


On-Road Transportation Greenhouse Gas Emissions Reduction Strategies: Lessons Learned and Considerations for Prince William County

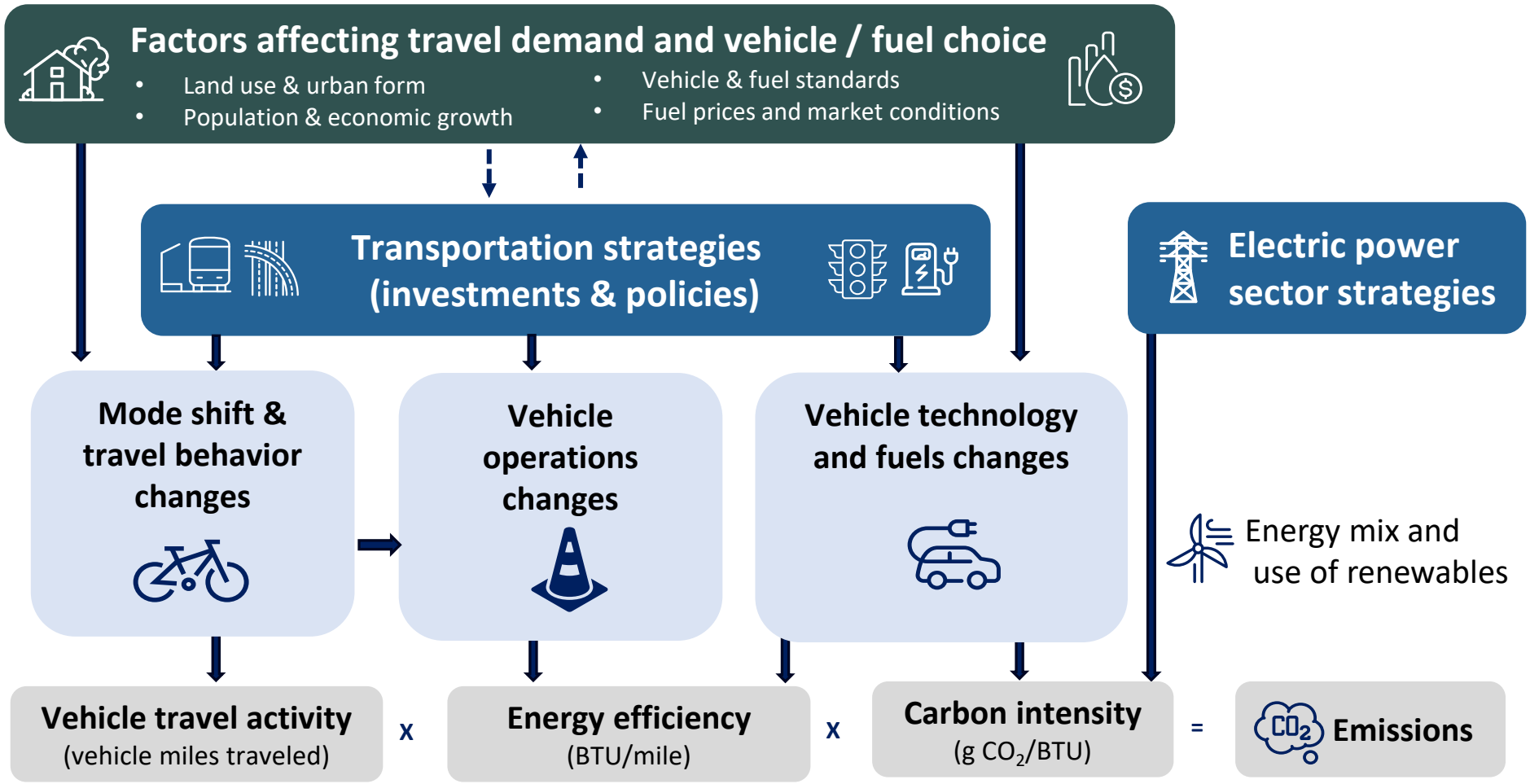
Michael Grant

Vice President, Transportation

March 27, 2025

Background and Lessons Learned from the Transportation Planning Board's Regional Studies

Pathways for Reducing GHG Emissions from On-Road Transportation



Pathways to On-Road GHG Reduction and their Potential

Mode Shift and Travel Behavior (MSTB)

- Mode shifts to transit, carpooling, nonmotorized
- Reduce trip lengths (e.g., brings jobs and housing closer together)
- Replace trips (e.g., telework, alternative work schedules)

Moderate GHG reduction potential, but both near-term and long-term actions and many community benefits

Transportation Systems Management and Operations (TSMO)

- Enhance incident management, traffic signal coordination, and other operations strategies
- Reduce speeding and idling
- "Eco-driving"

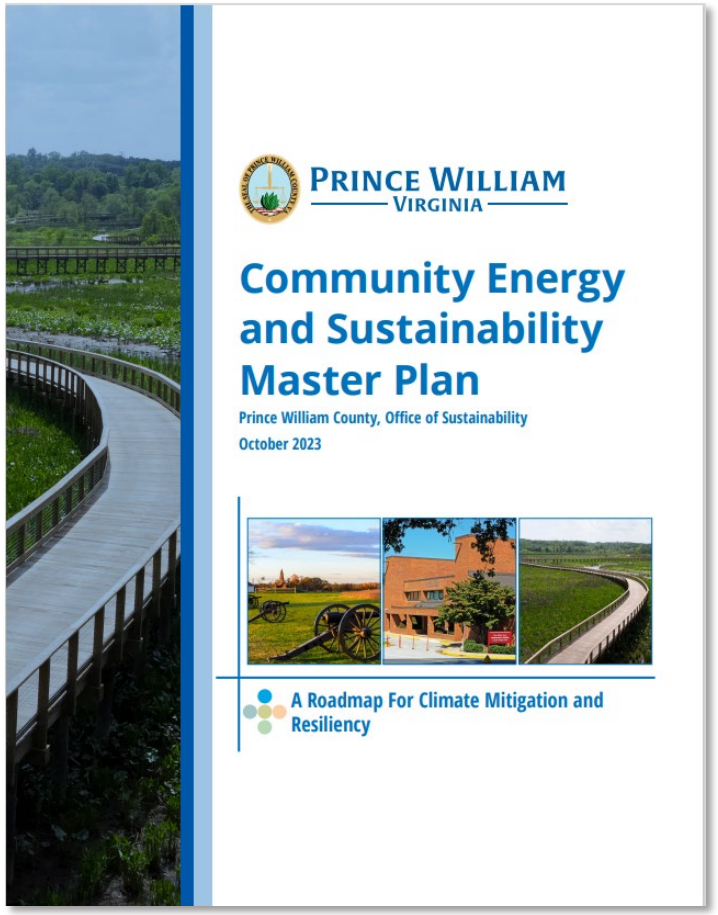
Generally limited GHG reduction potential, but near-term potential addressing travel delay

Vehicle Technology and Fuels

- Improve fuel economy of vehicle fleet
- Advance alternative fuels
- Accelerate electric vehicle deployment

Largest potential GHG reductions, needed to achieve deep decarbonization goals

Prince William County's Climate Mitigation Actions for the Community



Mode Shift and Travel Behavior (MSTB)

T.1: Improve Pedestrian and Bicycle Infrastructure and Enhance Connectivity

T.2: Encourage Transit-Oriented Development

T.3: Expand Existing Programs that Reduce Single-Occupancy Vehicle Trips

T.4: Upgrade Public Transit Infrastructure

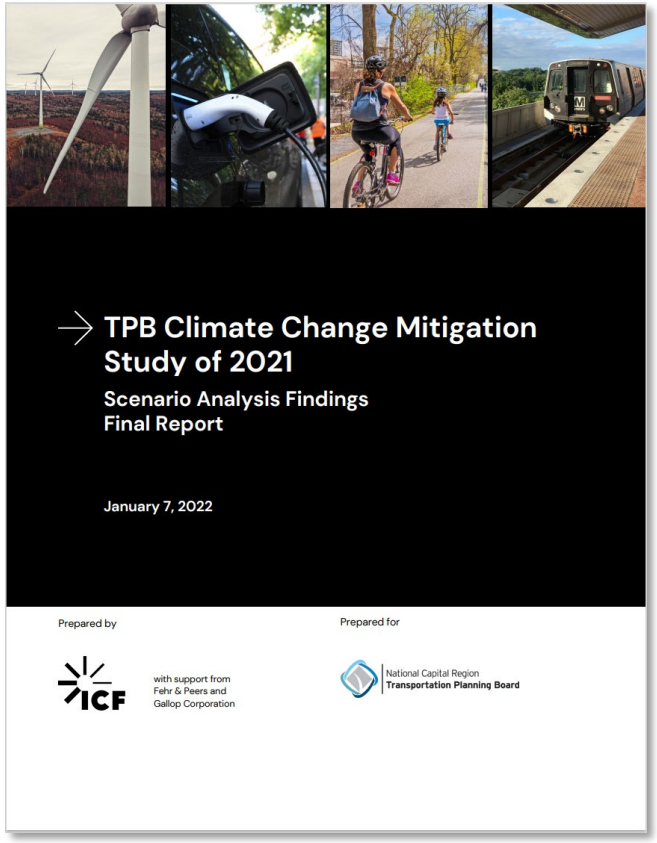
Vehicle Technology and Fuels

T.5: Encourage Zero-Emission Vehicles and Charging

T.6: Expand Public EV Charging Network

T.7: Adopt Zero- or Low-Emissions County Fleet

TPB's Climate Change Mitigation Study of 2021: Key Conclusions



- Achieving a 50% reduction in on-road GHG emissions (from the 2005 level) by 2030 is extremely ambitious.
  - None of the scenarios were estimated to achieve this goal.
  - Several scenarios achieve the level of on-road GHG reductions in COG's multisector 2030 Climate and Energy Action Plan (CEAP). All require significant shifts toward electric vehicles (EVs) and mode shifts.
- Achieving an 80% reduction in on-road GHG emissions (from the 2005 level) by 2050 is more attainable with vehicle technology advancements and a clean electric grid.
  - The goal can be achieved under other scenarios with vehicle technology/fuels strategies and a cleaner electric grid.
  - Mode shift and travel behavior strategies provide supporting GHG reductions but are less important when nearly all on-road vehicles are EVs and the electric grid is carbon neutral.

TPB's Adoption of On-Road GHG Reduction Goals and Strategies

Resolution on the Adoption of On-Road GHG Reduction Goals and Strategies (R18-2022):

Adopted 7 priority reduction strategies

1. Improve **walk/bike access** to all TPB identified high-capacity transit stations
2. Increase **walk/bike modes** of travel
3. Convert private and public sector light, medium, and heavy-duty vehicles, and public transit buses to **clean fuels,** by 2030
4. Deploy a region-wide robust **electric vehicle charging network** (or refueling stations for alternative fuels).
5. Add **additional housing units near TPB-identified high-capacity transit stations** and in COG's Regional Activity Centers.
6. Reduce travel times on all **public transportation** bus services
7. Implement **transportation system management & operations (TSMO)** improvement measures at all eligible locations by 2030.

Identified 7 additional strategies for further exploration

1. Take action to **shift growth in jobs and housing** to locations near TPB-identified high-capacity transit stations and in COG's Regional Activity Centers to improve the jobs-housing balance locally.
2. Make all public bus transportation in the region **fare-free** by 2030.
3. Make all public rail transportation in the region **fare-free** by 2030.
4. **Price workplace parking** for employees – in Activity Centers by 2030 and everywhere by 2050.
5. Convert a higher proportion of daily work trips to telework by 2030 and beyond.
6. Charge a **new fee per vehicle mile of travel (VMT)** by private passenger vehicles in addition to the prevailing transportation fees and fuel taxes [mileage-based user fee].
7. Charge a **"cordon fee" (commuter tax)** per motorized vehicle trip for all vehicles entering Activity Centers, by 2030.

Additional Strategies Explored as part of 2024 Study on Implementation Considerations

8. Implement a **carbon pricing** program or increase in fuel taxes.
9. Implement **pay-as-you-drive (PAYD) insurance** requirements.
10. Implement employer-based **parking cash-out** program requirements.
11. Reduce VMT associated with **school-based trips**.
12. Incentivize **electric bicycle (e-bike)** adoption.
13. Disincentivize parking through **parking reforms**.
14. Convert existing highway lanes to **high-occupancy toll (HOT) lanes**.
15. Expand **microtransit / first mile-last mile service** in the region.
16. Expand programs to **incentivize carpooling and vanpooling**.

GHG Reduction Potential

Many of the strategies that could have the largest impact at reducing GHG emissions in the near-term involve increasing the price of vehicle travel, which can be challenging politically and raise concerns in terms of equity and affordability.

- Shifting development to high-capacity transit stations and Regional Activity Centers could have relatively large impacts but also takes a longer time for benefits to manifest.
- The GHG emissions effects of the strategies depend heavily on how the strategies are implemented (i.e., level of pricing) and how much incremental changes can be achieved (i.e., effects beyond existing policies).

Although public agencies can implement policies or regulations to advance these strategies, the GHG impacts of many strategies depend heavily on factors outside public agency control.

	Strategy	GHG Reduction	
		Impact	Timeframe
1	TOD	●	🕐🕐🕐
2	Fare-Free Bus	◔	🕐
3	Fare-Free Rail	◔	🕐
4	Work Parking Pricing	◑	🕐🕐
5	Telework	◑	🕐
6	VMT Fee	●	🕐🕐
7	Cordon Fee	●	🕐🕐
8	Carbon Pricing	●	🕐🕐
9	PAYD Insurance	◑	🕐🕐
10	Parking Cash-out	◑	🕐
11	School-Based VMT	◔	🕐
12	E-Bike Incentive	◔	🕐
13	Parking Reform	◑	🕐
14	Convert to HOT Lanes	◑	🕐🕐
15	Microtransit	◑	🕐
16	Carpool/Vanpool Incentives	◑	🕐
Relative Impact: ◔ Low ◑ Medium ● High **Relative Timeframe:** 🕐 Short 🕐🕐 Medium 🕐🕐🕐 Long			

Revenues & Expenditures

Costs of implementation vary, with some strategies creating significant fiscal impacts on public agencies while others are net revenue generators.

- **Public Sector:** The costliest strategies would likely be fare-free bus and rail (Strategies 2, 3) due to the loss of farebox revenue. In contrast, the strategies that involve pricing (Strategies 6, 7, 8, 14) would be net revenue generators.
- **Private Sector:** Most of the strategies would pose either mixed/uncertain or negligible costs.
- **Households/Individuals:** Pricing policies generally add direct costs onto households, although overall impact depends on program design. In general, policies would result in benefits to society, since a reduction in VMT would likely result in reductions in the associated externalities (e.g., air pollution, noise, injuries due to accidents, etc.).

Strategy		Revenues & Expenditures		
		Public Sector	Private Sector	Households/ Individuals
1	TOD	-	-	$
2	Fare-Free Bus	($$$)	-	$
3	Fare-Free Rail	($$$)	-	$
4	Work Parking Pricing	($)	$	($$)
5	Telework	($)	-	$
6	VMT Fee	$$$	($)	($$)
7	Cordon Fee	$$	($$)	($)
8	Carbon Pricing	$$$	($$)	($$$)
9	PAYD Insurance	($)	-	$
10	Parking Cash-out	($)	($)	$
11	School-Based VMT	($)	-	($)
12	E-Bike Incentive	($)	-	$
13	Parking Reform	$	-	-
14	Convert to HOT Lanes	$$	-	($$)
15	Microtransit	($$)	-	$
16	Carpool/Vanpool Incentives	($$)	-	$

Relative Cost: ($) Low ($$) Medium ($$$) High
Revenue Generation/Savings: $ Low $$ Medium $$$ High

Regional Goals & Priorities

The impacts of strategies on regional goals depends heavily on how strategies are implemented.

- For instance, pricing strategies raise potential equity concerns in relation to the ability of low-income persons to pay. However, the programs can be structured to enhance equity.
- By reducing VMT, strategies should have beneficial impacts on air quality and public health (although some uncertainty regarding conversion of lanes due to traffic congestion and diversion).
- Strategies also generally will have beneficial effects on other goals such as safety, reliability, and efficiency. However, these impacts are relatively small or uncertain, with a few notable exceptions.

Strategy		Regional Goals & Priorities							
		Accessibility & Affordability	Environmental Quality	Equity	Infrastructure Condition	Livability & Prosperity	Reliability & Efficiency	Resiliency	Safety
1	TOD	⊕	⊕	⊕	⊙	⊕	⊕	⊕	⊕
2	Fare-Free Bus	⊕	⊕	⊕	◯	⊕	◯	◯	⊙
3	Fare-Free Rail	⊕	⊕	⊕	⊙	⊕	◯	◯	⊙
4	Work Parking Pricing	⊖	⊕	⊙	◯	⊙	⊙	◯	◯
5	Telework	⊕	⊕	⊖	◯	⊖	⊙	⊕	◯
6	VMT Fee	⊙	⊕	⊙	⊕	⊙	⊕	◯	◯
7	Cordon Fee	⊙	⊕	⊙	⊙	⊙	⊕	◯	◯
8	Carbon Pricing	⊙	⊕	⊙	⊕	◯	⊕	◯	◯
9	PAYD Insurance	⊕	⊕	⊕	◯	◯	◯	◯	◯
10	Parking Cash-out	⊕	⊕	⊕	◯	◯	◯	◯	◯
11	School-Based VMT	⊙	⊕	⊙	◯	◯	⊙	◯	⊙
12	E-Bike Incentive	⊕	⊕	⊕	◯	◯	◯	⊕	⊙
13	Parking Reform	⊕	⊕	⊙	◯	⊕	◯	◯	◯
14	Convert to HOT Lanes	⊙	⊙	⊙	⊕	⊙	⊕	◯	⊙
15	Microtransit	⊕	⊕	⊕	◯	⊕	◯	◯	◯
16	Carpool/Vanpool Incentives	⊕	⊕	⊙	◯	◯	◯	◯	◯

Impact on Goals: ⊕ Positive ⊖ Negative ⊙ Mixed / Uncertain ◯ Negligible

Several strategies would work best if paired together

- While some strategies may have counteracting effects, the most effective approach would pair “sticks” (strategies that disincentivize driving) with “carrots” (strategies that expand, enhance, or incentivize using transit, ridesharing, bicycling, walking, or telework).

- This could provide synergistic effects by providing the public with viable options and alternatives to driving, while addressing affordability and equity concerns and likely leading to more public support.

Perspectives on Prince William County's Identified Transportation Strategies

Prince William County's Climate Mitigation Actions for the Community

- Policies work together for synergistic results
  - Development patterns, transportation infrastructure, and incentives help to support travel choices that reduce VMT.
  - Expanding public EV charging network helps to address range anxiety, and encouraging EV adoption helps overcome barriers

Mode Shift and Travel Behavior (MSTB)

T.1: Improve Pedestrian and Bicycle Infrastructure and Enhance Connectivity

T.2: Encourage Transit-Oriented Development

T.3: Expand Existing Programs that Reduce Single-Occupancy Vehicle Trips

T.4: Upgrade Public Transit Infrastructure

Vehicle Technology and Fuels

T.5: Encourage Zero-Emission Vehicles and Charging

T.6: Expand Public EV Charging Network

T.7: Adopt Zero- or Low-Emissions County Fleet

T.1: Improve Pedestrian and Bicycle Infrastructure and Enhance Connectivity

Potential Actions:

- Improve/expand sidewalk network, crosswalks, and pedestrian signals
- Improve/expand the bicycle network (e.g., separated bike lanes, on-street bike lanes)
- Expand shared use paths
- Add bicycle parking
- Add bikeshare
- Install traffic-calming designs (e.g., speed humps, curb extensions, crosswalk islands, narrow travel lanes, build roundabouts at intersections)

Making It Happen:

- Develop strategic Active Transportation Plan, to identify priority locations for investments (filling key gaps, addressing safety concerns, prioritizing access to transit)
- Develop plans as part of routine roadway maintenance

GHG Impact: **Relatively low** – Although a large share of passenger trips are short, VMT reduction is limited by short distances and barriers to mode shifts (weather, personal ability and age, trip purpose needs, built environment)

Timeframe: **Medium** – May be able to accommodate some through routine roadway maintenance, but may require infrastructure planning and development

Cost: **Moderate** – Many investments are relatively low-cost, but a vast amount of potential needs

T.2: Encourage Transit-Oriented Development (TOD)

Potential Actions:

- Comprehensive plan / zoning amendments or updates
- Adjustments to parking requirements
- Streamlined permitting
- Developer incentives

Making It Happen:

- Identify key locations for TOD, based on existing and planned transit and designated activity centers
- Bring TOD-focus into planning policy/zoning

GHG Impact: **Relatively high** – Land use and urban design are key determinants of vehicle travel demand

Timeframe: **Relatively long** – While actions can be taken immediately, development takes considerable time

Cost: **Low** – Primarily part of existing county functions of comprehensive planning and zoning

T.3: Expand Existing Programs that Reduce Single-Occupancy Vehicle (SOV) Trips

Potential Actions:

- Expand rideshare and commuter assistance program resources for employers and the public (e.g., outreach and technical support)
- Provide and enhance incentives for the public to use alternatives to driving (e.g., GoMyWayVA™)
- Reduce transit fares
- Increase and enhance park-and-ride options to support ridesharing (including slugging) and transit
- Strengthen TDM proffers in development reviews
- Incentivize employers and developments to enhance options for biking/walking, shuttles, telework, and offering transit benefits or parking cash out

Making It Happen:

- Develop a Strategic Transportation Demand Management Action Plan – benchmark and draw from lessons from other jurisdictions
- Coordinate with OmniRide, Virginia Department of Rail and Public Transportation, Commuter Connections, and potentially other counties to pilot actions

GHG Impact: Medium – Demand management strategies have been estimated to be some of the most effective strategies, but largely due to parking pricing and telework

Timeframe: Relatively short – Most of these actions have near-term effects and can be implemented relatively quickly (assuming resources are available)

Cost: Moderate – Incentives and outreach require resources; park-and-ride facilities and reducing transit fares may be costly

T.4: Upgrade Public Transit Infrastructure

Potential Actions:

- Implement bus priority treatments (e.g., transit signal priority, bus rapid transit, bus lanes during peak hours)
- Enhance bus stops (e.g., benches, shelters, lighting, clear signage/real-time bus information at key locations, better sidewalk connections and crosswalks)
- Expand bus service coverage and frequency

Making It Happen:

- Partner with VDOT in exploring priority bus treatments
- Work with OmniRide to identify key priority bus corridors and conduct analysis to identify most promising locations for transit

GHG Impact: Medium– Land use and urban design are key determinants of vehicle travel demand

Timeframe: Medium – Infrastructure investments will take some time, and further bus network enhancements can be built out over time.

Cost: Moderate – New transit services will require subsidies, and infrastructure investments will require resources

T.5: Encourage Zero-Emission Vehicles and Charging

Potential Actions:

- Provide incentives for residents and businesses to purchase ZEVs
- Provide incentives/streamlined permitting for installing home EV chargers
- Conduct outreach to educate the public about the benefits of ZEVs

Making It Happen:

- Coordinate with MWCOG, other counties, and Commonwealth of Virginia to explore potential incentive programs (considering equity)
- Integrate outreach on ZEVs into existing environmental programs and county events; partner with auto dealers

GHG Impact: **Relatively high** – Getting individuals to purchase/lease ZEVs can yield a high level of GHG reduction due to the on-going amount of travel by passenger vehicles

Timeframe: **Relatively short** – Most of these actions have near-term effects and can be implemented relatively quickly (assuming resources are available)

Cost: **Moderate** – Incentives could be expensive to implement depending on level and demand, and need to consider aspects such as affordability for lower-income residents

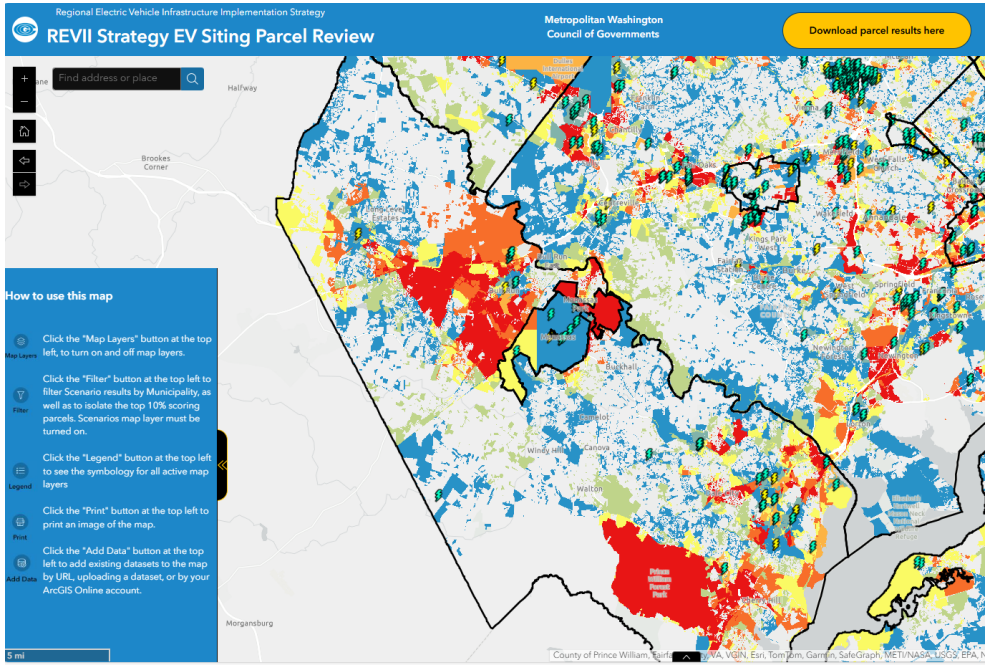
T.6: Expand Public EV Charging Network

Potential Actions:

- Work with private landowners or public entities to identify key target locations to explore for additions of public EV charging infrastructure
- Provide incentives/streamlined permitting for businesses and developments to install public EV chargers

Making It Happen:

- Utilize MWCOG's Regional EV Infrastructure Implementation Strategy and EV charger siting priority map as a starting point to identify and prioritize locations for needed community charging
- Coordinate with Dominion and private providers



GHG Impact: Medium – Public EV charging is important for households in multifamily housing developments and other places where home charging is not possible, and to address range-anxiety for longer-distance trips

Timeframe: Medium – Building out a full network will take time, but there are opportunities

Cost: Moderate – Incentives and outreach require resources; park-and-ride facilities and reducing transit fares may be costly

T.7: Adopt Zero- or Low-Emissions County Fleet

Potential Actions:

- Replace county fleet vehicles with ZEVs and other efficient vehicles
- Install associated EV refueling infrastructure

Making It Happen:

- Develop fleet transition plan (developing charging infrastructure scenarios, load capacity analysis, engineering design, infrastructure cost analysis, funding plan, and implementation plan)

GHG Impact: **Relatively low** – County fleet vehicles are a small share of overall motor vehicle use in the County

Timeframe: **Medium** – Can be implemented as part of overall vehicle replacement cycles, or advanced more quickly

Cost: **Relatively low** – Incremental costs of hybrid and EVs are not very large, but need fleet planning for electrification and necessary charging infrastructure

Summary

- **A lot of potential opportunities,** which have benefits for county residents and businesses:
  - Safety
  - Access and mobility
  - Public health
  - Community quality of life and economic vitality
- **Regional coordination** is helpful
  - Learn from experiences of other jurisdictions
  - Leverage and expand upon existing programs and resources; coordinate with other jurisdictions to maximize benefits
  - Some of the most impactful strategies are heavily influenced by state and federal actions (e.g., vehicle standards, incentives)

Get in touch with:
Michael Grant

Vice President, Transportation
(202) 862-1211
Michael.Grant@icf.com

icf.com

linkedin.com/company/icf-international/

twitter.com/icf

https://www.facebook.com/ThisIsICF/

About ICF

ICF (NASDAQ:ICFI) is a global consulting and digital services company with over 7,000 full- and part-time employees, but we are not your typical consultants. At ICF, business analysts and policy specialists work together with digital strategists, data scientists and creatives. We combine unmatched industry expertise with cutting-edge engagement capabilities to help organizations solve their most complex challenges. Since 1969, public and private sector clients have worked with ICF to navigate change and shape the future.