

**Initial Draft List of GHG Mitigation Actions
Prince William County
January 11, 2023**

PWC Draft Mitigation Actions with GHG Reductions

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2030 - What will it take to achieve 2030 target? (Strategies Modeled in External Tool)				Action Contribution Estimate to Strategy GHG Reductions				Action GHG Reduction Potential Estimate (MT CO ₂ e/yr., rounded)				Implementation Assumptions	Links	PWC Goal Contributions			
Sector	Modeled Strategy GHG Reductions	Modeled Strategy Assumption	Action #	Low	High	Low	High	Low	High	County-wide goal of 50% GHG reductions below 2005 levels by 2030	County Government goal of carbon neutrality by 2050*			County-wide goal of 100% renewable energy by 2035	County Government goal of 100% renewable energy in operations by 2030		
Electricity Generation	2,089,559	92% clean electricity by 2030 <i>(strategy contributes 57% of total 2030 reductions)</i>	A	Virginia Renewable Portfolio Standard (RPS) - by 2030, 30% renewable sources for Phase I Utilities and 41% renewable sources for Phase II Utilities	33%	45%	681,500	931,000	The Virginia RPS will contribute a large percent of total strategy emissions reductions. Assuming the RPS results in a 30% renewable grid in the low scenario and 41% renewable grid in the high scenario. The RPS also requires 100% renewable for Phase II Utilities by 2045 and Phase I by 2050.	Virginia's Renewable Portfolio Standard	X	X	X	X			
			1	Explore forming an opt-out municipal aggregation program to acquire 100% clean electricity for the community.	80%	100%	1,671,500	2,089,500	An opt-out program results in higher GHG reductions than opt-in. High implementation assumes 100% participation, which results in 100% of strategy reductions. Low implementation assumes roughly 20% customers opt-out of program, resulting in only 80% participation. AREA OF FOCUS FOR THE COUNTY - this is the only action in this sector that would result in high implementation/strategy success.		X	X	X	X			
			2	Promote purchasing utility green power options within the community.	2%	14%	49,000	294,000	Dominion and Novec offer 100% renewable options. PWC's current penetration rate of utility green power options is unknown. Electricity tariff penetration rates in the US vary from roughly 2-12% (see Science Direct Study). The high scenario assumes 12% of electricity will be covered by green power options while the low scenario assumes 2% will be covered. Also assuming this action will result in higher uptake than installing local renewables as it only requires an additional utility cost rather than a physical installation.		X		X				
			3	Provide outreach and education on available programs and incentives for residents and businesses to install solar (e.g., tax credits, multifamily shared solar program, net metering, community solar, solar renewable energy certificates (SRECs))	0.4%	0.7%	7,500	14,500	The Solarize Campaign in Connecticut tripled the number of solar installations in 3 years (campaign included marketing and lower solar costs due to group buy program - see Yale study). Assuming a similar program could result in a 100% increase in solar systems a year compared to a base year (300%/3 years). In 2021, roughly 600 PWC residents had solar systems (PWC website). Assuming this action results in an increase in solar systems by 100% a year with a minimum of tripling installation, this would add an additional 1,200-2,400 systems by 2030. If each system covers 100% of a home's electricity usage, which is approx. 17,000 kWh/yr. in VA, (see Energy Sage website), this results in an additional 20,400-40,800 solar MWh, which equates to 0.3-0.6% of the 2030 total: 6,577,126 MWh (the low scenario assumes 0.3% electricity emissions reductions while the high scenario assumes 0.6% reductions). The GHG reduction potential of this action also depends on the financial value of the incentive.	https://cbevyale.edu/sites/default/files/2019-09/Solarize%20Year%20Community%20Rev%2006.pdf https://www.pwcva.gov/news/prince-william-county-department-development-services-announces-residential-solar-energy	X		X				
			4	Develop additional solar incentives with input from stakeholders such as the Residential Solar Task Force. Incentives can include financial discounts, streamlined permitting, or waived fees.	0.4%	0.7%	7,500	14,500		https://www.energysage.com/local-data/electricity-cost/va/#:~:text=The%20average%20electric%20rates%20in,the%20course%20of%20the%20year.	X		X				
			5	Procure 100% clean electricity for all municipal operations.	0.5%	1.1%	11,000	22,000	Municipal electricity use produced 21,811 MTCO ₂ e in 2018. Assuming municipal electricity emissions remain relatively constant (in the BAU emissions scenario), completely reducing these emissions would only contribute to 1% of 2030 strategy reductions. The low scenario assumes half of these reductions.		X	X	X	X			
			6	Develop solar projects on County facilities and public schools.	0.02%	0.05%	500	1,000	At maximum, assuming the County could install an additional 100,000 square feet of solar panels on public facilities (roughly the size of 50 homes). These panels would generate 2,760,000 kWh (27 kWh/sqft in VA - see Energy Sage report), which is roughly 0.04% of 2030 kWh. The low scenario assumes half of these reductions.	Energy Sage: How Much Solar Can My Roof Generate	X	X	X	X			

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2030 - What will it take to achieve 2030 target? (Strategies Modeled in External Tool)			Action Contribution Estimate to Strategy GHG Reductions		Action GHG Reduction Potential Estimate (MT CO ₂ e/yr., rounded)		Implementation Assumptions	Links	PWC Goal Contributions						
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Building Energy	331,401	40% of existing HVAC / water heaters are highly efficient or electrified. 100% of lighting / appliances are highly efficient, proportional reduction in fugitive emissions (strategy contributes 9% of total 2030 reductions)	7	Provide outreach and education to residents and businesses about building energy efficiency and electrification options and incentives.					Assuming that these actions (incentives and outreach) results in 0.5-1% of buildings participating in voluntary fuel switch and efficiency retrofits annually (see ACEE study on participation rates). The high scenario assumes 1% participation and the low scenario assumes 0.5%. These reductions include any market trends that were not quantified separately. The GHG reduction potential of this action also depends on the financial value of the incentive.	American Council for an Energy Efficient Economy, Expanding the Energy Efficiency Pie	X				
			8	Provide incentives and/or discounts to encourage existing building energy efficiency retrofits (e.g., rebates, reductions in transfer fees or the previous year's property tax for sellers, discount or deferral on future year property tax for buyers).	5%	11%	18,000	36,000	AREA OF FOCUS FOR COUNTY - due to lack of County authority to implement mandatory actions, large incentives are required to realize reductions in this sector		X				
			9	County staff advocate for a low-carbon building code and vote on energy code updates. Advocate for quicker adoption of the IECC code in Virginia.	Not Estimated	Not Estimated	Not Estimated	Not Estimated	Reductions not estimated as it is difficult to quantify the additional impact that County advocacy/voting would have on national code stringency and is considered as "Indirect" action.	ACEEE, Proposed Model Building Code Could Slash Energy Use in New Commercial Buildings	X	X			
			10	Require building owners to bring building energy efficiency in line with current adopted code when there are alterations, renovations, or additions.	2%	6%	7,000	21,500	Assuming major renovations occur across 1-2% of total buildings/year in PWC. Assuming emissions would be reduced by 20-30% on average for those buildings due to updated code (energy efficiency requirements increase by 8% per 3-year code cycle - see NBI source). The high end assumes 2% participation and 30% emissions reductions while the low end assumes 1% participation and 20% emissions reductions.	New Buildings Institute, Advance Climate Action by Getting Involved Now in the Commercial 2024 IECC Update	X	X			
			11	Propose green zoning regulations to incentivize efficient buildings, multifamily and mixed use areas, and transit oriented developments.					Denser, multifamily housing reduces household energy demand by 27-47% (see ACS study). Assuming these actions would impact new development building emissions.	ACS, Linking Housing Policy, Housing Typology, and Residential Energy Demand in the United States	X				
			12	Provide incentives or streamlining for developers who build to a more energy efficient standard set by the County.	2%	6%	5,500	19,500	Assuming 20-40% of developers/new developments will use these incentives. The low end assumes 27% energy reduction and 20% implementation in new development while the high end assumes 47% energy reduction and 40% implementation in new developments. These actions only quantify building energy impacts, not vehicle miles traveled (VMT) impacts from dense development GHG reductions quantified in separate TOD action below.		X				
			13	Implement a voluntary commercial building energy benchmarking and reporting program.	1%	2%	2,000	5,500	Assuming this program would cover 90% of commercial buildings/energy use. Assuming commercial benchmarked buildings save 1-3% energy a year compared to non-benchmarked (variety of sources). The low end assumes 1% energy savings while the high end assumes 3%.		X				
			14	Develop a net-zero building plan for all existing County municipal buildings	0.2%	0.5%	700	1,500	Municipal building non-electricity emissions were 1,481 MTCO ₂ e in 2018. Assuming the high end results in 100% emissions reductions while the low end results in 50%. Assuming emissions are relatively constant.		X	X			
15	Develop an all-electric new construction requirement for all new County municipal buildings.	0%	0%	10	70	Action will have a minimal impact on emissions due to limited municipal new construction between 2025-2030. Assuming new construction will produce 1-5% total municipal building non-electricity emissions (1,481 MTCO ₂ e).		X	X						

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Transportation - Mode Shift	74,967	5% mode shift from fossil fuel vehicles (strategy contributes 2% of total 2030 reductions)	16	Improve active transportation infrastructure around transit stops and stations (e.g., connect active networks, provide bike lockers).	50%	100%	37,500	75,000	Air Quality Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity Actions were evaluated using the CAPCOA methodology to understand their relative VMT reduction potential compared to other travel mode shift actions. These actions are considered high impact under this methodology and a combination of these actions could result in 100% strategy achievement.	X					
			17	Continue to improve connectivity of sidewalks and trails (paved and unpaved) for pedestrians and cyclists.						X					
			18	Implement complete streets in downtowns and neighborhoods.						X					
			19	Support transit-oriented development, and ensure that land uses within 1/2 mile of transit stations are oriented toward people and not auto uses (e.g., auto repair, car washes, drive throughs)						X					
			20	Eliminate minimum parking standard or introduce maximum parking standards.						X					
			21	Develop and implement a parking pricing program in downtown areas or hubs and include free or discounted parking for electric vehicles.						X					
			22	Offer discounted transit passes to residents.						X					
			23	Work with major employers to expand the TDM and Transit Fare Buy Down Program (expanding off Strategic Plan program)						X					
24	Partner with County transit operators to improve and provide new public transit infrastructure (e.g., priority bus lanes, bus stops, priority signaling)	7%	14%	5,000	10,500	Assuming action could reduce community on-road transport emissions by a maximum of 0.6% (see CAPCOA Action T-26. Implement Transit-Supportive Roadway Treatments). Assuming the low end results in half of the high end reductions (0.3%). Air Quality Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity	X								
Transportation - Vehicle Fuel Switch	867,970	50% of vehicles are electric or ZEV (strategy contributes 24% of total 2030 reductions)	8	Zero Emission Vehicle (ZEV) adoption trends	34%	52%	295,000	451,500	Interpolated from Bloomberg Electric Vehicle Outlook 2022 international forecasts. Interpolation assumes roughly 17-26% ZEV adoption for passenger and light duty commercial vehicles by 2030. Low end assumes 17% and high end assumes 26%. Bloomberg Electric Vehicle Outlook 2022	X					
			25	Provide outreach and education on existing ZEV incentives or rebates.	3%	10%	28,000	83,500	These actions are grouped together as studies show that a combination of incentives, infrastructure, and model availability are needed to increase EV uptake, and the impacts of each are difficult to disaggregate. Assuming a vehicle turnover of approximately 8% a year (12 year life). Assuming that in PWC, the share of new vehicle purchases that are EV is 2% (US average from ICT 2020 study). Assuming these actions will increase EV share of new vehicles from 2% to 4-12% (indicative of EV new vehicle share in cities with high levels of promoting actions, see ICT study Figure 6 and 7). Of the 8% of vehicles that are turned over each year, 4-12% of them will be EVs (low end assumes 4% and high end assumes 12%). AREA OF FOCUS FOR COUNTY - due to lack of County authority in this sector, it is necessary for the County to focus on expanding EV infrastructure and offering incentives to support consumer choices	X					
			26	Develop incentives for residents and businesses to purchase ZEVs or install charging equipment, such as through rebates, "group-buy" programs, or streamlined permitting.						X					
			27	Expand public EV charging infrastructure, especially along main routes and in popular destinations.						X					
			28	Partner with public transit operator to promote the transition to zero emission buses (e.g., providing charging station infrastructure).						2%	4%	17,500	34,500	Assuming bus VMT are 1-2% of total community VMT and bus emissions could be fully reduced by 2030 (low end assumes 1% and high end assumes 2%).	X
29	Transition County fleet to zero-/low-emissions vehicles, make supporting infrastructure open to other fleets.	0.5%	0.9%	4,000						8,000	Municipal fleet emissions were 7,765 MTCO ₂ e in 2018. Assuming the high end results in 100% ZEV fleet while the low end is 50%.	X	X		

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Transportation - Off-road	24,661	15% of off-road equipment are ZEV (strategy contributes 1% of total 2030 reductions)	C	Electric equipment adoption trends.	33%	100%	8,000	24,500	CallStart study demonstrates that 5-15% of construction equipment will be battery electric by 2030 (low end assumes 5% and high end assumes 15%).	Technology and Market Assessment of Zero-	X			
			30	Adopt a contracting policy that encourages the County to contract with businesses operating low- or zero-emission fleets of off-road equipment.	16%	32%	4,000	8,000	Assuming County contracts produce a maximum of 5% off-road emissions and all can be reduced by 2030. Low end assumes half of those reductions could be achieved (2.5%).		X	X		
			31	Start a lending library where residents can check out electric landscaping equipment (and possibly expand to other energy-efficiency related tools)	6%	20%	1,500	5,000	Assuming only 1-3% annual participation from off-road equipment users/action impacts 1-3% of off-road emissions (low end assumes 1% and high end assumes 3%).		X			
Transportation - Aviation	16,316	20% reduction in aviation emissions (strategy contributes <1% of total 2030 reductions)	32	Encourage and promote train travel to regional destinations; support high-speed rail initiatives.	1%	2%	200	400	Assuming a maximum of 0.5% air travelers switch to rail trips by 2030 due to lack of rail infrastructure and lack of County authority in this sector. Low end assumes half of those reductions could be achieved (0.25%).		X			
Waste	81,379	60% waste diversion (strategy contributes 2% of total 2030 reductions)	33	Implement organic food waste composting, and provide compost for free to residents, businesses, and the agricultural sector.	2%	4%	1,500	3,500	In 2018, the US composted 4% of total food waste on average (EPA). Assuming composting program will result in composting of 4-8% of total PWC food scraps by 2030. Reductions quantified in CURB. Impacts of increased levels of at-home eating post-covid are not considered in reductions.	EPA, Advancing Sustainable Materials Management, 2018 Fact Sheet	X	X		
			34	Require commercial generators to divert food scraps either through food recovery or composting programs.	25%	38%	20,000	31,000	Assuming commercial businesses generate 50-70% of total food waste (Feeding America). Assuming businesses divert 90-100% of food waste through mandatory program. Therefore, 45-70% of total food waste is diverted through mandatory program. Reductions quantified in CURB. Impacts of increased levels of at-home eating post-covid are not considered in reductions.	Feeding America, How we Fight Food Waste in the US	X			
			35	Develop a sustainable purchasing policy to promote or require procurement of sustainable products, such as those made from recycled materials, or prohibit the use of certain materials, such as single use plastics.	NA	NA	NA	NA	Assuming no impact on County waste emissions as this impacts upstream/scope 3 emissions that are not included in the inventory.					
Industrial Processes and Product Use	159,248	57% of HFCs are replaced with zero GWP alternatives (strategy contributes 4% of total 2030 reductions)	D	Kigali Amendment to reduce production and consumption of HFCs.	88%	100%	139,500	159,000	Under the Kigali Amendment, industrialized nations like the United States will reduce production and consumption of HFCs to about 15% of 2012 levels by 2036 (equates to a 85% reduction in HFCs by 2036). Low end assumes a 50% reduction in HFCs.	NY Times, Senate Ratifies Pact to Curb a Broad Category of GHG Gases	X			
			36	Promote and/or incentivize the selling and purchasing of low-global warming potential (GWP) refrigerants in the community.	NA	NA	NA	NA	GHG reductions assumed to occur as a result of Kigali Amendment shown in Action D.		X	X		
			37	Develop a refrigerant disposal program to properly dispose of refrigerant at end of equipment lifespan.							X			
Agriculture, Forestry and Land Use	3,510	10% reduction in agricultural emissions (strategy contributes <1% of total 2030 reductions)	38	Provide resources to agricultural community on sustainable farming practices that reduce the use of fertilizer and increase soil carbon sequestration.	14%	28%	500	1,000	In 2017 PWC contained 22,874 acres of farmland which was primarily cropland (62%), pastureland (20%) and woodland (14%). If all cropland (14,181 acres) and pastureland (4,574 acres) switched to using compost applications (one of the actions with the highest GHG sequestration benefit in the Comet Planner tool), could sequester roughly 50,000 MTCO ₂ e/year. Action reductions assume only 1-2% of cropland and pasture area uses compost applications by 2030 due to action (low end assumes 1% and high end assumes 2%). NOTE: CAPCOA directs users to Comet Planner tool for quantifying agriculture actions-selected "Compost Application (Compost (C/N < or = 11) Application to Annual Crops, Purchased from a certified composting facility)" - selected Sacramento as a proxy area in CA (location impacts calculated emissions).	http://www.comet-planner.comet-planner.com/ https://www.nass.usda.gov/Publications/AgCensus2012/Online_Resources/County_Profiles/Virginia/ps1153.pdf	X			
Total Reductions	3,649,011	MTCO₂e												

RED = areas where County feedback on assumptions is needed