



CAMBRIDGE
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Think  Forward

Long-Range Transportation Planning for an Uncertain Future: Scenario Planning and Analysis for Northern Virginia's TransAction Plan

presented to

TRB Innovations in Travel Analysis and Planning Conference

presented by

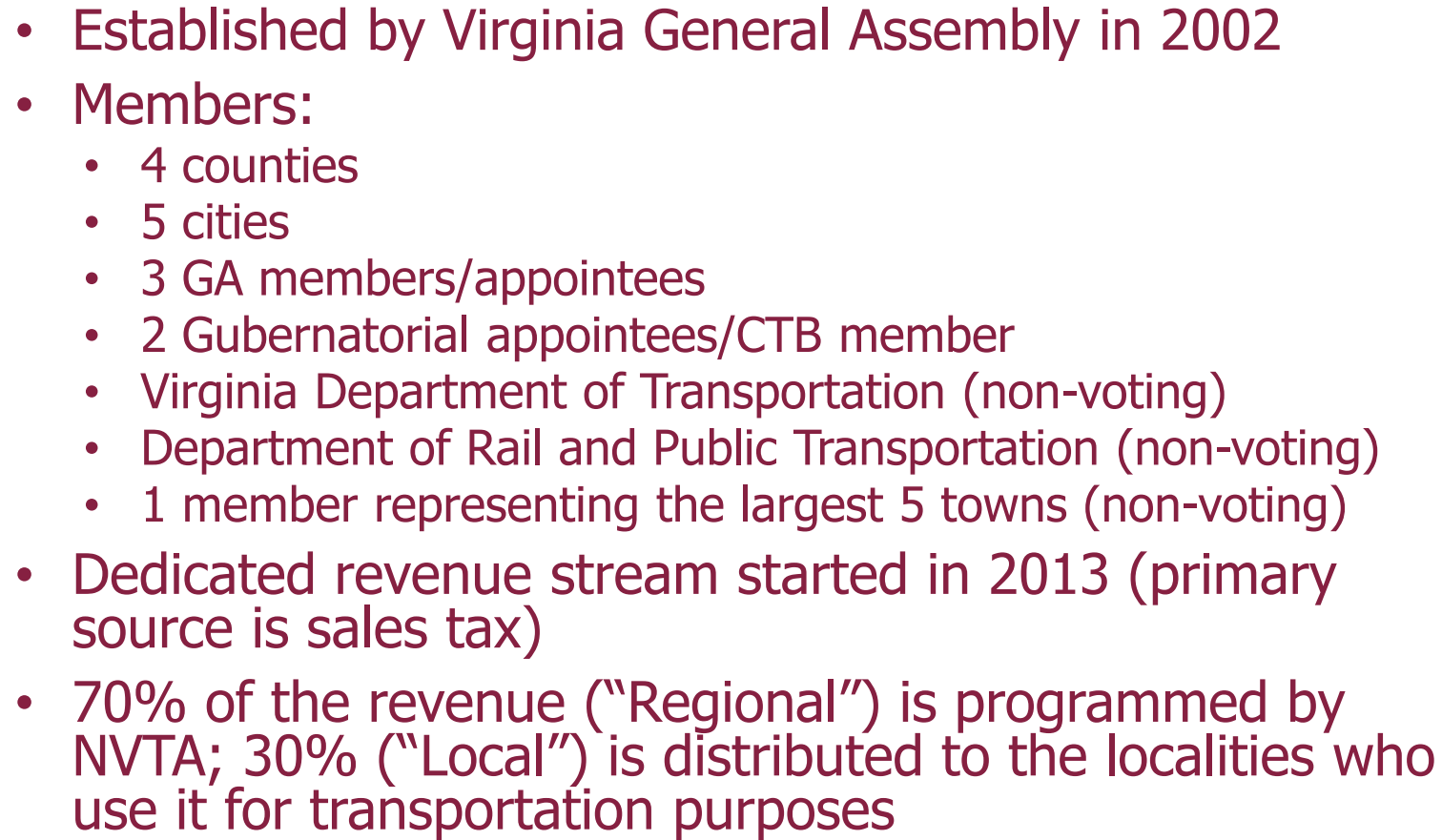
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Introduction to NVTA & TransAction





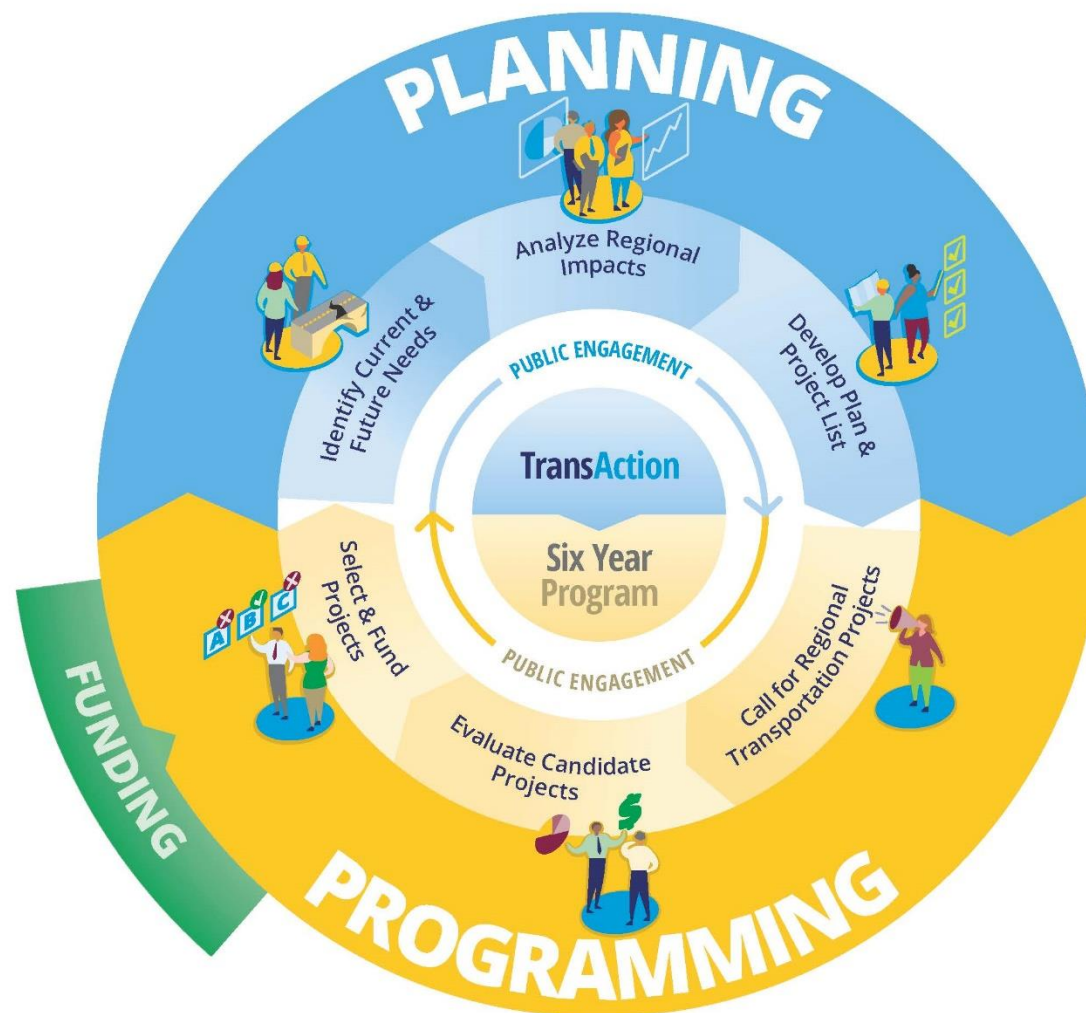


NVTA's Primary Responsibilities



TransAction

- Multimodal Long-Range Transportation Plan for NoVA
- Updated Every Five Years
- Fiscally and Geographically Unconstrained
- Identify Current and Future Transportation Needs & Priorities
- Analyze Regional Impacts
- Develop Plan and Project List
- Most recent TA adopted in December 2022
- Horizon year: 2045



Six Year Program (SYP)

- Allocates NVTA's Regional Revenues to Regional Transportation Projects
- Updated Every Two Years
- Most Recent SYP Adopted in July 2022
- \$3.1B on 122 regional projects



TransAction: The Multimodal Long-range Transportation Plan for Northern Virginia



- **Vision:** “Northern Virginia will plan for, and invest in, a safe, equitable, sustainable, and integrated multimodal transportation system that enhances quality of life, strengthens the economy, and builds resilience.”

Goal	Objective	Performance Measure	Weight	Alignment with Core Values
Mobility: Enhance quality of life of Northern Virginians by improving performance of the multimodal transportation system	A. Reduce congestion and delay*	A1. Total Person-Hours of Delay in autos	10	
		A2. Total Person-Hours of Delay on Transit	10	
	B. Improve travel time reliability*	B1. Duration of Severe Congestion	10	
		B2. Transit person-miles in dedicated/priority ROW	10	
Accessibility: Strengthen the region's economy by increasing access to jobs, employees, markets, and destinations for all communities	C. Improve access to jobs*	C1. Access to jobs by car, transit, and bike	10	
		C2. Access to jobs by car, transit, and bike for EEA populations	10	
	D. Reduce dependence on driving alone by improving conditions for people accessing transit and using other modes	D1. Quality of access to transit and the walk/bike network	15	
Resiliency: Improve the transportation system's ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.	E. Improve safety and security of the multimodal transportation system	E1. Potential for safety and security improvements	10	
	F. Reduce transportation related emissions	F1. Vehicle Emissions	10	
	G. Maintain operations of the regional transportation system during extreme conditions*	G1. Transportation System Redundancy	5	

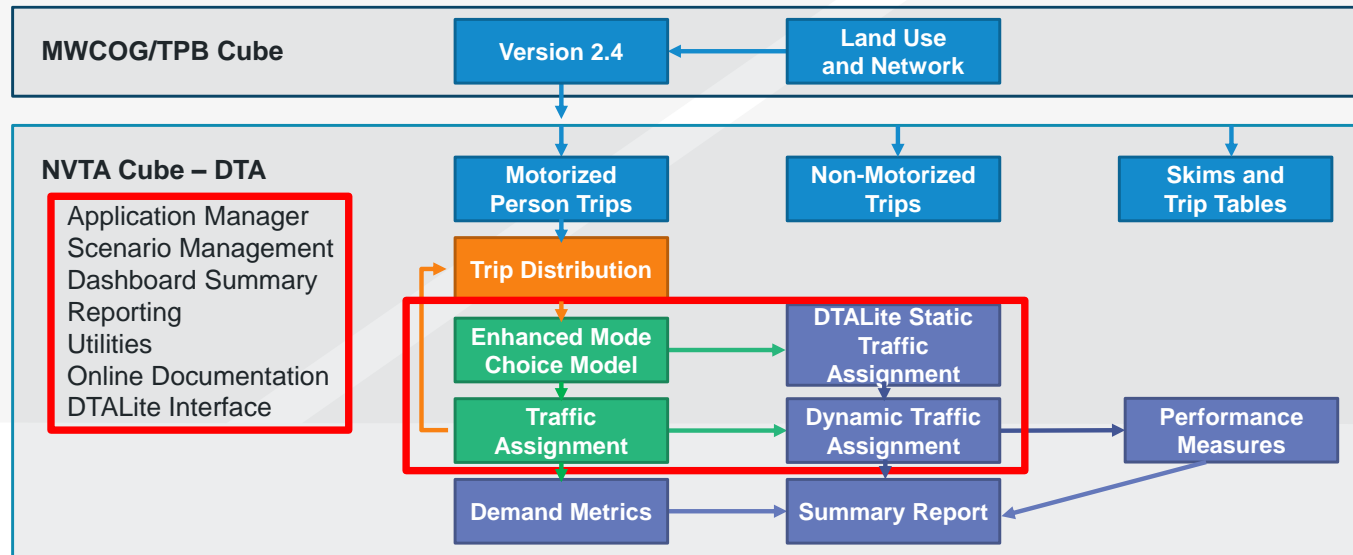
Uncertainty in TransAction

- Questions answered using Scenario Analysis:
 - » What happens if the future looks different than what the model predicts?
 - » Which investments will still be good investments no matter how the future plays out?
 - » Can we avoid investment obsolescence by identifying project that will have significant impacts across a range of potential futures?
- TransAction process includes analysis of futures that are plausible, but not necessarily preferred or predicted
 - » Post-Pandemic 'New Normal'
 - » Transportation Technology
 - » Incentives/Pricing

Future Uncertainty

What could happen to transportation
in Northern Virginia by 2045?

TransAction Modeling Framework



- Based on the MWCOG/TPB regional model
- Enhanced Capabilities Include:
 - » Embedding TNCs and connected and automated vehicles as options in mode choice
 - » Reflecting travel by connected and automated vehicles in traffic assignment
 - » Integrated Dynamic Traffic Assignment

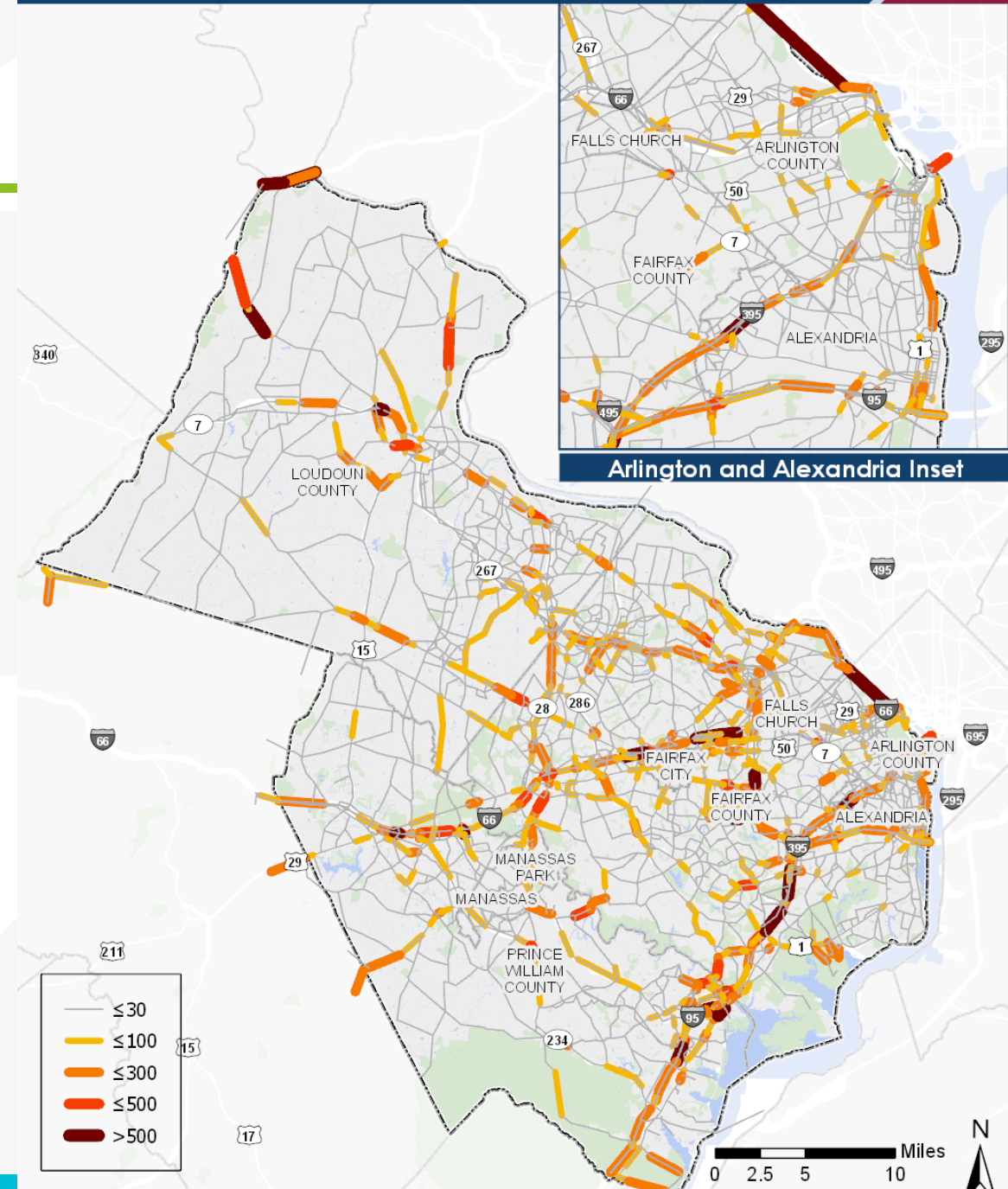
For more details see:

Model to Actions: *Developing a Macro-Mesosopic Modeling System to Support Project Prioritization and Plan Update in Northern Virginia TransAction Modeling Framework* presented by Feng Liu

Standard Forecasts

Measure	Standard Forecast
Auto Person Trips	8.2M
Transit Trips	387k
VMT	66.3M
Person-Hours of Delay	802k
Duration of Severe Congestion	840
Job Accessibility (Average # of jobs accessible)	2.16M
Emissions (tons of CO ²)	17k

Delay in NB (Vehicle Hours)



1

Post-Pandemic New Normal Scenario

» What if trends observed during the pandemic continue into the long-term future?

➤ Key Assumptions:

- » Reduction of work-related trips (HBW, NHW) by 21% - stratified by income
- » Reduction of shopping trips by 5.6%
- » Increase in delivery trips (1 delivery for every 3 shopping trips removed)
- » Increase in non-motorized trips by 5%
- » No Land Use changes assumed



Income Group	Adjustment to HBW/ NHW Trip Generation Rates
1 (Lowest)	0.95
2	0.90
3	0.86
4 (Highest)	0.82

Post Pandemic New Normal Results



What could happen to transportation in Northern Virginia by 2045?

Change in Results as Compared to Standard Forecast

Measure	New Normal
Auto Person Trips	-4.2%
Transit Trips	-10.9%
VMT	-3.9%
Person-Hours of Delay	-15.0%
Duration of Severe Congestion	-21.0%
Job Accessibility	8.2%
Emissions	-3.5%



Key Findings:

- » Fewer trips being made in the region (<4% reduction) reduces VMT and emissions
- » Most trips are being removed from the peak period, which has an outsize impact on congestion reduction and access to jobs



Technology Scenario

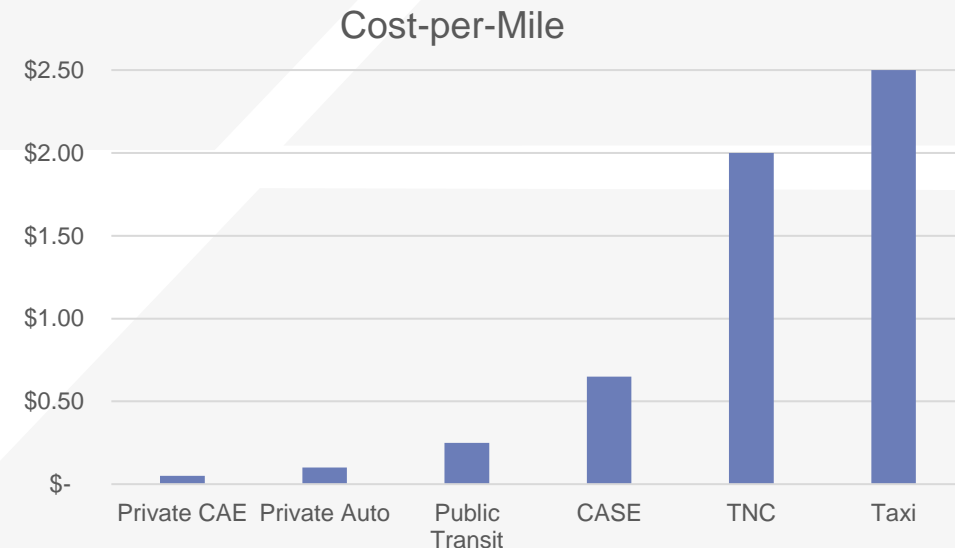
» Focus on implementation of Connected/ Automated/Shared/ Electric vehicles (CASEs)

➤ Market Penetration:

- » Private Vehicles: 20%
- » TNCs: 100% fully automated within Northern Virginia, DC, Montgomery & Prince George's
- » Large Trucks: 33%
- » Transit Buses: not automated
- » Shuttle buses: 100% automated

➤ All automated vehicles are assumed to also be Connected and Electric

➤ Lower operating costs



Technology Scenario (cont.)

» Focus on implementation of Connected/ Automated/ Shared/ Electric vehicles (CASEs)

➤ Changes to trip making:

- » CAE owners make more trips
- » CAE owners make longer trips

➤ Zero-Occupancy Vehicle (ZOV) trips:

- » Remote parking of private vehicles
- » CASE relocation between passengers

➤ Capacity Increase:

- » Freeways: 15%
- » Major Arterials: 5%

➤ Automated Shuttles available at all rail stations (FM/LM)

➤ No Land Use changes assumes





What could happen to transportation in Northern Virginia by 2045?

Change in Results as Compared to Standard Forecast

Measure	Technology
Auto Person Trips	1.0%
Transit Trips	-2.3%
VMT	2.7%
Person-Hours of Delay	-9.1%
Duration of Severe Congestion	-19.6%
Job Accessibility	2.2%
Emissions	-25.0%



Key Findings:

- » Despite increases in person-travel and vehicle-travel, significant decreases in person-hours of delay and in duration of severe congestion
- » Transit trips decrease (-2%) due to the combined effects of reduced trips and transit trips shifting to CASE vehicles
- » Despite VMT increases, emissions decrease by 25% as a result of electrification

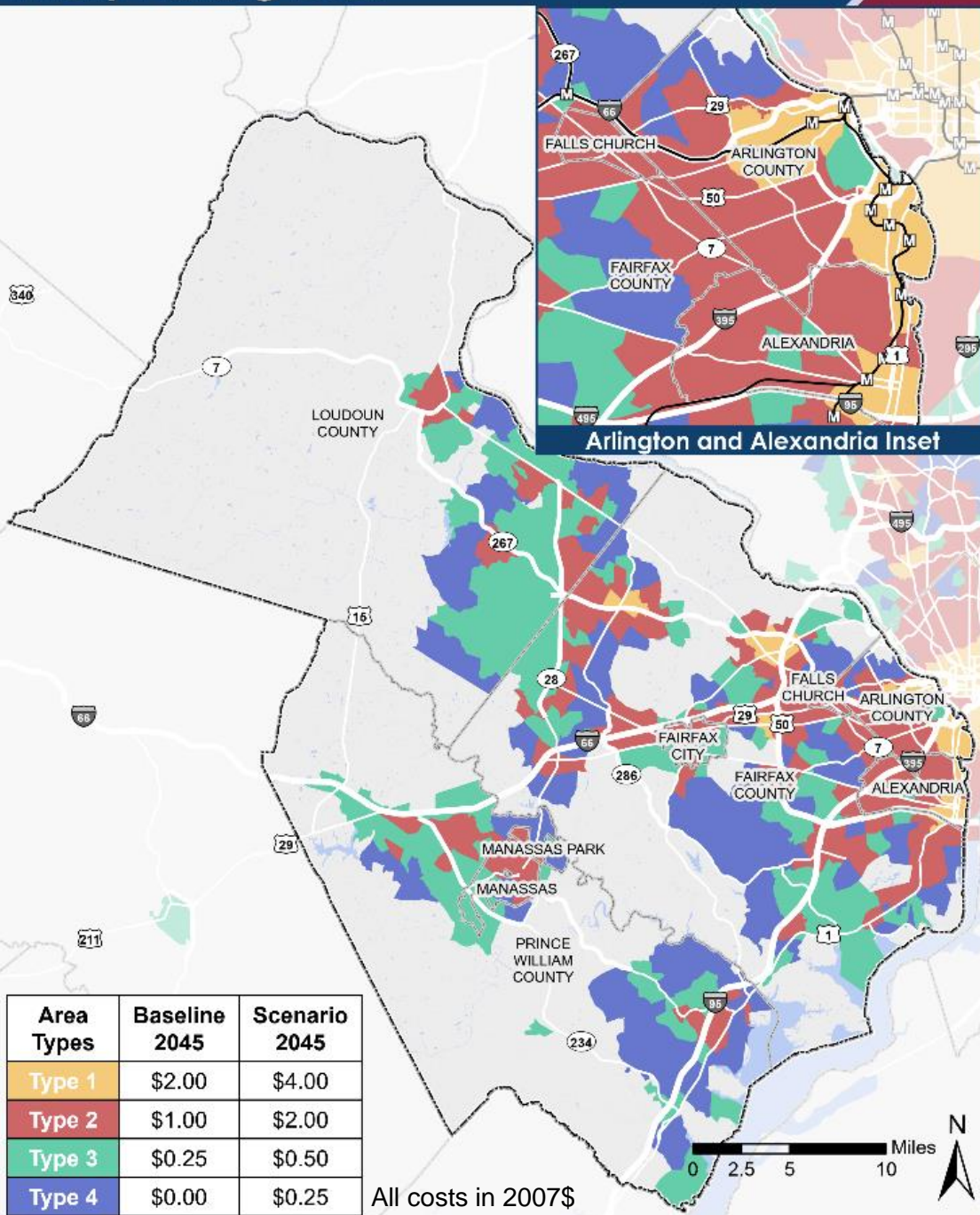


Incentives/Pricing Scenario

- » Implementing transportation pricing and incentive mechanisms to manage travel demand
- Key Assumptions:
 - » VMT Pricing on all roads: 25¢ peak, 12¢ off-peak
 - Discounts for lower-income households
 - » Increase in parking costs across the region
 - » Free transit
 - » Shift in travel times from peak hours



Hourly Parking Costs



Incentives/Pricing Scenario Results



What could happen to transportation in Northern Virginia by 2045?

Change in Results as Compared to Standard Forecast

Measure	Incentives/ Pricing
Auto Person Trips	-1.2%
Transit Trips	25.6%
VMT	-5.4%
Person-Hours of Delay	-8.9%
Duration of Severe Congestion	-7.7%
Job Accessibility	0.3%
Emissions	-4.8%



Key Findings:

- » Transit trips increase by >25% as travel shifts from autos
- » Results in decreases in congestion and emissions and some improvements in accessibility





What could happen to transportation in Northern Virginia by 2045?

Change in Results as Compared to Standard Forecast

Measure	New Normal + Technology
Auto Person Trips	-2.5%
Transit Trips	-12.9%
VMT	-1.3%
Person-Hours of Delay	-22.8%
Duration of Severe Congestion	-36.4%
Job Accessibility	7.0%
Emissions	-27.7%



Key Findings:

- » Reductions in trip making from the New Normal assumptions more than offset travel induced by new technologies
- » Reduced travel (especially peak travel) and increased roadway capacities result in significant reductions in congestion
- » Electrification has major impacts on emissions

New Normal + Incentives/Pricing Scenario Results



What could happen to transportation in Northern Virginia by 2045?

Change in Results as Compared to Standard Forecast

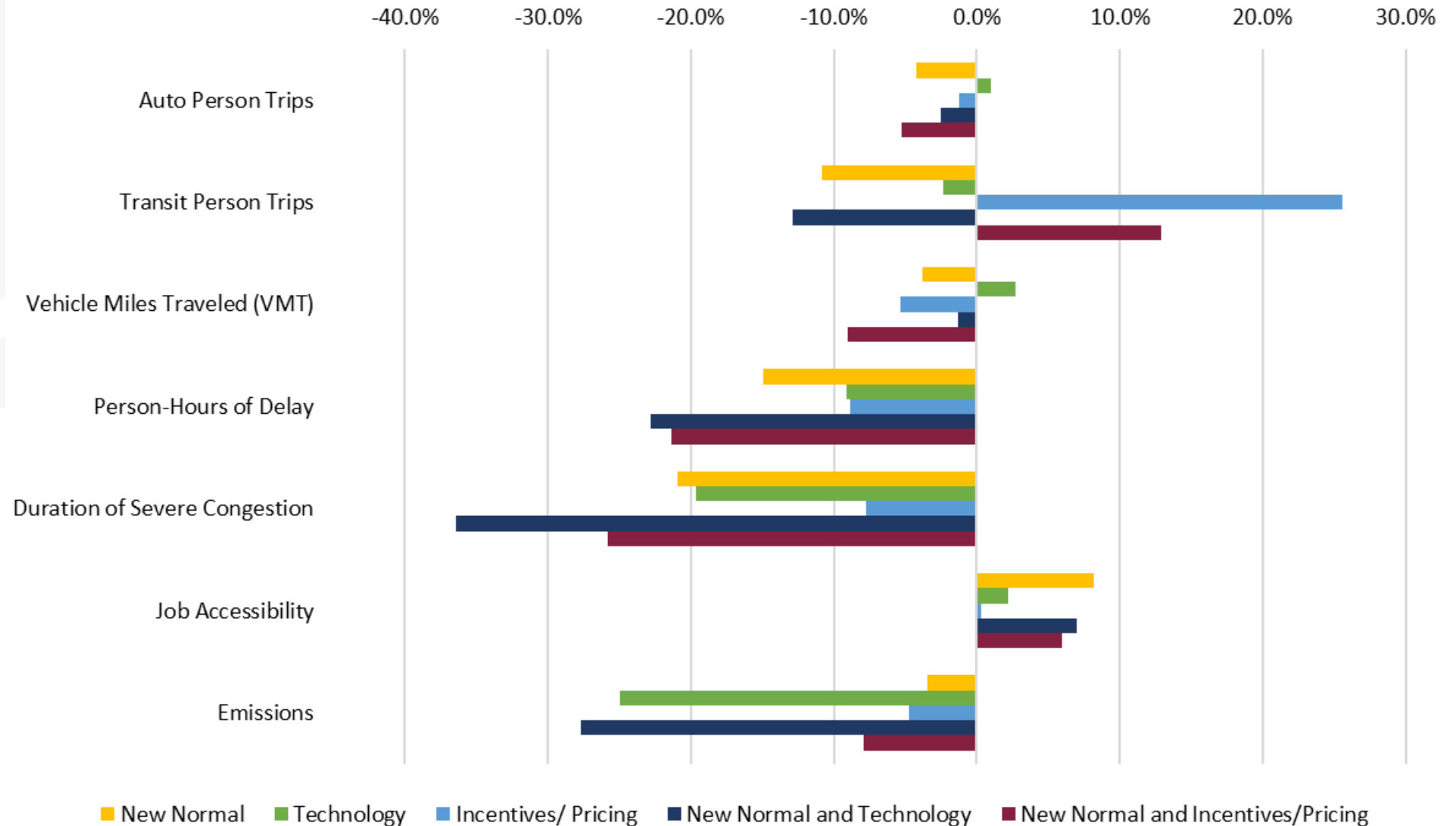
Measure	New Normal + Incentives/Pricing
Auto Person Trips	-5.3%
Transit Trips	12.9%
VMT	-9.0%
Person-Hours of Delay	-21.3%
Duration of Severe Congestion	-25.8%
Job Accessibility	6.0%
Emissions	-7.9%

➤ Key Findings:

- » Reduced auto travel (especially during the peak) results in significant reductions in congestion
- » Compound impacts from decreases in trip making in the New Normal assumptions and shifting to transit due to Incentives assumptions

What could happen to transportation in Northern Virginia by 2045?

Change in Results as Compared to Standard No-Build



Questions?

For more information, visit <https://nvtatransaction.org>

