

Appendix A

Program Description Renewable Energy Conversion Incentive Pilot Program

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Summary of Purpose

The purpose of this program is to address the carbon footprint of housing stock and petroleum-based vehicles in Washington Grove (WG), which account for roughly 67% of our emissions as modeled per the 2021 Emissions Inventory. The incentives program is modeled after federal subsidies for heat pump installations and conversions, with specific requirements tailored to the Grove.

Several federal and state programs have been established to reduce carbon emissions. For example, H.R.5376 - Inflation Reduction Act of 2022 (signed into law on August 16, 2022) establishes tax credits and rebates to promote the installation of heat pump and other energy efficient heating systems. The Maryland Energy Administration has also established loan programs to promote the installation of energy-efficient heating and renewable electricity systems. Notably, many residents may be ineligible for rebates under these programs due to limitations on the systems covered and income-based provisions.

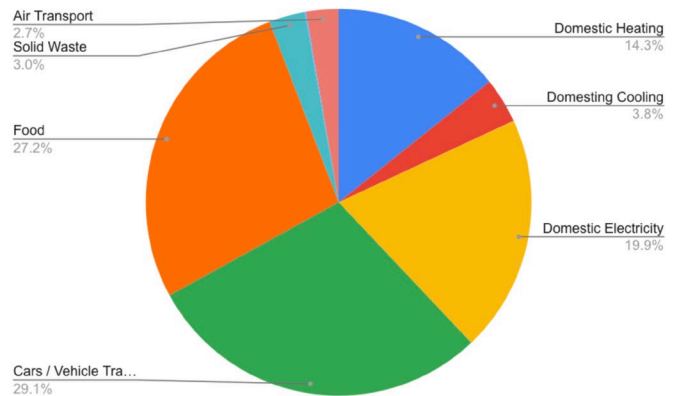


Figure 1. Relative breakdown of Grove carbon emissions among 7 different categories. Analysis valid for 2021.

In tandem with federal and Maryland policies, the Town of Washington Grove has also stated its intention to abide by the climate goals of the Paris Accords and modifications thereof. In 2021 the Sustainability

Committee (then only an informal group) set out to identify and quantify sources of CO₂ emissions in the Grove. The ultimate goals of that analysis were to understand the scope of the climate-change problem and provide actionable information in support of town mitigation strategies. An initial analysis of 2021 emissions is now complete.

Between the categories listed in the pie chart to the right, WG created about 6000 tons of CO₂ in 2021. While the 2021 figures for transportation are likely lower than 2023 levels, housing and food contributions should be roughly on par with our current emissions. Moreover, transportation values still provide a *lower bound* on the corresponding emissions (meaning that at worst, we are understating their contribution to our CO₂ footprint). To put these numbers in context, WG would require roughly 25 times as much forest land as we currently have to sequester our 2021 emissions. Thus, our forests have a relatively minimal impact on our carbon footprint, and there is very little we can do to significantly increase their sequestration potential. Considering the sources of emission in Fig. 1, it is therefore clear that we must take active steps to mitigate our footprint.

It is notable that housing stock and transportation account for more than 2/3 of our town-wide footprint. As a practical matter, we may also think of this breakdown as applying to an average Grove household: ~ 1/3 of emissions come from running the house, and another 1/3 from the associated vehicles. Therefore, if each household (i) converted vehicles to electric (EVs), (ii) converted all heating units to heat pumps (HPs), and (iii) purchased 100% renewable electricity, the town-wide carbon footprint would be slashed by nearly 2/3.

The challenge is that HPs and EVs are expensive, and renewable electricity is not always well-known or understood. This suggests a local government incentive to: (i) defray costs of conversion; and (ii) assist homeowners to easily switch to renewable electricity. We also note that in WG, some homes already have HPs but use propane or oil as a backup. Thus, it is desirable to incentivize these homes to install a more efficient heat pump and/or switch to electric backup, since the latter is compatible with renewable electricity.

It is also important to understand the scope of conversions that are needed. There are roughly 170 houses in town with oil, propane or methane as either primary or backup heating, slightly more using non-renewable electricity and on the order of 500 vehicles. Local Governments for Sustainability (ICLEI) suggests a target of 62% reduction of CO₂ emissions by 2030 (see also **Additional Analyses and Justification**). This target is achievable *if we eliminate emissions due to housing stock and vehicles over a 7 year period. However, this would require nearly 100 conversions per year, spread between stationary combustion and vehicle sources, e.g., 25 HP conversions/year, 70 EV conversions/year and 5 backup conversions/year. Moreover, the needed rate of conversions only increases the longer the community waits to take definitive action.*

While we cannot expect the Town government to fully mitigate this situation, it does have the ability and resources to make significant impact by promoting adoption of clean energy and transportation. Such programs may be especially productive if they piggy-back on federal and state programs. The local incentives program described below is one such opportunity.

Proposed Rebate Program

The rebate program can work as follows. Upon (1) successful installation of a clean-energy heating/cooling system, or purchase of an EV, combined with (2) electricity supplied by a renewable

electricity provider, residents will be eligible for a rebate from the Town of Washington Grove. The following three specific cases will be covered under the program.

I. Conversion of Oil/Propane/Methane units to Heat Pumps plus use of a renewable residential electricity provider.

For houses that use oil, natural gas and/or propane as the primary heating, the Town will provide a rebate of \$1500 after the following requirements are met:

1. Installation of an Energy Star or “CEE High Tier” HP system (incl. geothermal) with electric backup, *AND*
2. Residential electricity supplied by a Community Solar Energy provider or another provider of at least 90% renewable electricity.

II. Upgrade of an existing heat pump or conversion of Backup Oil/Propane to Electric backup plus use of a renewable residential electricity provider.

For houses with an existing stationary combustion backup system, and one or more heat pumps, the Town will provide a rebate of \$1000 after the following requirements are met:

1. Residential electricity supplied by a Community Solar Energy provider or another provider of at least 90% renewable electricity, *AND EITHER*
2. Conversion of the existing backup system to electric resistance heat, *OR*
3. A heat pump upgrade that eliminates the fossil fuel backup system.

All claims must be submitted within 6 months of the final county inspection (if applicable) confirming that the system is operable and meets county regulations, or if an inspection is not required for installation, claims must be submitted within 6 months of completion of the installation.

III. Purchase of an Electric Vehicle (EV) plus use of a renewable residential electricity provider.

Any resident will be eligible for a \$1500 rebate provided that:

1. They purchase a 100% electric EV or a plug-in hybrid EV with a battery that meets the minimum size for a state rebate (4 kWh) *AND*
2. Residential electricity supplied by a Community Solar Energy provider or another provider of at least 90% renewable electricity.

Leasing an EV for a minimum of three years is equivalent to the purchase for the purposes of this rebate.

Assistance with Conversions by the Sustainability Committee

As part of the installation process, the Sustainability Committee (SC) can provide free advice, upon request of the homeowner, on the pros and cons of different HP systems or EVs.

SC members can also aid homeowners in filling out paperwork for federal and state programs that may supplement the town rebate.

Operational Considerations, Provisions, and Limitations

Operation of the Program

1. The Town Council (TC) will select a representative (the Town’s representative) to formally administer the program. The Town’s representative may be the mayor, TC, treasurer, or any other entity as determined by the TC.

2. The SC proposes to assume responsibility for verifying all claims against the program and advising the Town's representative on whether a claim satisfies the terms of the program. However, the Town's representative will make an official decision on the status of a claim and direct the treasurer (if different from the Town's representative) to disburse payments. In more detail, the Town's representative shall:
 - A. Verify that all documents needed to verify the claim have been submitted.
 - B. Audit the recommendation to ensure that the SC has correctly interpreted the documentation according to the provisions herein; and
 - C. Approve the claim provided both conditions are met.
3. The rebates described above will be available to all households while funds exist in the program.
4. The program will commence once the TC approves a resolution and/or ordinance directing the Sustainability Committee to begin administering the program. The program will run until such time as the TC decides to end the program.
5. Claims may only be submitted for systems fully installed and inspected or EVs purchased as of July 1, 2023.
6. Claims must be submitted using Town-provided paper forms.
7. In the event that funding for the program runs out before its termination, the TC will continue receiving claims for a period of 12 months. If during or after this time the TC renews funding for the program, claims will be processed and submitted for reimbursement according to the level of priority as set forth in item 4 of the Provisions and Limitations.
8. The SC will update the TC once yearly, or more often if deemed necessary by the TC, on the status of the program, rate of disbursing funds, and CO2 emissions reductions achieved through the program.
9. The SC will maintain a working document that describes the technical assessment of the WG carbon inventory.
10. The SC and/or TC, as determined by the TC, will maintain all records associated with each reimbursement for a period of at least 5 years after the date of submission of the corresponding claim.
11. The program will be subject to audit, peer-review, and/or modification by the TC.
12. Recipients will be asked (but not required) to provide electricity usage for a period of 3 years to support continuing SC modeling efforts. When available, data from years before conversion will also be requested. All electricity usage data will be stored on encrypted systems that are not connected to the internet, or on town servers as determined by the TC. Unless explicit permission is granted in writing, personally identifiable information (PII) will not be made public and will only be used for the purposes of verifying claims and disbursing payments.

Provisions and Limitations

1. Each household will be eligible for only one HP rebate for the duration of the program.
2. Each household will be eligible for up to two EV rebates for the duration of the program.

3. Applications will be processed in the following order.
 - A. The first applications from each household will be processed in the order in which it was received and before any second or third application of any type, or any application from the mayor, TC, or SC.
 - B. The second applications from each household will be considered in the order in which they were received and before any third-time applications or applications from the mayor, TC, or SC but after all first-time applications in the queue have been processed.
 - C. Likewise, the third application from each household will be considered in the order of receipt, before applications from the TC, SC, or mayor, and after all second-time applications are processed.
 - D. Applications from the mayor, TC, and SC will be processed only after all other applications in the queue, and with a similar order of priority.
5. WG will not be responsible for any terms or conditions imposed by their HP installation contractor, EV seller, or electricity provider.
6. The SC will aid homeowners in filling out rebate paperwork for federal and state programs that may supplement the town rebate.
7. Residents already having renewable electricity will still be eligible for the full rebate in each of the categories I-IV.
8. HP systems must be either Energy Star Certified OR meet the “highest tier CEE” level of efficiency or be certified as a “cold-climate heat pump”. This corresponds to SEER2 >16, EER2 >12, and HSPF2 > 9.
9. Heat pump systems must be sized to function as the primary heat source for the residence.
10. EVs must meet the minimum battery capacity of 4kWh as required for the Maryland EV rebate.

Benefits to the town

We estimate that on average, every oil to HP + renewable conversion will save roughly 4.25 tons of CO₂ / year due to heating, another 1.25 tons CO₂ / year due to cooling, and 6.5 tons of CO₂ / year due to other or “baseline” electricity usage converted to renewables, for a total of 12 tons of CO₂ / year.

For propane to electric backup + renewable conversions, the numbers are the same except that the town saves 2.25 tons of CO₂ due to heating, for a total of 10 tons of CO₂ / year.

The benefit comes not just from the HP, but the conversion to renewable electricity, which impacts *all* cooling and other electricity CO₂ footprints.

EV conversions should have a comparable impact. While we are still calculating the exact estimates, replacing a gasoline car with an EV is on the same order of magnitude as replacing an oil furnace with an HP. However, the benefit of requiring residents to switch to renewable electricity is that in doing so, even if the heating is stationary combustion, the baseline electricity and cooling will be run by clean energy. Thus, we can expect 10 tons to 12 tons CO₂/year reduction associated with EV + renewable conversions as well.

Note that these figures are averages and represent the fact that most residents in town do not yet have renewable electricity or EVs.

Comparable Programs

The federal government will soon offer (via H.R.5376 - Inflation Reduction Act of 2022) reimbursements of up to \$8,000 on HP systems. However, the largest part of the rebate (up to \$8000) is given at the point of sale and depends on the household income relative to the AMI.

Many residents in WG will likely not be eligible for the federal rebate but rather the standard tax credit covering 30% of the cost of installing a heat pump, up to \$2,000, beginning in 2023. Tax filers can claim the credit when they file next year or in subsequent years. Combined, the incentives essentially remove the higher upfront costs of heat pumps vs. traditional furnaces. In some cases, the heat pumps are now cheaper than furnaces, and that savings continues because they are cheaper to operate.

The state of Maryland also has rebate programs for certain systems, but these tend to favor geothermal HP systems and solar electricity / water heaters. Pepco has a similar program for geothermal HPs.

The rebates being proposed here, while smaller than the federal subsidies, are nonetheless significant and on par with both the state rebates for geothermal (\$3000) and federal tax credits on HPs (\$2000).

Additional Analyses and Justification

Figures of metrics from other sources

The *EDGAR - Emissions Database for Global Atmospheric Research 2022 Report on Fossil CO2 emissions by country* (CO2 emissions of all world countries - JRC/IEA/PBL 2022 Report; https://edgar.jrc.ec.europa.eu/report_2022?vis=tot#data_download) estimates that the US CO2 emissions per-capita are 15.7 tons. The Washington Grove analysis yields an estimate of roughly 6000 tons / 550 residents, or 11 tons per-capita. However, the EDGAR report includes emissions sources not considered in our analysis, due, for example, to industrial output and energy content of products consumed. Consider then that 62% reduction of the emissions we have identified in town corresponds to a roughly 43% per-capita reduction when considered in the context of the US-per-capita emissions. Thus, a target of 62% reduction in these WG emissions is roughly in line with the Paris Accords.

Rate of adoption of local incentives

It is difficult to directly quantify the degree to which incentives increase demand for heat pumps. However, there is indirect evidence suggesting that incentives are both popular and increase the likelihood of homeowners purchasing heat pumps; see, for example, <https://www.sltrib.com/renewable-energy/2023/04/12/fueled-by-incentives-heat-pumps/> and <https://www.hvnplus.co.uk/news/heat-pumps-sales-post-second-successive-year-of-global-growth-12-04-2023/>. Market research (see the second link) suggests an increasing demand in heat pumps is driven by incentives, and in 2022 installations of HPs surpassed those of stationary combustion systems.

Cost to Town

While conversion rates of 100 units / year are too ambitious for a town-wide incentives program, we anticipate that 15% of this or 15 units per year is a reasonable start. Assuming an average rebate of \$1500 requires annual funding of \$22,500. The Sustainability Committee can and should also seek additional sources of funds, e.g., through grants.

While not directly applicable to the town, at least [one larger scale study by the EPIC and Rhodium Group](#) has found that clean electricity tax credits yield a four-fold return on investment. The analysis considers the cost of incentives relative to the costs associated with damage from CO2 emissions.

Future rebates

On review of the interest in the program by Town residents, the council may consider expanding the rebate to cover more complicated situations such as replacement of baseboard electric heat as a primary source, conversion of domestic water heaters with heat pump water heaters, induction stoves, home energy audits, insulation or air sealing of houses, solar systems, etc. In addition, we can investigate how to offer increased rebates to low- or middle-income households.

Other Administrative Procedures of the Program

1. The town will maintain the rebate application form on the WG Town website and as a paper application in the town office.
2. Hard copies of rebate forms will be submitted to the town clerk with all supporting information (see example below).
3. At least one week before each SC meeting, a member of the SC will be provided with photocopies of the rebate paperwork and supporting documents.
4. At the following SC meeting, the committee shall discuss each application and vote on a recommendation of whether to approve or deny the rebate. The SC may also propose that the TC consider whether to amend the program to cover a rebate that does not clearly fall within the scope of the program.
5. For each such recommendation, the SC will select a member to complete, sign, and date an official recommendation form, which will be submitted to the Town Clerk with all photocopies of rebate forms and supporting documentation. These documents will then be provided to the Town's representative, who will make a final decision on whether to approve the rebate, taking into consideration the SC recommendation. The SC recommendation will also be made available to the resident filing the claim.
6. The representative will notify the Town Treasurer, applicant and the SC of the decision regarding issuing the rebate.

Example of Rebate Recommendation Form

Resident submitting the claim:

Washington Grove address:

Type of rebate and amount:

Supporting documentation provided:

August 14, 2023

(If claim is for a heat-pump system, claim requires: invoice indicating paid-in-full, county inspector report certifying system meets county codes, copy of bill or contract indicating conversion to renewable electricity.

EV's require invoice and battery size.

Costs can be redacted, but model numbers must be available.

SC Recommendation:

If denied, provide reason:

Name, date, and signature of SC representative:

Appendix B

Pilot Program Operation

1. The program will commence as of the effective date of Resolution 2023-06 of the TC and will run until such time as the TC decides to end the program.
2. The Town Council (TC) will select a representative (the Town's representative) to formally administer the program. The Town's representative may be the Mayor, TC, Town Treasurer, or any other entity as determined by the TC.
3. The Sustainability Committee (SC) will be responsible for verifying all claims against the program and advising the Town's representative in writing whether a claim satisfies the terms of the program.
4. Claim applications will begin being accepted by the Sustainability Committee on the effective date of the program.
5. The Town's representative will make an official decision on the status of each claim and if approved, direct the Town Treasurer (if different from the Town's representative) to disburse payment. Specifically, the Town's representative shall:
 - A. Verify that all documents required to verify the claim have been submitted.
 - B. Audit the application to ensure that the SC has correctly interpreted the documentation according to the provisions herein; and
 - C. Approve the claim provided both conditions are met.
6. The rebates described above will be available to all households while funds exist in the program.
7. Claims may only be submitted for systems fully installed and inspected or EVs purchased on or after July 1, 2023.
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Eligible Renewable Energy Conversions

I. Conversion of Oil/Propane/Methane units to Heat Pumps plus use of a renewable residential electricity provider.

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Leasing an EV for a minimum of three years is equivalent to the purchase for the purposes of this rebate.

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 - c. Likewise, the third application from each household will be considered in the order of receipt, before applications from the Mayor, TC or SC members, and after all second-time applications are processed.
 - d. Applications from the Mayor, Town Councilors or Sustainability Committee members will be processed only after all other applications in the queue, and with a similar order of priority.
4. The Town will not be responsible for any terms or conditions imposed by their HP installation contractor, EV seller, or electricity provider.
5. The SC will aid homeowners in filling out rebate paperwork for federal and state programs that may supplement the town rebate.
6. Residents already having renewable electricity will still be eligible for the full rebate in each of the categories I-III.
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