfill disposal of community solid waste and wastewater treatment systems

Every five years the Delaware Valley Regional Planning Commission (DVRPC) creates an inventory of Greater Philadelphia's energy use, energy expenditures, and GHG emissions to understand our impact on climate. Tracking energy use, energy expenditures, and GHG emissions over time enables us to know how best to increase energy efficiency and how to transition to GHG-free energy most effectively, and so reduce GHG emissions. DVRPC's most recent inventory is for 2015. The 2020 inventory is being prepared.

The inventory estimates energy use and GHG emissions for our community. It covers the residential, commercial, and industrial sectors, as well as transportation sectors (on-road transportation, passenger and freight rail, aviation, and off-road vehicles and equipment). DVRPC also includes non-energy GHG emissions from waste management (solid waste and wastewater), agricultural processes (animal- and plant-related), industrial processes, and fugitive and process emissions from natural gas and petroleum systems. DVRPC also estimates carbon dioxide (CO₂) taken up or released by the growth or loss of trees and forests.

The complete report can be found online at <https://www.dvrpc.org/webmaps/MunicipalEnergy/>

Some tips for understanding the [2015 GHG Emission Inventory](#). In the DVRPC Inventory, “commercial sector” refers to facilities such as office buildings, warehouses, retail outlets, schools, and some large-scale residential units.



Did You Know...?

MTCO₂e stands for metric tons of carbon dioxide equivalent. MTCO₂e is the metric used to describe emissions from greenhouse gases such as carbon dioxide, methane, and nitrous oxide. Because these gases have different global warming potentials, they are converted and aggregated into a single metric, MTCO₂e, in order to explain GHG emissions information.

HOW DOES OUR COMMUNITY CURRENTLY USE ENERGY?

We ALL use energy in everything we do!

None of us wants to pollute or do harm when we turn on the lights, cook dinner, go to work or enjoy a recreational activity. The good news is that with existing technology, we can continue to live full and rewarding lives at home and at work while phasing out fossil fuels and *phasing in efficiencies and renewable energy*.

Combating extreme weather, forest fires, flooding, and other climate change impacts needs to start locally. Once we understand where we are now, we can begin to take the steps for safer, cleaner, healthier energy. Just as generations before us switched from wood and whale oil to crude oil and coal, we will make the switch to renewable energy sources.

ABOUT THE TOWNSHIP



7,283 people



2,707 households
87.3% home ownership



5,264 jobs



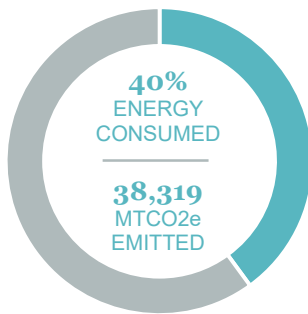
\$112,100 median household income



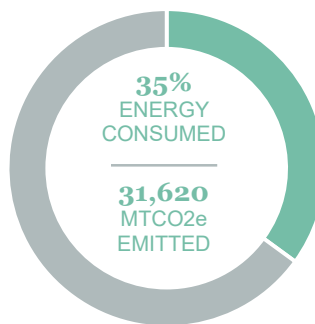
small commercial sector

WHERE WE USE THE MOST ENERGY (2015)

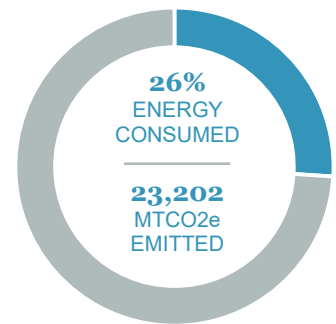
COMMERCIAL & INDUSTRIAL SECTOR



TRANSPORTATION SECTOR



RESIDENTIAL SECTOR



WE SPEND A LOT OF MONEY ON ENERGY EVERY YEAR

The total cost of the energy used in the residential, commercial, and industrial sectors and for on-road vehicle travel is estimated to be **\$23,782,315**.



APPENDIX E

Planning for a Healthier, Safer, Cleaner Future

Planning for a healthier, safer, cleaner future

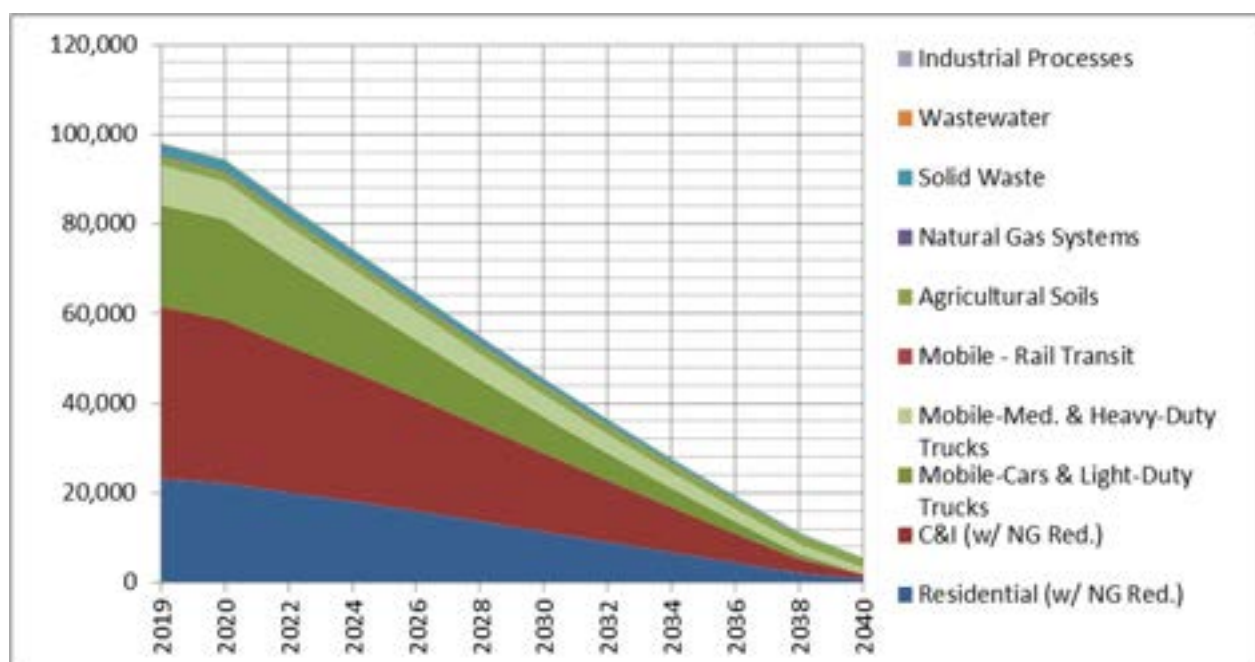
East Marlborough is a community which puts public health, safety, resilience, and overall quality of life first. We are confident that our community has the strength, leadership, skills, compassion, and ability to achieve a transition to renewable energy.

In August 2020, East Marlborough Township passed a resolution towards a Vision for 100% Clean Energy Future committing to a clean energy transition goal for electricity by 2035 and for all other purposes by 2040. In passing the resolution, the Board of Supervisors committed to creating a plan for how the entire East Marlborough community could transition to 100% renewable energy* by the year 2040.

In 2020, we began a planning process to create a roadmap to meet these goals. We started by identifying our municipal pollutant emissions. 2021 will include developing a set of strategies and actions that will guide the municipality and community as we work together to reduce our fossil fuel use.

From recent studies and reports, it is becoming clear that global carbon emissions must be cut in half by 2030. We cannot wait until the 2040 target for deep power-sector decarbonization. Fortunately, dramatic reductions in the costs of solar energy, wind energy, and battery technologies offer the potential to accelerate this timeline. Close to 100% emission reduction of greenhouse gases can be achieved in our highest emitting sectors by using the technologies we have available right now as shown in Figure A.

Figure A
Graph Showing Path to Zero Emissions by 2040



* A 100% goal is fully achieved when the amount of **energy** generated from **renewable energy** sources equals or exceeds **100%** of the annual **energy** consumed. Other terms are used for this as well, including net-zero energy and decarbonization.

PLAYING OUR PART

We know that all groups of our community will need to do their part. To lower our emissions and reduce pollution, our best opportunities are to create voluntary programs that have the greatest impact on greenhouse gas emissions. Let's work together to significantly improve the energy efficiency in our homes, businesses, schools, places of worship, recreational sites, and government facilities.

1/

EFFICIENCY

Weatherization
Insulation
Advanced lighting
Energy management systems
Benchmarking and audits

2/

ELECTRIFICATION

Efficient Heating and Cooling
with Heat Pumps
Energy Star electric
appliances and water heaters
Plug-in hybrid and electric
vehicles

3/

RENEWABLE ENERGY

Purchase renewables through
PA Powerswitch or Power
Purchase Agreements

On-site and off-site generation
of greenhouse-gas free energy.

Combined, these actions can get us to zero emissions, based on our current greenhouse gas emissions profile. We modeled what this would look like in our community if we start now.

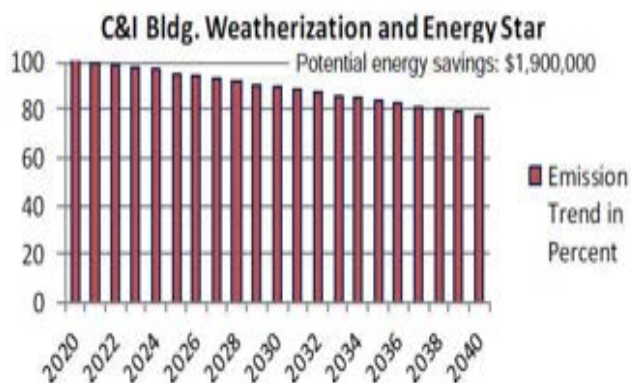
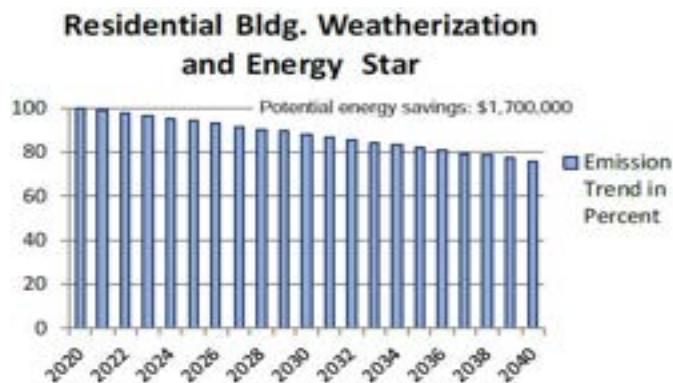
WE ASKED THE MODEL

To meet the emissions, reductions needed and lower pollution, at what rate do we need to:

- adopt efficiency measures?
- replace worn out heaters and furnaces with heat pumps?
- replace older vehicles with hybrids and electric cars?
- buy or install renewable electricity?"

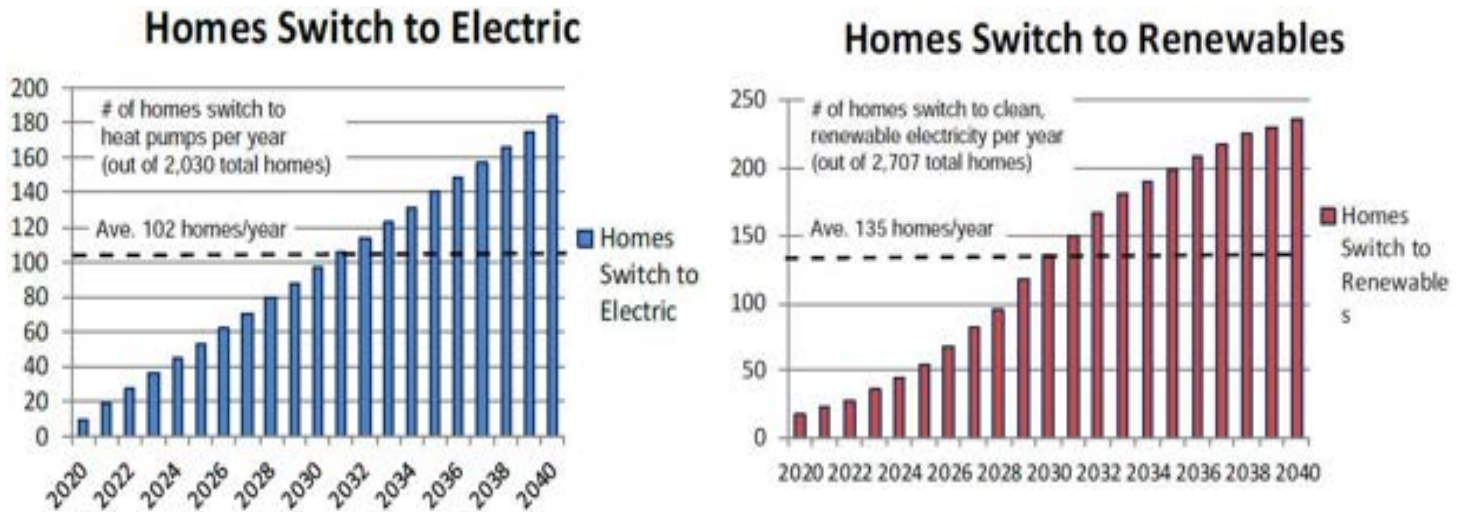
HERE IS WHAT WE LEARNED

Up to 24% reduction in emissions can be achieved through energy efficiency alone! (By weatherizing our buildings, installing LED lights, and purchasing Energy Star appliances from now on.)



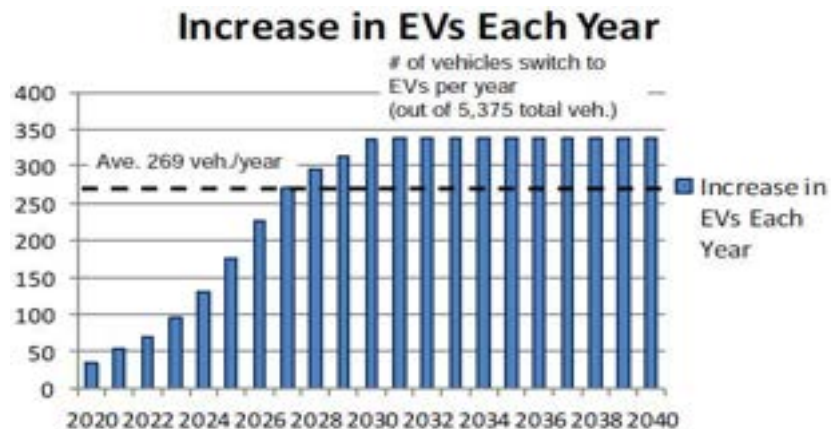
HERE IS WHAT WE LEARNED

Then over time, our homes and buildings would gradually electrify their heating systems and appliances and obtain their electricity from renewable sources:



Heat pumps are 3 times more efficient than oil or natural gas at heating buildings AND will provide cooling in the summer.

At the same time, electric vehicles (EVs) would replace gasoline and diesel vehicles as they wear out:



EVs get the equivalent of 100 miles per gallon. Current vehicles get an average of 25 MPG. We can also support community wide reductions in vehicle related pollution emissions by 2040 by also improving mass transit, telecommuting, and more integrated land use planning.

The great changes that we need to make are relatively easy when started now and made over a period of 20 years.

We need to encourage voluntary action over the next 2 decades.

In the best-case scenario we modeled, each year in East Marlborough:



135*

HOUSING UNITS

would undergo weatherization improvements, many with funding and rebates from governmental agencies and PECO.

would be upgraded with more efficient Energy Star appliances and LED lighting as the existing appliances and light bulbs need to be replaced, receiving rebates for these purchases.



53*

OIL & PROPANE
FURNACES

would be replaced each year (when the furnace needs to be replaced) with high efficiency heat pumps saving money on operating costs.

East Marlborough has 2,707 housing units.



49*

GAS-FIRED
FURNACES

would be replaced each year (when the furnace needs to be replaced) with high efficiency heat pumps saving money on operating costs. This process would start later (for instance in 2026), because of the economics of the conversion.

Largest contributors to GHG emissions INCREASES:



Population growth



Economic growth

Largest contributors to GHG emissions DECREASES:



Cleaner electricity
grid



Less energy used
driving per mile



Decreased energy use
per household



What drove GHG
emissions in Greater
Philadelphia between
2010 and 2015?

*All of these changes would start at lower levels than the average as the residents and the businesses become familiar with the transition.

APPENDIX F

List of Available Energy Efficiency Measures and Energy Transition Methods

List of Available Energy Efficiency Measures and Energy Transition Methods

Actions for Buildings

The following is a list of actions applicable to building systems that could be adopted by East Marlborough Township as part of the ETP:

[illegible]

[illegible]

Actions for Transportation

The following is a list of actions applicable to transportation that could be adopted by East Marlborough Township as part of the ETP:

[illegible]

[illegible]

Action	Municipal	Public Schools	Institutions	Residents	Businesses	Non-Profits	PECO	Co., PA., Feds			
potential partners for shared power purchase agreements											
Aggregate energy demand from a group of public and/or private buildings in order to engage a PPA for off-site GHG-free energy.											
Develop GHG-free programs for low income households											
Assist large entities in implementing clean energy purchases (e.g. PPAs and Virtual PPAs)											
Work with PECO and others to site and develop GHG-free capacity in local service area											
Work with PECO to advance regional grid flexibility to enable predominantly GHG-free electricity supply											
Invest in energy storage											
Support relevant state and federal policies through active legislative and regulatory engagement											
Incentivize buildings with rooftop space such as warehouses, factories, schools, parking to install rooftop GHG-free energy systems.											
Develop methane gas capture and Combined Heat and Power (CPH) for wastewater treatment plants											
Consider opportunities for biogas production											
Preserve forests (including heritage trees,) which capture carbon											

Actions for Waste Management

The following is a list of actions applicable to waste management that could be adopted by East Marlborough Township as part of the ETP:

Action	Municipal	Public	Institutions	Residents	Businesses	Non-Profits	PECO	Co., PA.,			
Develop or update recycling plan	X							X			
Outreach to residents and businesses	X							X			
Implement more comprehensive recycling	X	X	X	X	X	X					
Implement residential composting	X			X							
Increase rates of, and participation in, composting and recycling	X	X	X	X	X	X					
Increase compliance with waste diversion ordinances	X										
Explore a residential Pay As You Throw (PAYT) program	X										
Benchmark waste management facilities	X	X	X	X	X	X					
Upgrade or retrofit facilities to higher energy efficiency pumps in water or sewer systems. Ensure pumps are sized appropriately and installing variable frequency drives, whose speed varies to match flow conditions	X										
For water facilities: Promote water efficiency and conservation, detect and fix distribution leaks.	X										
Encourage residential and commercial low-flow toilets and low-flow showerheads.	X	X	X	X	X	X	X	X			
Improve efficiency of aeration equipment. Aeration systems in wastewater plants typically account for about half of a wastewater treatment plant's energy use. The use of improved system controls, energy efficient fans and blowers, and energy-efficient diffuser technologies can reduce costs in this area.	X										
Improve efficiency of operations. Installing Supervisory Control and Data Acquisition (SCADA) software can increase the efficiency of process monitoring and operating control	X										
Require recycling bins at all public facilities and events	X										
Increase use of reusable shopping bags	X			X							
Consider single use plastic ordinance	X			X							
Maximize diversion of construction and demolition waste					X						

[illegible]

APPENDIX G

Factsheet: Residential Energy Efficiency Tax Credit and Residential Clean Energy Tax Credit

25C Residential Energy Efficiency Tax Credit and 25D Residential Clean Energy Tax Credit

Timing: Available now (new version of 25D also retroactive to all of 2022); **Administration:** IRS

⚡ THE BIG PICTURE

The 25C and 25D tax credits incentivize household electrification by lowering the total cost of qualified electrification upgrades. 25C provides a capped 30 percent tax credit for heat pumps, heat pump water heaters (HPWHs), qualifying electrical panel upgrades, select weatherization measures, and energy audits. **For the first time, air source heat pumps for space heating/cooling and HPWHs will be eligible for a tax credit of up to \$2,000 per year, and electrical panel upgrades installed in conjunction with a heat pump or HPWH will be eligible for a tax credit of up to \$600.**

25D provides an uncapped 30 percent tax credit for rooftop solar, battery storage (for the first time), and geothermal heating. IRS has also allowed 25D to be applied to an electrical panel upgrade as long as it is installed in conjunction with and enables another eligible energy installation.

The details on 25C: heat pumps, heat pump water heaters, and more

- Available now
- 30 percent capped tax credit for residential efficiency and electrification upgrades, up to \$3,200 per year (see chart)
- Annual total credit for heat pumps and heat pump water heaters capped at \$2,000
- Annual total credit for other upgrades capped at \$1,200; limits per upgrade may apply
- Covers purchase and installation costs for heat pumps, HPWHs, and panel upgrades; covers just purchase costs for other listed upgrades
- Upgrades subject to efficiency requirements
- Up to \$600 for electrical panel upgrades if they are installed in conjunction with and enable a heat pump or HPWH
- Credit limit is annual (not lifetime), so it resets each year and can be used again
- Nonrefundable, so households must have adequate tax liability to offset

25C Tax Credit

For Qualified Electrification Upgrades

Total Annual Credit	\$3,200
Heat pumps and HPWHs	\$2,000
Other upgrades	\$1,200
Annual Credit for Heat Pumps and HPWHs	\$2,000
Heat Pump	\$2,000
HPWH	\$2,000
Annual Credit for Other Upgrades	\$1,200
Insulation	\$1,200
Doors	\$500
Windows	\$600
Electrical panel	\$600
Energy Audit	\$150

The details on 25D: rooftop solar, battery storage, and geothermal heating

- Available now (new version of 25D also retroactive to all of 2022)
- 30 percent uncapped tax credit for rooftop solar, battery storage, and geothermal heating
- Should include electrical panels if they are installed

in conjunction with and enable any of the above installations

- Covers purchase and installation costs
- Nonrefundable, so households must have adequate tax liability to offset
- Carry-forward ability applies, so households may roll over unused tax credits year over year

Frequently Asked Questions

Will 25C and 25D be retroactive?

25C and 25D were available starting January 1, 2023, so save your receipts for filing season! If you installed rooftop solar in 2022, it is eligible for the new, 30% 25D tax credit. If you installed a heat pump in 2022, it is eligible for the old 25C tax credit: 10% of costs up to \$300.

Will 25C and 25D reduce up-front costs for consumers?

No, but they will reduce total costs.

Can renters utilize 25C and 25D?

Yes! Renters may be specifically interested in the 25C credit for portable, window-unit heat pumps once the Consortium for Energy Efficiency releases relevant efficiency standards (hopefully by 2024).

Who qualifies for 25C and 25D?

Anyone with adequate tax liability to offset can qualify for 25C and 25D.

Can 25C and 25D stack with other incentives?

Yes! 25C and 25D can stack with other federal incentives like the Electrification Rebates and the Efficiency Rebates.

Do 25C and 25D cover electrical panel upgrades?

25C and 25D cover panel upgrades if they are installed in conjunction with and enable the installation of another covered upgrade, like a heat pump or rooftop solar, respectively.

Do smart panels qualify for 25C and 25D?

Yes, as long as they have capacity of at least 200A.

Do 25C and 25D apply to new construction?

No for 25C; yes for 25D.

Which tax credits cover which heat pumps?

25C covers air-source heat pumps, and 25D covers geothermal heat pumps.

Does 25C have efficiency requirements?

Yes. 25C is applicable only to heat pumps and HPWHs that meet the Consortium for Energy Efficiency's highest non-"advanced" tier. ENERGY STAR-certified doors and ENERGY STAR Most Efficient-certified windows also are eligible.

What does it mean that 25C resets every year?

By resetting every year, 25C will be available to households for multiple upgrades over multiple years. For example, if a household maxes out 25C in one year by claiming a \$2,000 credit for a heat pump and a \$1,200 credit for insulation, that household can utilize 25C again in a future year for a HPWH and an electrical panel upgrade.

Does 25D cover community solar?

25D may cover community solar in some cases, if you're a partial owner of a community solar installation. If you're a "subscriber" to a community solar project owned by a developer (including nonprofits, co-ops, and local governments), you'll likely not be eligible for 25D, but the developer may be eligible for the supplier-facing Section 48 investment tax credit.

APPENDIX H

Factsheet: Electrification Rebates

The Inflation Reduction Act: Electrification Rebates (The High-Efficiency Electric Home Rebate Program)

Funding: \$4.5 billion (\$225 million reserved for Tribes)

Timing: Rebate programs may start to become available to consumers by late-2023

Administration: Funding distributed by DOE; rebate programs administered by State Energy Offices and Tribes

⚡ THE BIG PICTURE

The Electrification Rebates (formerly known as the High-Efficiency Electric Home Rebate (HEEHR) Program) provide point-of-sale consumer discounts to enable low- or moderate-income households across America to electrify their homes. Notably, **households will experience the point-of-sale Electrification Rebates as immediate, off-the-top discounts when making qualifying electrification purchases.**

The details:

- Establishes point-of-sale consumer discounts for “qualified electrification projects” (see chart), up to \$14,000 per household;
- Covers 100 percent of electrification project costs (up to \$14,000) for low-income households (who earn less than 80 percent of their Area Median Income) and 50 percent of costs for moderate-income households (who earn between 80 and 150 percent of their Area Median Income);
- Covers installation and labor costs as well as purchase costs;
- Extends up-front discounts to multifamily buildings in which 50 percent of residents are low- and moderate-income (LMI); and
- Incentivizes contractors to perform electrification projects in LMI communities with contractor rebates up to \$500 per project.

Electrification Rebate Levels

For Qualified Electrification Projects

Income Eligibility and % Costs Covered

Low-income: <80% Area Median Income (AMI) % costs covered (including installation)	100%
Moderate-income: 80-150% AMI % costs covered (including installation)	50%

Overall Incentives

Max consumer rebate	\$14,000
Max contractor rebate	\$500

Rebates for Qualified Electrification Projects

Heat pump HVAC	\$8,000
Heat pump water heater	\$1,750
Electric stove/cooktop	\$840
Heat pump clothes dryer	\$840
Breaker box	\$4,000
Electric wiring	\$2,500
Weatherization insulation, air sealing, ventilation	\$1,600

Frequently Asked Questions

Will the Electrification Rebates reduce up-front costs for consumers?

Yes! The rebates' up-front discounts will cover up to 100 percent of point-of-sale costs, up to a max of \$14,000.

Can qualified renters utilize the Electrification Rebates?

Yes! Renters may be specifically interested in the rebates for portable appliances like window-unit heat pumps and induction cooktops.

Who qualifies for the Electrification Rebates?

The rebates are reserved for low- and moderate-income households. Households can use Rewiring America's [IRA Savings Calculator](#) to estimate their eligibility, though final eligibility will be determined by DOE guidance and state implementation.

How will consumers verify their income for the Electrification Rebates?

Income verification methods will be determined by DOE guidance and state implementation.

When will the Electrification Rebates be available?

Our best guess is that the rebates may start to become available by the end of 2023, but the exact timeline depends on DOE guidance and state implementation.

If the Electrification Rebates become available in the second half of 2023, will they be retroactive?

As a point-of-sale rebate, the Electrification Rebates likely won't be available retroactively.

Do the Electrification Rebates have efficiency requirements?

Yes. The rebates are applicable only to ENERGY STAR-certified appliances (where such categories exist), including heat pumps, heat pump water heaters, heat pump clothes dryers, and weatherization products.

Do the Electrification Rebates incentivize both geothermal and air-source heat pumps?

Yes!

Do the Electrification Rebates include contractor incentives?

Yes, the rebates include contractor rebates of up to \$500 per project.

Can multi-family building owners qualify for the Electrification Rebates?

If 50 percent or more of the building is occupied by LMI households, building owners should be able to utilize the rebates up to \$14,000 per eligible unit.

Can the Electrification Rebates be stacked with federal tax credits?

Yes! The rebates can stack with federal energy efficiency and electrification tax credits (e.g., 25C and 25D).

Can the Electrification Rebates be stacked with other federal grants?

Yes, but not for the same single upgrade. Households pursuing a multi-upgrade retrofit can use the Electrification Rebates for some upgrades and other federal grants or rebates, such as LIHEAP or WAP, for other upgrades within the same household retrofit project.

Can the Electrification Rebates be stacked with state programs?

The rebates can stack with state programs per state discretion, so households and contractors should consult with their State Energy Offices.

What are the Efficiency Rebates, and how do they interact with the Electrification Rebates?

- The Efficiency Rebates are a rebate program that rewards modeled energy savings of at least 20% or measured energy savings of at least 15%. More guidance on the program is forthcoming from DOE.
- The Efficiency Rebates are not income-capped.
- The Electrification and Efficiency Rebates cannot be combined for the same single upgrade, but can be stacked for different upgrades within the same household retrofit project, should that household meet both program's eligibility requirements.

APPENDIX I

Wastewater Treatment Plant Utility Energy Audit Report



Utility Energy Audit Report

Report Prepared for:
East Marlboro Municipal Authority
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Phone: 610-444-0725

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Electricity Cost
\$0.0867/kWh - (Average Jan - Dec)
Heating Fuel: Electric



Energy Efficiency Program Overview:

The Pennsylvania Rural Water Association (PRWA) has implemented a program to assist water and wastewater utility systems to evaluate and lower their energy consumption and costs. It is our belief that we all have a part in reducing greenhouse gases, reduce our every increasing energy demands and help sustain our current energy supply. Energy savings have multiple advantages besides environmental. These initiatives can reduce operating costs, freeing up capital for other priorities and additional investments.

This energy efficiency assessment considers current and past energy use, identifies the primary energy consuming components, and identifies methods to lower energy use and costs. These methods to lower energy usage includes; more efficient equipment such as pumps, motors, lighting; changes in operational methods; and suggest other heating and cooling efficiencies. This report will also look at the payback for your initial investment and savings accumulated from the reduction of energy used.

This energy and sustainability program is just one program of the many that PRWA provides for its members that include G.I.S. mapping, water, wastewater, sourcewater and wellhead protection technical assistance, stormwater management assistance, free equipment rental, financial services, legislative and regulation updates, and many PA DEP approved training events.

Financing Energy Efficiency

Energy improvements create a stream of savings in the form of reduced monthly energy bills. The savings may cover the monthly cost of financing the improvements. Financing energy efficiency improvements as part of your commercial mortgage is the best possible way to go—you have the advantage of (i) low monthly payments due to a long term and a relatively low interest rate; and (ii) interest that is deductible from your income tax.

Local Resources

Utility Rebate or Loan Programs

A number of utilities offer special energy efficiency rebate and/or loan programs. Program details vary so check what energy efficiency products or services qualify for these programs in your area. In some cases, utility rebates may cover most of the product or service cost. Visit your utility's website to find out if it offers energy efficiency rebates or loans. Additional information may also be available at www.dsireusa.org, a website dedicated to tracking incentives for energy efficiency and renewable energy.



Other funding sources for loans, grants and rebates could include the USDA RUS/RD loans and grant funding, the Rural Water Loan Fund, PRWA revolving loan funds, federal/state/ and local agencies, ect. Rebates from government agencies or your electric provider. You can find additional rebates or loans available in your area by visiting www.dsireusa.org. Be sure to check the federal incentives as well. This website is maintained and updated regularly by NCSU under contract to the U.S. Department of Energy. You need to know which electric and gas companies that serve you.

Check out the USDA Rural Development Website at <https://www.rd.usda.gov/>. Get signed up in the RD Apply for low cost financing and grant awards. This report will be submitted to the National Rural Water Association and the USDA Rural Development agency.

Other financing available is a great rebate program available through the Act 129 legislation. This is a rebate program available through your electrical generator. Before starting any energy efficiency project, invite First Energy (West Penn) or whomever is your energy provider to investigate the project for you. They can help document the energy savings that is used to calculate the rebate amount, which can be as high as 50%.

Executive Summary

Facility Description -

East Marlboro Township is a lagoon wastewater treatment plant with a population of 7,000. They have an average flow of .300 MGD and a permitted flow of 0.440 MGD. They solely serve the residences of East Marlboro Township.

Electric rate structure -

The Electric rate structure is comprised of a Distribution Charge and a Consumption Charge, which are both at a single fixed rate. The Distribution Charge is the peak power demand, which is the highest energy demand for your facility during the month. This can be reduced by using equipment during non-peak times; for example, with the use of timers, only running certain equipment during the hours of 9pm to 7am or not running large equipment at the same time. The Consumption Charge comprises of generation and transmission costs which is based entirely on the total actual electric usage.

Major sources of inefficiency are the water heater, HVAC, pump controls and blower controls. The water heater is designed to be continuously running to maintain hot water. Turning it off completely, placing it on a timer, or replacing it with an on-demand heater could really save energy. There is a lot of unused conditioned space that could be



closed off. For example, the bathrooms, hallways and conference rooms could be closed off to reduce the amount of conditioned space. The programmable thermostat could be moved to the office instead of the hallway. The pumps and motors could be placed on VFDs which can greatly reduce energy consumption.

Major equipment sources of electric use on the following page.

pa rural water
Association

[illegible]

poa rural water Association

Recommendations	Initial Cost	Hrs/Day	HP	Amps	Watts	Volts	KwH /Day	KwH/Mo.	\$/ KwH	\$/month	Monthly Savings	Payback Months
AR-1 Pump (\$150*25HP)@ 90 %	3,750.00	24	25.0	27.0	9,067	460	218	6528	0.0867	566.11	209.38	17.9
AR-2 Pump (\$150*25HP)@ 90 %	3,750.00	24	25.0	28.0	9,402	460	226	6770	0.0867	587.08	217.14	17.3
AR-3 Pump (\$150*15HP)@ 90 %	2,250.00	24	15.0	18.5	6,212	460	149	4473	0.0867	387.89	143.47	15.7
AR-4 Pump (\$150*15HP)@ 90 %	2,250.00	24	15.0	17.0	5,709	460	137	4110	0.0867	356.44	131.83	17.1
AR-5 Pump (\$150*7.5HP)@ 90 %	1,125.00	24	7.5	6.5	2,183	460	52	1572	0.0867	136.29	50.41	22.3
AR-6 Pump (\$150*7.5HP)@ 90 %	1,125.00	24	7.5	8.0	2,686	460	64	1934	0.0867	167.74	62.04	18.1
AR-7 Pump (\$150*5HP)@ 90 %	750.00	24	5.0	6.5	2,183	460	52	1572	0.0867	136.29	50.41	14.9
Replace water heater with on-demand heater	1,000.00	0.5			3,500		2	53	0.0867	4.55	29.56	33.8
Light Savings - see Light study for Details											4.99	32.4
										Monthly Savings	899.22	
										Annual Savings	10790.69	

Benefits of recommended actions

Presumes taking all the energy savings reductions and taking four hours a day off the blowers. It would result in energy reduction of $(757,776 - 633,346) / 757,776 = 16.4\%$. The energy savings would be as follows:

	Annualized Pre-Assessment	Annualized Post Assessment	Annualized Savings
Total Energy Consumption (kWh)	757,776	633,346	124,430
Current energy rate (\$)	0.08672	0.08672	
Total Energy Costs (\$)	\$65,671	\$54,880	\$10,791

Current Energy Usage

Plant	KWh	Comments	Average \$/kWh	Peak Demand (kW)	Total Power Cost
Nov-18	52512		0.086721		4,553.89
Dec-18	68400		0.087896		6,012.06
Jan-19	65520		0.075863		4,970.53
Feb-19	55104		0.087958		4,846.82
Mar-19	57312		0.087316		5,004.27
Apr-19	57936		0.087235		5,054.05
May-19	60432		0.089724		5,422.19
Jun-19	75888		0.085862		6,515.93
Jul-19	70800		0.088654		6,276.71
Aug-19	63168		0.089662		5,663.79
Sep-19	68496		0.086085		5,896.50
Oct-19	62208		0.087672		5,453.90
Total	757776			Total Cost	65,670.64
Avg Cost KWh	0.086721				
				Avg month Cost	5,472.55
Avg Month kWh	63,148				

Recommendations for improvements

- Variable Frequency Drive (VFD) for lagoon aerators
- Replace water heater with an on-demand water heater or place it on a timer
- Save on lighting by replacing with LED lights. When purchasing LED lights at a participating hardware store take your electric utility account number for an instant rebate at the register.

Lighting Changes

Lighting	Initial Cost	Hours/Day in Use	Lights in use	Watts	(lamps * watts)	KwH /Day	KwH/Mo.	\$/ KwH	\$/month
Fluorescent lamps T12		6	52	32	1664	9.984	299.52	0.0753	22.55
							Total Lights		22.55
LED Fluorescent lamps	161.72	6	72	18	1296	7.776	233.28	0.0753	17.56
Total Costs	161.72						Total Lights		17.56
Est Replacement costs - 3.11 for Fluorescent Lights				Payback	32.4 months			Mon. Savings	4.99
Annual Savings	59.84								



The Following Areas are Outside the Scope of this Audit

Other Recommendations

- 1.) Install a motion sensor on exterior lighting building lighting and a timer on parking lot lighting to improve energy efficiency and building security.
- 2.) Have the HVAC system balanced after completion of energy efficiency upgrades.
- 3.) Install Oxygen Sensors and Variable Frequency Drives for the blowers.
- 4.) Recycle effluent for use at the wastewater treatment plant.
- 5.) Try to reduce the energy use during peak times from 8 am to 6 pm as much as feasible.
- 6.) In the next upgrade consider more energy efficient technology, anaerobic digestion for biogas generation of electricity, micro-turbines for the effluent flow for energy generation, etc.

Areas not Examined in this Audit:

- 1.) No testing was performed to ascertain total building air leakage or total leakage from ductwork.
- 2.) We did not perform combustion analysis or carbon monoxide testing of your combustion appliances. Significant reduction in the ventilation of your building can result in flue gasses containing carbon monoxide leaking into the conditioned space of your building.



Other Recommendations or energy saving things to look for

Replace Unsatisfactory Windows Doors

Glass is a very poor insulator and much heat is lost through windows during the winter. A single pane of glass loses fifteen times more heat than a section of insulated wall of the same size. By adding a second pane of glass, the amount of energy lost through windows is cut almost in half.

Using low-e glass for the second pane reduces energy loss by an additional 10%. In warm climates, the heat of the sun shining through windows accounts for up to half of the cooling costs. Solar tinted glass, solar film or a solar shade, can reduce total air-conditioning costs by up to 25%. Replacing windows is expensive, but if the window frames are in poor condition, this may be the best solution. The National Fenestration Rating Council rates the energy efficiency of replacement windows. The quality of the installation is as important as the quality of the product, therefore check references of the installer before signing a contract.

The combination of a single glazed primary interior window and an intact exterior storm window is comparable to a double-glazed window. Ensure that the upper and lower sashes are fully in place during heating season, so that "dead" air is trapped between the windows.

Install Solar Shades

Windows account for about 50% of heat gain in hot weather. Installing either solar film or solar shades on windows that receive direct sunlight will help to reduce heat gain.

Solar shades reduce solar heat gain. The most effective solar shades are those installed on the outside of the window because they block the solar heat before it passes through the window. If possible, the shades are installed indoors, they should be sealed to the window frame. If not sealed, much of the rejected solar heat escapes into the room around the sides of the shade. In climates with heating and cooling seasons, install solar shades that can be raised to allow solar heat inside during the heating season.

Solar window film applied directly to the interior glass deflects heat in the summer and can reduce solar heat gain by 30-40%.



Replace Air Conditioner and Heating Units

Central air conditioning systems are expected to last from 15 to 20 years. Waiting for an older air conditioner to stop working before replacing it makes little sense since the old one will cost twice as much to operate each day you wait. Older buildings often have air conditioners that require twice as much electricity as the current Energy Star® air conditioner.

Replace Water Heater

Energy Auditor Comments:

The design life of most water heaters is 13 years your water heater is about 40 years old. It is advisable to replace a water heater if it is older than its design life rather than waiting until it unexpectedly breaks down. If a water heater is not working properly, a technician should decide whether it should be repaired or replaced.

Lower the temperature of the water heater to 120° F to save energy and reduce the chance of scalding. If the hot water supply is insufficient at this setting, increase the water heater temperature by 5 degrees Fahrenheit and try it for a few days. CAUTION: If your dishwasher does not have a booster heater and your dishes do not come out clean, you should raise the water temperature to the setting recommended by the dishwasher manufacturer.

Energy can be saved by installing an insulating blanket around the water tank to reduce standby heat losses. When the water heater is located in a conditioned space that requires cooling in the summer, insulating will also lower the cooling load. Many business owners can install this product themselves. CAUTION: If the tank has a warning label against the installation of additional insulation, do not install a wrap.

Another energy saving option is an electric timer which shuts off an electric water heater when hot water is not needed, thus reducing standby losses. This measure typically saves between 5%-12% of the energy used by the water heater. CAUTION: Contact a qualified electrician to perform the installation of the electric timer (the breaker must be turned off or the fuse must be disconnected).

Additional Energy Efficiency Measures

Lighting Options

Compact fluorescent light bulbs use only one-third the electricity consumed by incandescent bulbs and last up to ten times as long. They produce less heat, are available in warm colors and can be screwed into many existing light fixtures. While they cost more initially, their energy savings and long-life saves money and hassles in the long run. Consider installing hardwired fluorescent lights throughout your building. You may also want to put outside lights on a timer so that they are lit only during the specific hours that your business is open.



Recycling and Disposal of CFLs

Compact fluorescents have become a popular form of efficient lighting, and they are starting to be seen in our landfills. Because of their mercury content, it's best to handle CFLs the same way you would other household hazardous waste products like paint or batteries. They should never be incinerated. While most states and communities do not require recycling of compact fluorescents, check with your community recycling center or local government about your disposal options. For information on disposal laws and recycling programs in your area, see www.epa.gov/bulbrecycling.

If you break a CFL, the Environmental Protection Agency recommends you take the following steps:

- Carefully scoop up the fragments and powder with stiff paper or cardboard and place them in a sealed plastic bag; use disposable rubber gloves if available. Do not use your bare hands.
- Wipe the area clean with damp paper towels or disposable wet wipes and place them in the plastic bag.
- Place the plastic bag in a second sealed plastic bag and dispose of in the trash.
- Open a window to disperse any vapor that may escape and leave the room for 15 minutes or more.
- Some states require that broken and unbroken CFLs be taken to a recycling center.
- Do not use a vacuum cleaner or broom to clean up the broken bulb on hard surfaces.
- For carpet cleaning and additional information on CFL disposal, see the Energy Star CFL page.

Guidance on Indoor Air Quality

Inadequate Ventilation

Most older buildings need to be weatherized to reduce energy loss. This can reduce the amount of air infiltrating the building. Inadequate ventilation increases the concentrations of indoor air pollutants from sources inside the building. Signs of inadequate ventilation include stuffy air, musty smell, moisture condensation on cold surfaces and mold growth (see www.epa.gov/mold). If the building is too tight, an air-to-air energy recovery ventilator should be installed to increase air circulation without losing conditioned air. Having adequate air ventilation is crucial to maintaining good indoor air quality.

Reducing Toxins

Many building improvement products have significant "off-gassing." Chemicals leach out of the product and into the indoor air. Painting and carpeting are two common improvements and, both may release toxic chemicals.



Paints

There are serious health and environmental concerns surrounding paint. Using paints that are free of Volatile Organic Compounds (VOCs) such as benzene and toluene and free of heavy metals such as cadmium, can aid in reducing exposure to toxins for both you and your environment. However, the fact that a paint is VOC free does not necessarily mean that it is free of toxins such as formaldehyde, ammonia, acetone or odor-masking agents. Fortunately, paints with reduced levels of VOCs, or even VOC-free, are available.

Resources

The Environmental Protection Agency (EPA) has a consumer booklet, The Inside Story: A Guide to Indoor Air Quality. www.epa.gov/iaq/pubs/insidest.html

New American Dream has information on Green Seal certified paint manufacturers: www.newdream.org/consumer/paint.php

Statement of Limited Liability for Services Performed

Implementing the recommendations in this report will reduce your energy bills and make your building more comfortable. It will also help the environment. The estimates in this Energy Audit Report ("Report") are based on the data obtained from measuring and inspecting your facility. The information was analyzed using standard energy audit techniques, which takes into account local weather, energy prices implementation costs and other relevant factors. The savings estimates in this Report can be adversely impacted by variations in the behavior of the occupants, the weather and other factors. Your actual implementation costs may vary from our estimates due to price differences among contractors and suppliers as well as unforeseen issues.

Pennsylvania Rural Water Authority does not offer any warranty, either expressly or implied, for the estimated savings or costs in this Report. Should you find an error in the report, please call Chad Heister, PRWA Energy Circuit Rider at (814) 404-1335.

APPENDIX J

Factsheet: Clean Energy Tax Incentives



Clean Energy Tax Incentives: Elective Pay Eligible Tax Credits

The Inflation Reduction Act of 2022 ("IRA") makes several clean energy tax credits available to businesses; tax-exempt organizations; state, local, and tribal governments; other entities; and individuals. The IRA also enables entities to take advantage of certain clean energy tax credits through its elective pay provision (also colloquially known as direct pay). Elective pay allows several types of entities, such as tax-exempts and governments, to treat the amount of certain credits as a payment against tax on their tax returns and as a result receive direct payments for certain clean energy tax credits.

	Tax Provision	Description
Energy Generation & Carbon Capture	Production Tax Credit for Electricity from Renewables (§ 45, pre-2025)	For production of electricity from eligible renewable sources , including wind, biomass, geothermal, solar, small irrigation, landfill and trash, hydropower, marine and hydrokinetic energy. Credit Amount (for 2022): 0.55 cents/kilowatt (kW); (1/2 rate for electricity produced from open loop biomass, landfill gas, and trash); 2.75 cents/kW if Prevailing Wage and Apprenticeship (PWA) rules are met ^{1,2,3,7}
	Clean Electricity Production Tax Credit (§ 45Y, 2025 onwards)	Technology-neutral tax credit for production of clean electricity. Replaces § 45 for facilities that begin construction and are placed in service after 2024. Credit Amount: Starts in 2025, consistent with credit amounts under section 45 ^{1,2,3,6,7}
	Investment Tax Credit for Energy Property (§ 48, pre-2025)	For investment in renewable energy projects including fuel cell, solar, geothermal, small wind, energy storage, biogas, microgrid controllers, and combined heat and power properties Credit Amount: 6% of qualified investment (basis); 30% if PWA requirements met ^{1,4,5,6,8}
	Clean Electricity Investment Tax Credit (§ 48E, 2025 onwards)	Technology-neutral tax credit for investment in facilities that generate clean electricity and qualified energy storage technologies. Replaces § 48 for facilities that begin construction and are placed in service after 2024 Credit Amount: 6% of qualified investment (basis); 30% if PWA requirements met ^{1,4,5,6}
	Low-Income Communities Bonus Credit (§ 48(e), 48E(h)) Application required	Additional investment tax credit for small-scale solar and wind (§ 48(e)) or clean electricity (§48E(h)) facilities (<5MW net output) on Indian land, federally subsidized housing, in low-income communities, and benefit low-income households. Allocated through an application process. Credit Amount: 10 or 20 percentage point increase on base investment tax credit ⁷
	Credit for Carbon Oxide Sequestration (§ 45Q)	Credit for carbon dioxide sequestration coupled with permitted end uses in the United States. Credit Amount: \$12-36 per metric ton of qualified carbon oxide captured and sequestered, used as a tertiary injectant, or used, depending on the specified end use; \$60-\$180 per metric ton if PWA requirements met. ^{1,7}
	Zero-Emission Nuclear Power Production Credit (§ 45U)	For electricity from nuclear power facilities. Facilities in operation prior to August 16, 2022. Credit Amount (for 2023): 0.3 cents/kWh (reduced rate for larger facilities); 1.5 cent/kWh if PW req's met ^{1,7}
Manufacturing	Advanced Energy Project Credit (§ 48C) Application required	For investments in advanced energy projects. A total of \$10 billion will be allocated, not less than \$4 billion of which will be allocated to projects in certain energy communities. Credit Amount: 6% of taxpayer's qualified investment; 30% if PWA requirements are met ¹
	Advanced Manufacturing Production Credit (§ 45X)	Production tax credit for domestic clean energy manufacturing of components including solar and wind energy, inverters, battery components, and critical materials. Credit Amount: Varies by component
Vehicles	Credit for Qualified Commercial Clean Vehicles (§ 45W)	For purchasers of commercial clean vehicles. Qualifying vehicles include passenger vehicles, buses, ambulances, and certain other vehicles for use on public streets, roads, and highways. Credit Amount: Up to \$40,000 (max \$7,500 for vehicles <14,000 lbs) ⁹
	Alternative Fuel Vehicle Refueling Property Credit (§ 30C)	For alternative fuel vehicle refueling and charging property , located in low-income and non-urban areas. Qualified fuels include electricity, ethanol, natural gas, hydrogen, and biodiesel. Credit Amount: 6% of basis for businesses and can increase to 30% if PWA is met.
Fuels	Clean Hydrogen Production Tax Credit (§ 45V)	For producing clean hydrogen at a qualified, U.S.-based clean hydrogen production facility. Credit Amount: \$0.60/kg multiplied by the applicable percentage (20% to 100%, depending on lifecycle greenhouse gas emissions), amount increases if PWA is met ^{1,7}
	Clean Fuel Production Credit (§ 45Z, 2025 onwards)	Technology neutral tax credit for domestic production of clean transportation fuels , including sustainable aviation fuels, beginning in 2025* Credit Amount: \$0.20/gallon (\$0.35/gal for aviation fuel) multiplied by CO2 "emissions factor"; \$1.00/gallon (\$1.75/gal for aviation fuel) multiplied by CO2 "emissions factor" if PWA is met ^{1,7}

Notes:

The information in this document may be subject to change as guidance is issued or finalized. For all IRA clean energy tax credits, please see [irs.gov/cleanenergy](https://www.irs.gov/cleanenergy) for further details and eligibility requirements.

¹ Credit is increased by 5 times for projects that pay prevailing wages and use registered apprentices. Apprenticeship requirements do not apply for §§ 45L and 45U. Prevailing wage and apprenticeship requirements do not apply to certain projects, including certain projects of less than 1 megawatt or those that began construction prior to January 29, 2023.

² Credit is increased by 10% if the project meets certain domestic content requirements for steel or iron, and manufactured products.

³ Credit is increased by 10% if located in an energy community.

⁴ Credit is increased by up to 10 percentage points for projects meeting certain domestic content requirements for steel, iron, and manufactured products.

⁵ Credit is increased by up to 10 percentage points if located in an energy community.

⁶ Section 168(e) provides favorable depreciation treatment for facilities or property qualifying for this tax credit. These facilities or property will be treated as a 5-year property for purposes of cost recovery, leaving them with lower taxable income in the earlier years of a clean energy investment.

⁷ Credit rate is adjusted annually for inflation.

⁸ See section 48 for more detail and applicable exceptions to the credit rate.

⁹ The entities eligible for elective pay of the commercial clean vehicle credit is a subset of the entities eligible for elective pay of other credits. In addition, starting January 1, 2024, the amount of a new clean vehicle or previously owned clean vehicle tax credit (but not a commercial clean vehicle credit) can be transferred to a dealer for an equivalent reduction in the eligible vehicle's sales price.

