

Natural Gas Vehicles

A Roadmap for Cleaner Air, Cheaper Fuel and Investment in Pennsylvania's Future

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Philadelphia, Pa.

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Overview



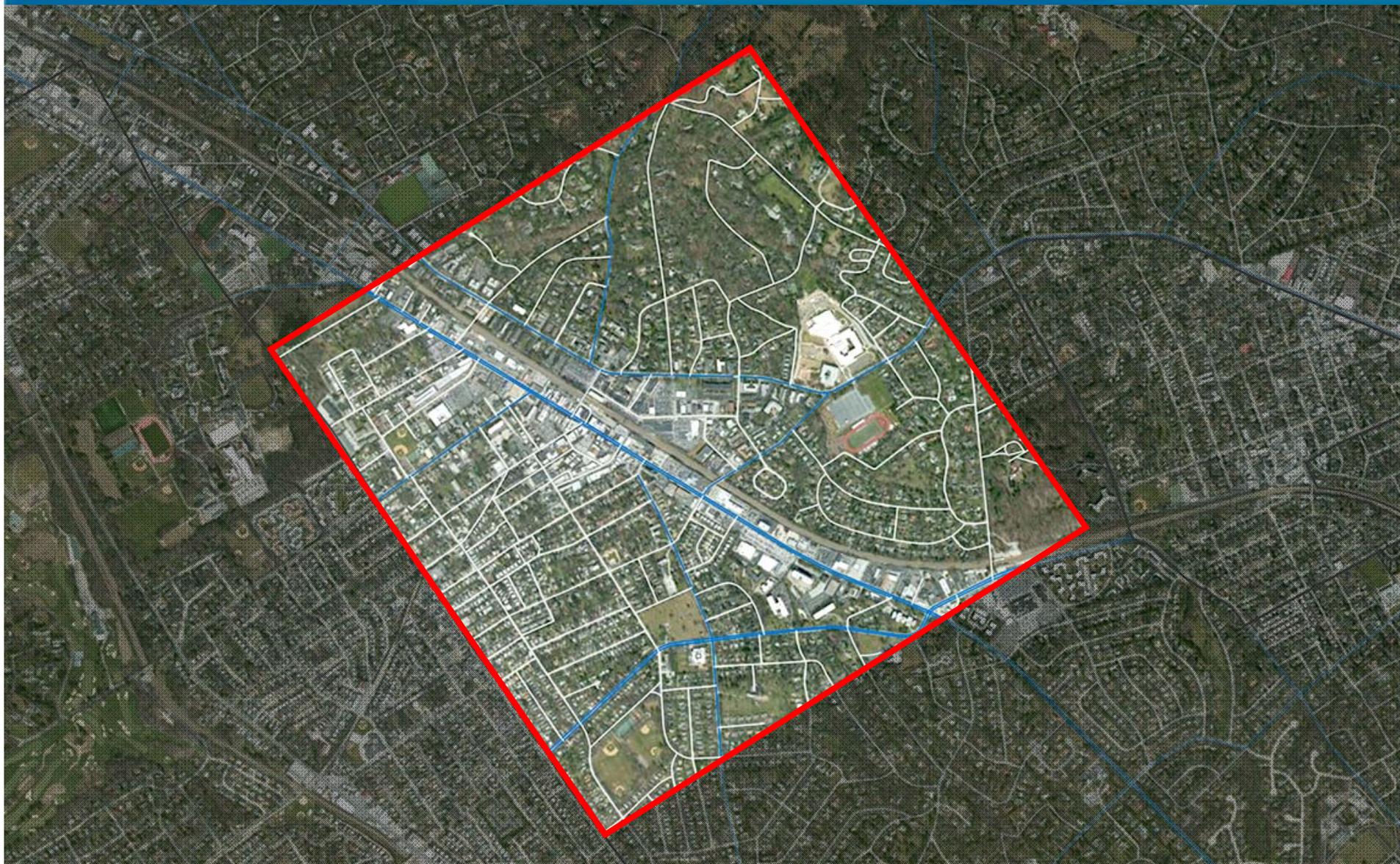
- There are clear environmental and economic benefits to increased use of natural gas as a transportation fuel
 - MSC commissioned analysis on mobile sources of emissions and the corresponding air quality improvements in a SEPA neighborhood
 - Small scale deployment has a large scale impact on emissions reduction
 - 2011 roadmap for Pennsylvania NGV infrastructure



- Potential Benefits on the local scale of movement to natural gas as a transportation fuel
- Analysis examined the effects of emissions from vehicle traffic in a “representative” Southeastern PA neighborhood
- The analysis looked at two emission cases:
 - “Base Case” to represent the current situation: vehicles burning diesel fuel
 - “CNG Case” same types of vehicles, but burning natural gas
 - Generally assumed “all other things being equal”
- Consider Scale-up
 - This is one neighborhood – imagine the benefits realized if implemented in a handful of neighborhoods across Southeastern PA and the region

- Representative Philadelphia neighborhood
 - Neighborhood is 1.7 sq miles in area
 - Includes 22.5 miles of “local roads” and 1.5 miles of “highway”
- “Base Case” has the following vehicles
 - Delivery Trucks: 10 deliveries/day, 6 day/week, 52 week/year
 - Garbage Trucks: 2 routes/week, 52 week/year
 - Semi-Trailers: 840 vehicles/day, 7 day/week, 52 week/year
 - School Buses: 4 buses at 2 trips/day, 5 day/week, 37 week/year
 - All vehicles run on diesel fuel
- “CNG Case”: Same as Base Case, but all vehicles on natural gas

Representative SEPA Neighborhood



Neighborhood Air Emissions

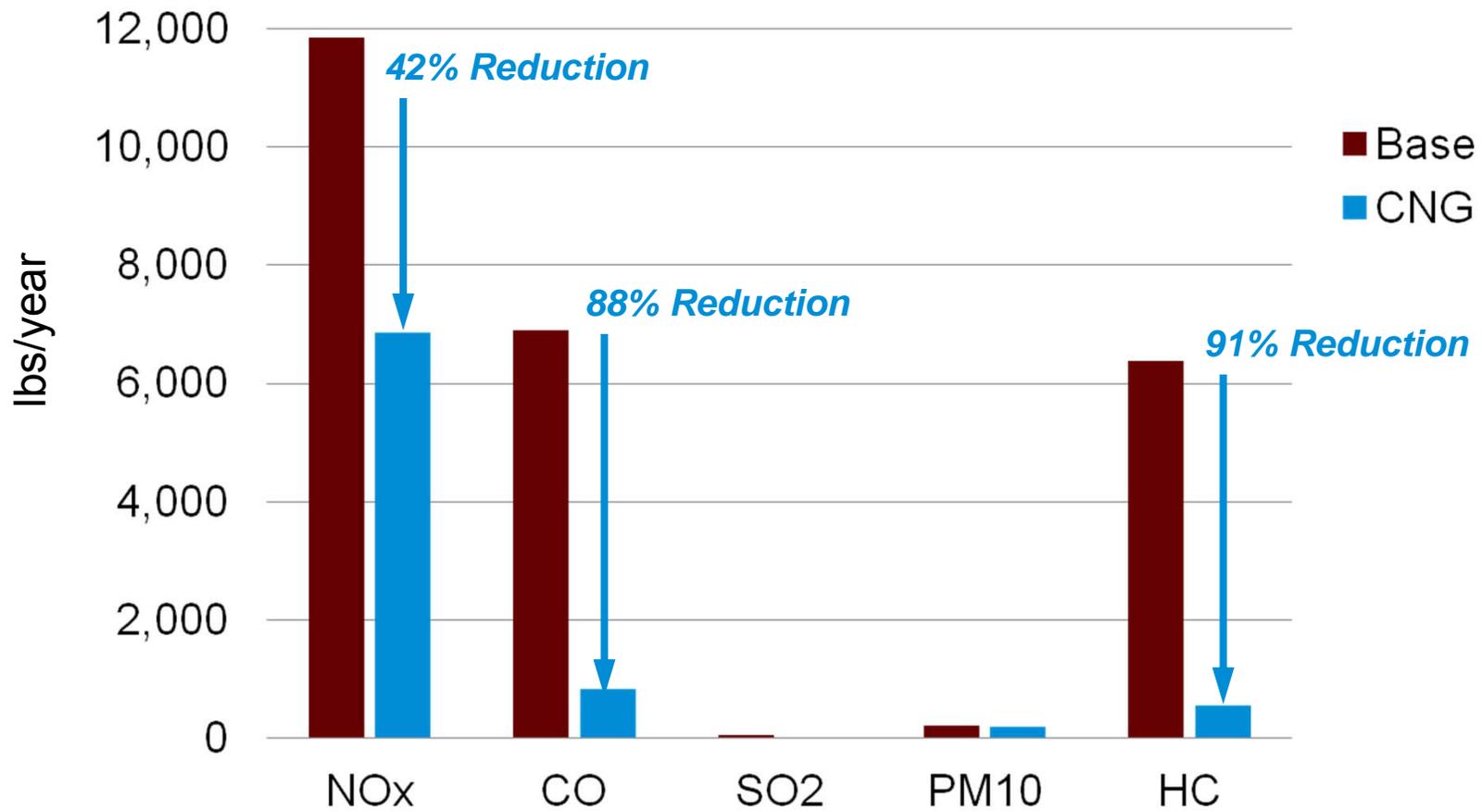


Pollutant		Emissions (lbs/year)		Reduction	
		Base Case	CNG Case	lbs/yr	Percent
Nitrogen Oxides	NOx	11,842	6,865	4,977	42%
Carbon Monoxide	CO	6,906	824	6,082	88%
Sulfur Dioxide	SO2	49	3	46	95%
Particulates	PM10	211	198	13	6%
Hydrocarbons	HC	6,372	553	5,820	91%

Neighborhood Air Emissions



Neighborhood Air Emissions
Base Case (Diesel) vs. CNG Case



Potential mobile source impacts



Converting 50% of semi trucks in the 5-county area of SEPA from diesel to natural gas has about the same effect on NOx reductions as retiring a medium-sized coal-fired power plant

50% of semi's in SEPA moving to natural gas

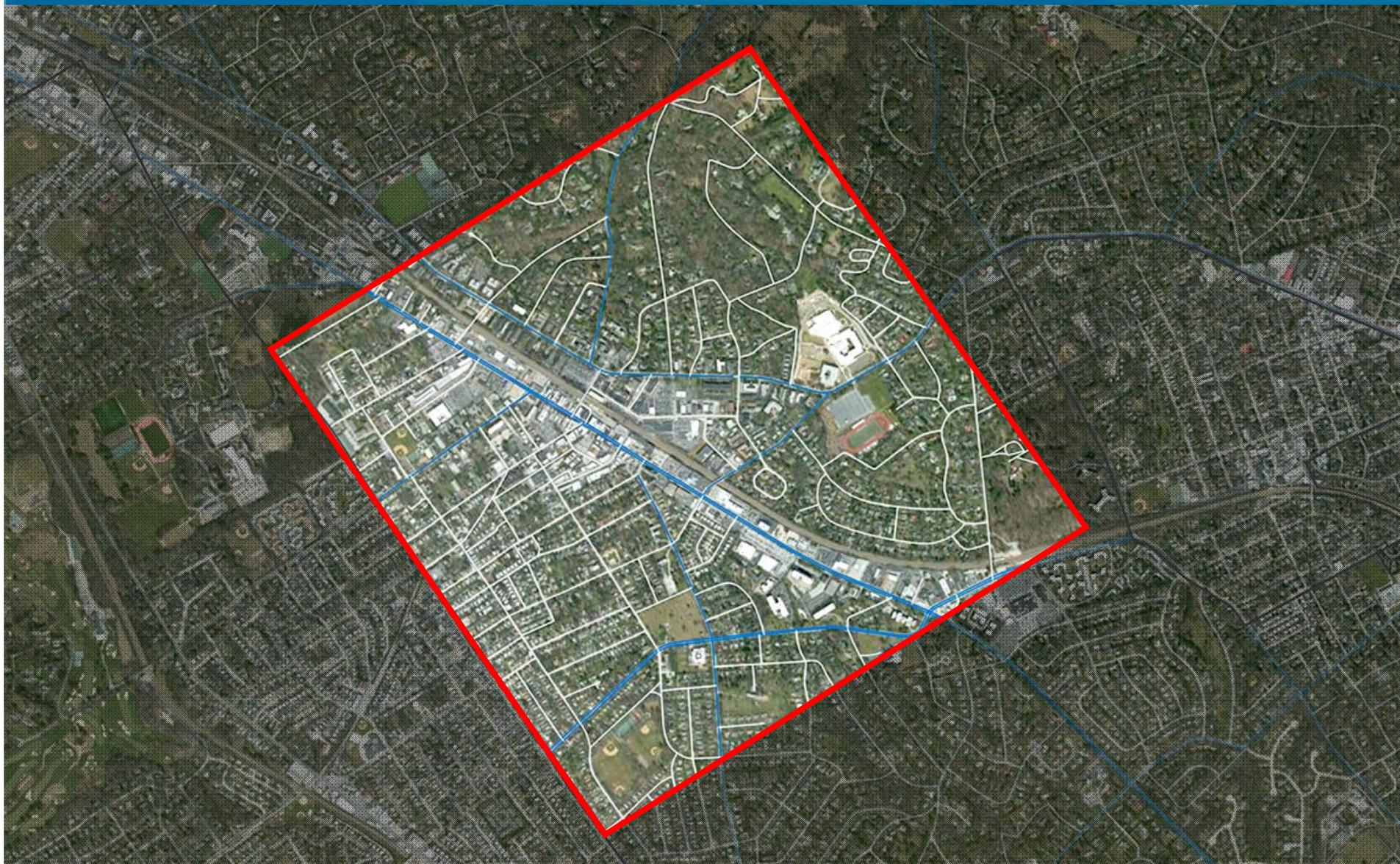
≈ 275 million miles per year additional fueled by natural gas

≈ 1,500 tons **less** per year of NOx

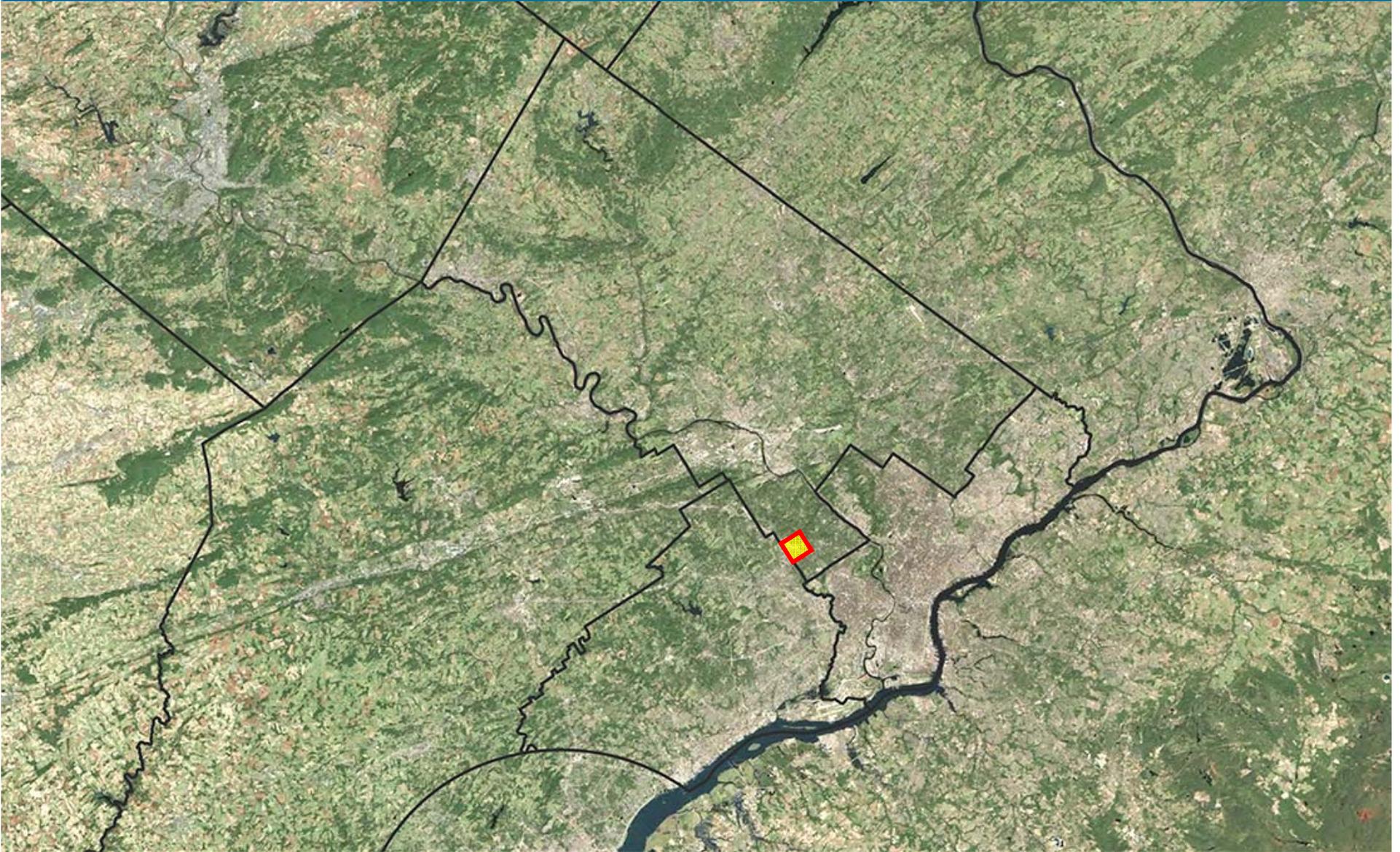
≈ 1 well-controlled, medium-sized coal-fired power plant (345 MW)



Scale up Across the Region: Neighborhood Air Emissions ...



... in 5-County Context ...



... in the local vicinity, but ...



... impacts happen at this level



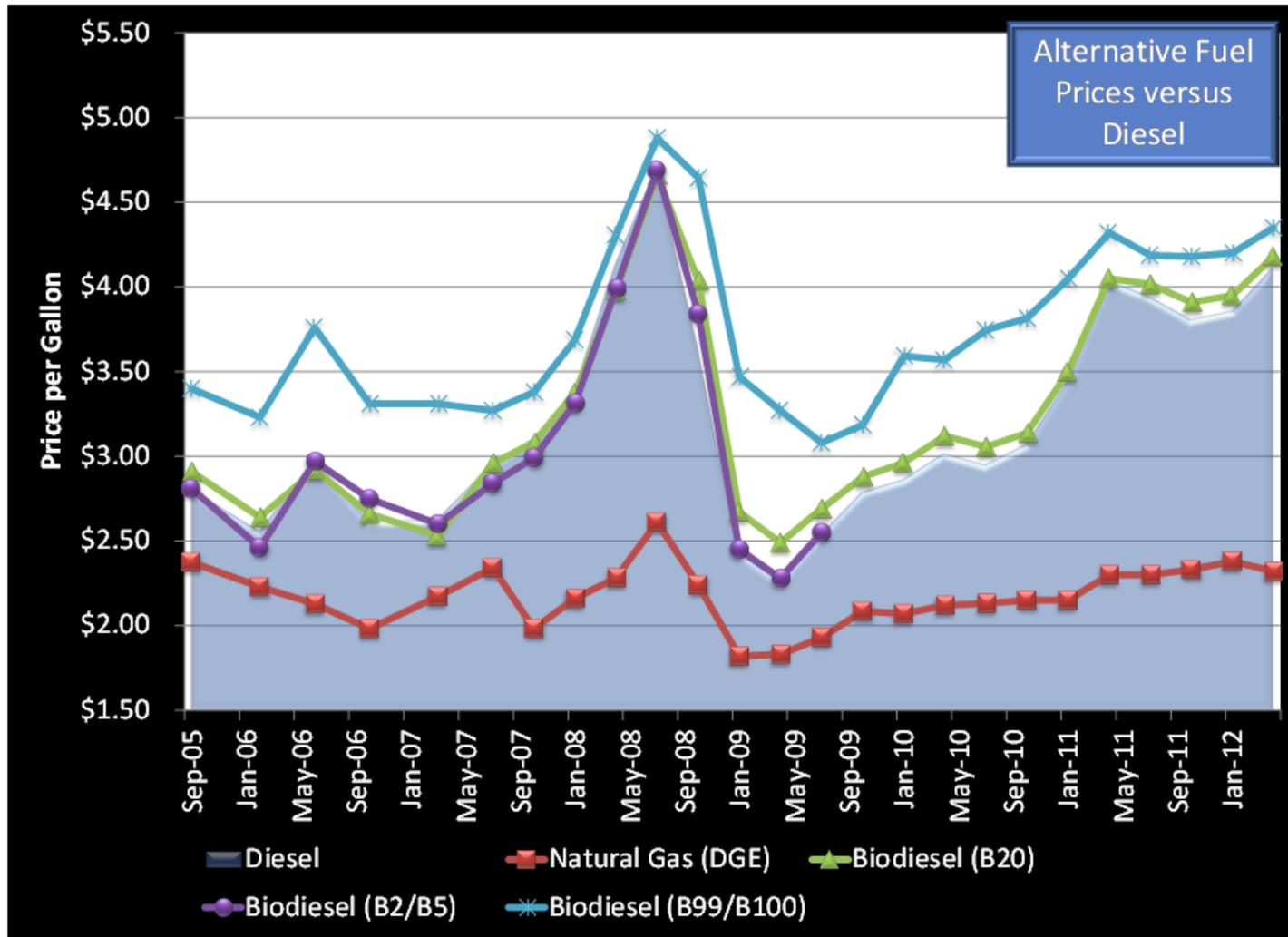
Pennsylvania's NGV Roadmap

Summary of Roadmap



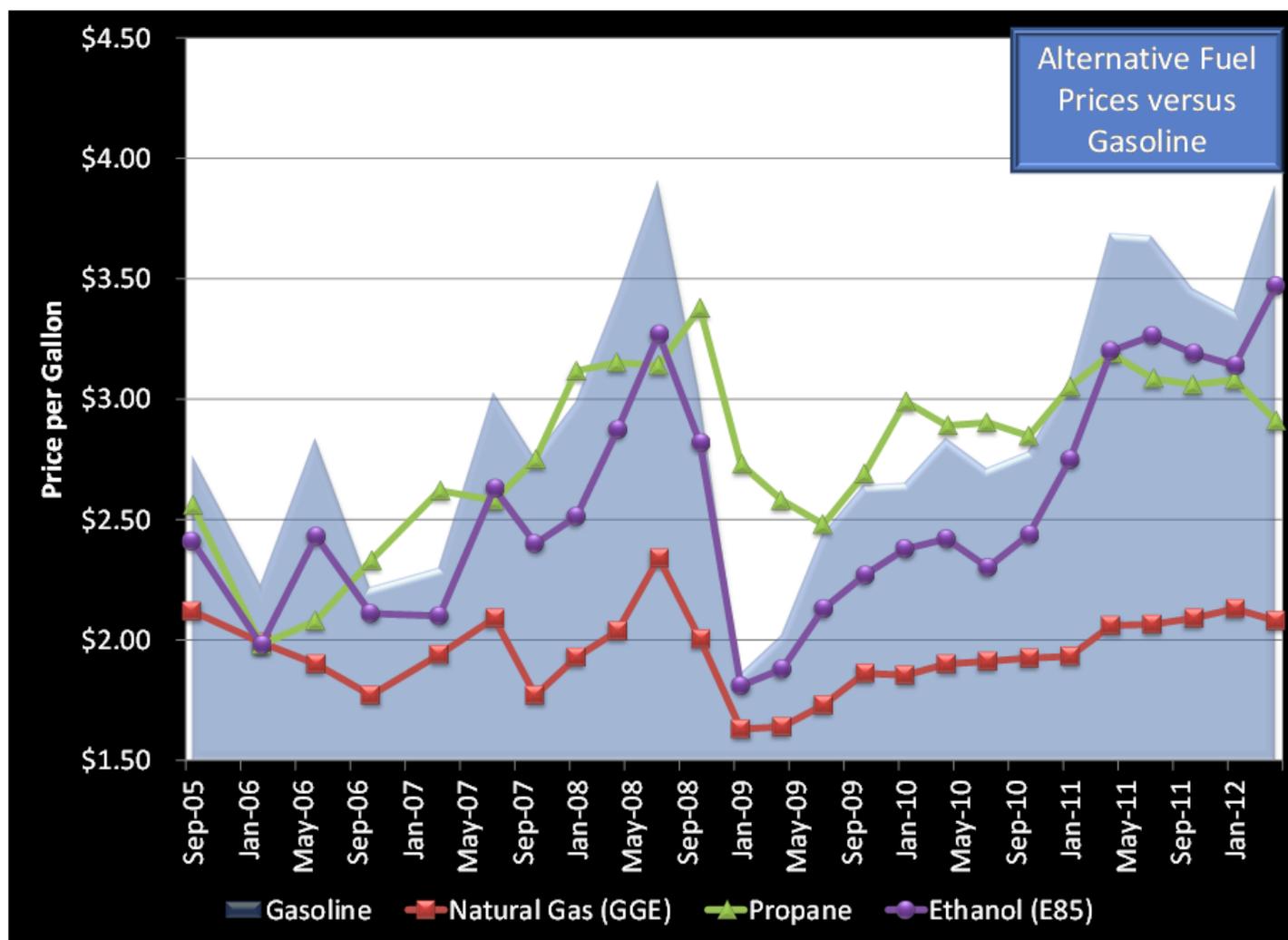
- Proximity to Marcellus provides the Commonwealth with a unique opportunity to expand it's clean energy transportation infrastructure
- Key findings:
 - Over five years, implementation of the MSC NGV Roadmap would result in \$123 million of new investment in the commonwealth;
 - A reduction in annual fuel costs for Pennsylvania fleet operators of roughly \$9.2 million;
 - Direct impact on nearly 1,300 Pennsylvania jobs; and
 - Annual emissions reductions
 - Nitrogen oxides (Nox) by 720 tons
 - Particulate matter (PM) by 14.5 tons
 - Greenhouse gases by 21,000 metric tons

Fuel Cost Comparison (Diesel)



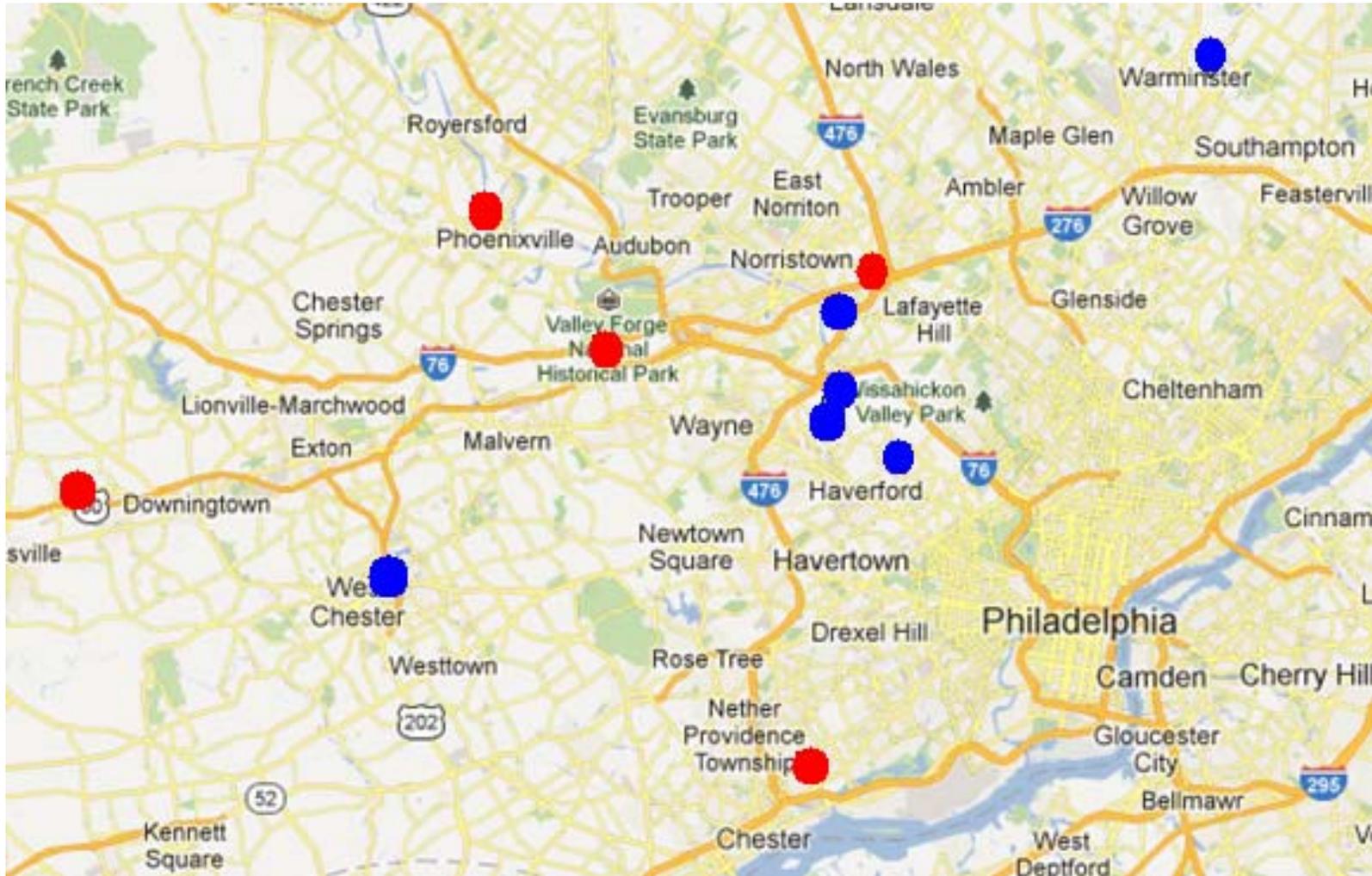
Source: DOE EIA, April 2012

Fuel Cost Comparison (Gasoline)



Source: DOE EIA, April 2012

SEPA CNG Fueling Stations



Source: DOE NREL



Public Access



Private Access

- NGV's provide a clear, clean and cost-savings alternative for fleet operators and the public
- The air quality benefits of NGVs are real, with every conversion making a difference
- Volatility in gasoline and diesel markets can be offset with affordable and long-term natural gas prices
- Regulatory certainty and consumer confidence is key to sustained growth and deployment of NGVs



Thank You