

An Electrifying Plan for Vehicles

PA APA Conference

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PortAuthority



Benefits of Electrification

Cost Savings

- Fueling
- Maintenance

Improved Air Quality

- Environmental Benefits
- Public Health Benefits and health reductions

Electrification Considerations

Vehicles

- Types
- Uses
- Range
- Charge time

Charging Infrastructure














- Charger types: level 1, 2 or Fast Chargers
- Property ownership and permitting
- Electric hookup

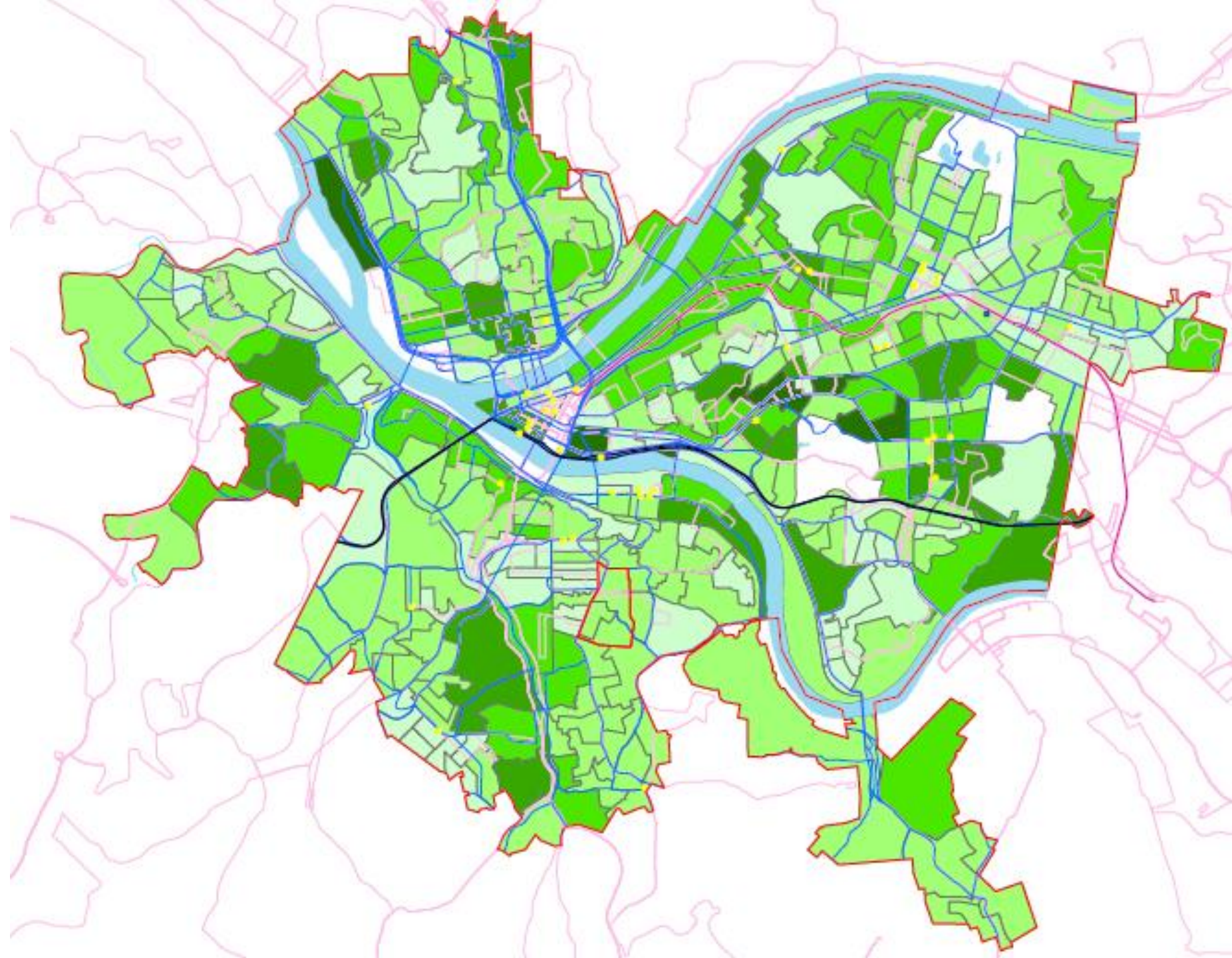
The Exercise

Using the City of Pittsburgh as an example, consider purchasing and installing the following:

- Electric vehicles
 - Municipal Fleet (sedans, refuse, police, EMS, etc.)
 - Transit Fleet
- Charging Infrastructure
 - Municipal Fleet
 - Transit Fleet
 - Resident Charging
 - Private Fleet Charging (taxis, car shares, private businesses)

MAP KEY

-  City of Pittsburgh
-  Parking Authority Garages
-  East Liberty PAT Garage
-  East Busway
-  I-376
-  Major Roads
-  Port Authority Bus Routes
-  Water
- Population Density**
 -  0 - 50
 -  51 - 100
 -  101 - 150
 -  151 - 250
 -  251 - 632



Features

Vehicles:

- Electric Buses
 - Upfit of \$550,000
- Electric Sedans
 - Upfit of \$10,000

DC Fast Charger

Fully charged in
roughly 20 minutes

~ \$40,000 (dual hose)



Level 2 Charger

Fully charged in
roughly 8 hours

~ \$10,000 (dual hose)



E-Bus Charger

Fully charged in
roughly 8 hours

~ \$10,000 (dual hose)



State Grants:

2 Electric Buses and Chargers (hypothetical)

DC Fast Chargers (\$50,000 Limit, must be public use)

Level 2 Chargers (50% upfit = \$10,000 limit, municipal fleet, private fleet or public)

Electric Vehicles (100% upfit = \$100,000 limit, municipal fleet)

Your Charge

- Use the map, features, and money at your table to develop a plan for electrification for:
 - Municipal fleet
 - Transit
 - Resident charging

Your spending limit is \$200,000

Be sure to locate charging infrastructure, vehicles, and transit on the map

Battery Electric Buses for Pittsburgh

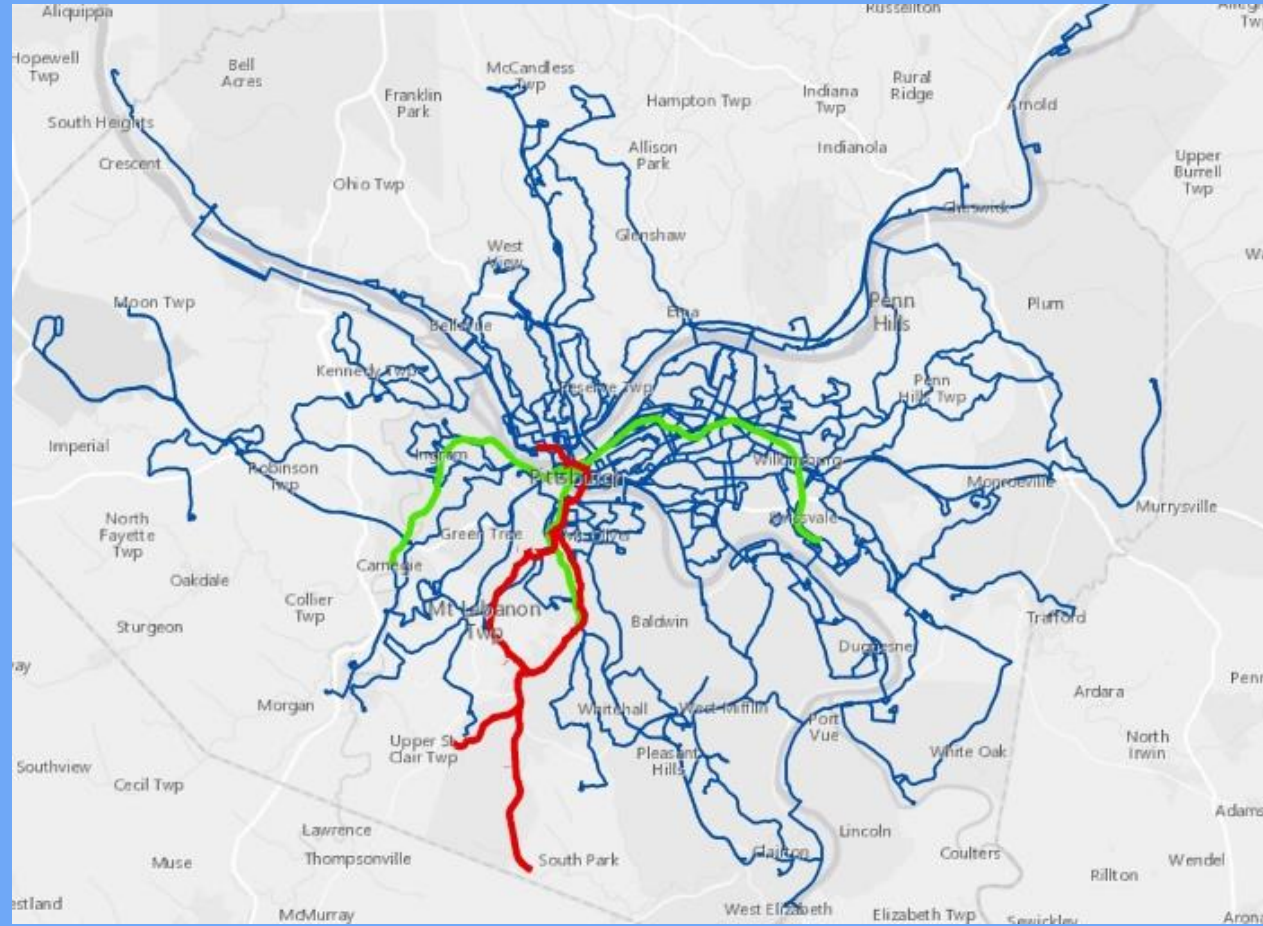
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David E. Wohlwill, AICP
Port Authority of Allegheny County

Port Authority Profile

- Began operations in 1964
- Carried 63 million riders in 2017
- On-street bus, three busways, light rail, Mon Incline and ACCESS paratransit
- 99 bus routes, 3 light rail routes
- 2,600 employees
- 731 buses, 83 rail cars, 4 inclined plane cars
- Funded by fare and advertising revenues along with money from federal, state and Allegheny County sources
- Governed by an 11-member Board of Directors

Port Authority's Service Area



Development of Battery Electric Buses

- Santa Barbara, CA and Chattanooga, TN among early users of battery electric buses
- Typically operated on shorter distance, urban circulator routes.



Source: ElectricVehicleNews.com

Battery Electric Bus Issues

- Significantly higher upfront cost of BEBs compared to diesel buses (\$550,000 increment for a 40-foot bus)
- Limited funding available to offset higher costs
- Concern about operating range of BEBs
- Need electric charging stations
- Amount of time needed to recharge batteries
- Natural gas is currently very available, particularly in Southwestern Pennsylvania. Much of the transit industry has opted to go with natural gas buses. (CATA in State College, PA is 100% CNG)

Further Development of Battery Electric Buses

- Recent technological advances made BEBs more feasible for heavy duty urban transit service
- In 2017, Proterra ran a bus 1,100 miles on a single charge on a test track.
- Anticipated revenue range to be 350 miles
- Costs of batteries sharply decreased
- Currently being operated in California (several systems) Chicago, New York City, Reno NV, Winnipeg, MB and other cities



RTC of Reno, NV Proterra BEB

Carnegie Mellon University/ Traffic21 Study

- In 2014, Carnegie Mellon University/Traffic21 evaluated and compared the eight bus propulsion technologies for Port Authority.
- Compared CNG, LNG, Hybrid diesel electric, Biodiesel, conventional diesel and battery electric buses
- BEBs were found to be four times as energy efficient as conventional diesel buses.
- Greatest air pollution reduction benefits
- Study results documented in "Which Alternative Fuel Technology is Best for Transit Buses?"
- https://www.cmu.edu/energy/education-outreach/public-outreach/17-104%20Policy%20Brief%20Buses_WEB.pdf

Testing of Battery Electric Buses In Pittsburgh

- Proterra, New Flyer and BYD demonstrated 40' buses in 2016
- New Flyer demonstrated a 60' articulated coach in June 2018



New Flyer Articulated Battery Electric Bus

Federal Low and No-Emission Bus Grant Program

- Support the transition of the nation's transit fleet to the lowest emission and most energy efficient transit vehicles
- Provides funding for acquisition of zero-emission and low-emission transit buses, including acquisition, construction, and leasing of required supporting facilities
- 85% federal share for buses
- 90% for supporting equipment and facilities
- Private partnership
- Up to .5% for workforce training and .5% for National Transit Institute training

Federal Low and No-Emission Bus Grant Program

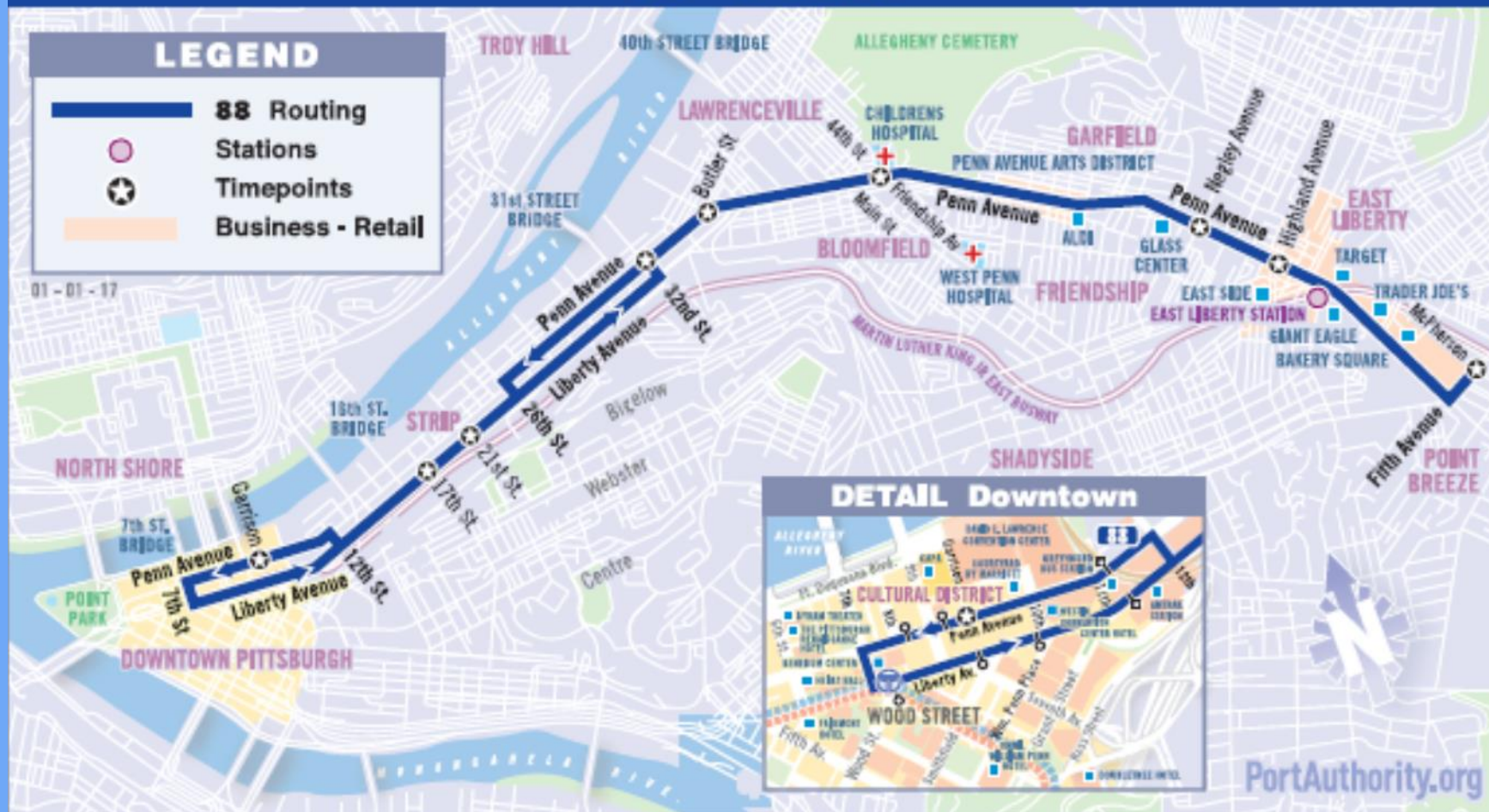
- \$55 million total available in 2017
- Port Authority applied for \$2.5 million in funding to deploy battery electric buses on 88 Penn Route
- Covered incremental cost of buying five 40-foot battery electric buses, two charging stations and training
- New Flyer and Duquesne Light - private partners
- 129 applications seeking for \$515 million in funding
- 51 projects selected
- FTA awarded Port Authority \$500,000 - enough to contribute to the purchase of two buses
- To be delivered in July 2019

Selection of 88 Penn Route for first use of Battery Electric Buses

- Short route - 6.1 miles (one way)
- Requires just five buses for peak service
- 3,136 average weekday riders in 2017, 18th busiest bus route
- Variety of operating conditions and terrain
- Route has long, steep hill

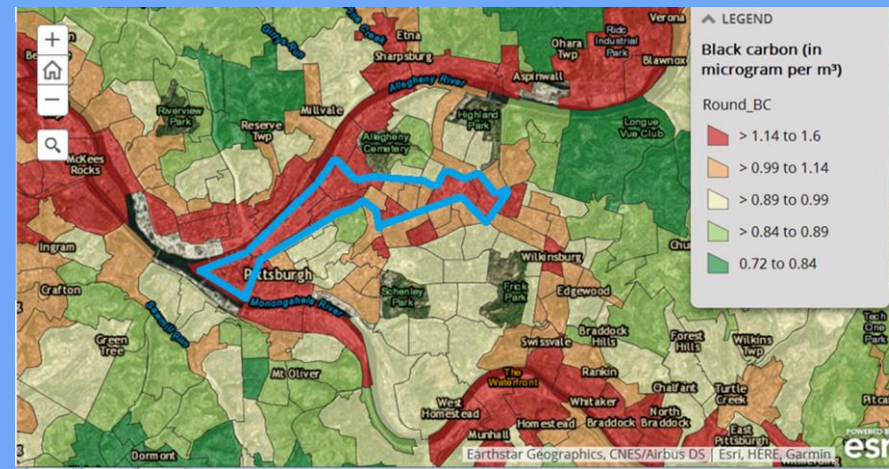


88 Penn



Communities Served by 88

- Population served is 32,525 (10% of City's population)
- Several communities (East Liberty, Garfield and Larimer) have poverty rates above 25%
- Serves major commercial/retail areas (Downtown Pittsburgh, Strip District and East Liberty)
- Serves corridor with high levels of black carbon




Benefits

- Elimination of tailpipe emissions of PM, CO, NOx and VOCs
- Reduce greenhouse gas emissions by 325 tons annually
- Estimated annual fuel savings of 55,000 gallons
- Quieter
- Anticipated 24% reduction in operating, maintenance and ownership costs
- Familiarize public and Port Authority staff with battery electric buses



Interest in further deployment of Battery Electric Buses for Pittsburgh

- In May 2018 PennPIRG and PennEnvironment call for Pennsylvania's transit systems to convert to electric buses
- Report predicts that if Port Authority replaced all diesel buses with electrics, 23,000 tons of greenhouse emissions would be eliminated annually - equivalent to removing 4,500 cars from area roads
- Suggested Volkswagen Settlement Funding could be used, but amount is limited



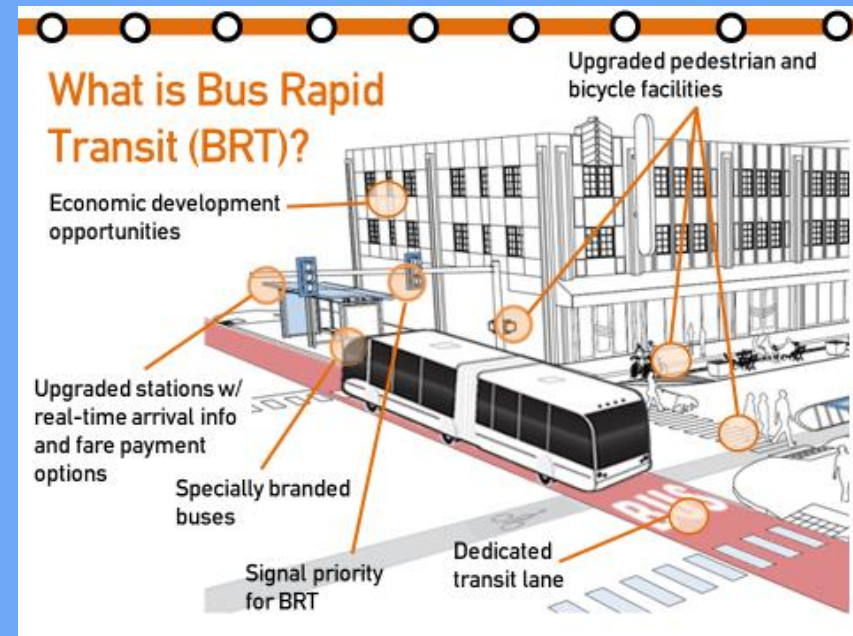
Electric Buses

Clean Transportation for Healthier
Neighborhoods and Cleaner Air

FRONTIER GROUP PennPIRG Education Fund PennEnvironment

Pittsburgh Bus Rapid Transit Project

- City, Port Authority, Urban Redevelopment Authority and Allegheny County
- Link Downtown, Uptown, Oakland and other East End neighborhoods
- Busiest transit corridor in Southwestern Pennsylvania
- About to enter into Final Design
- Revenue service would begin 2021



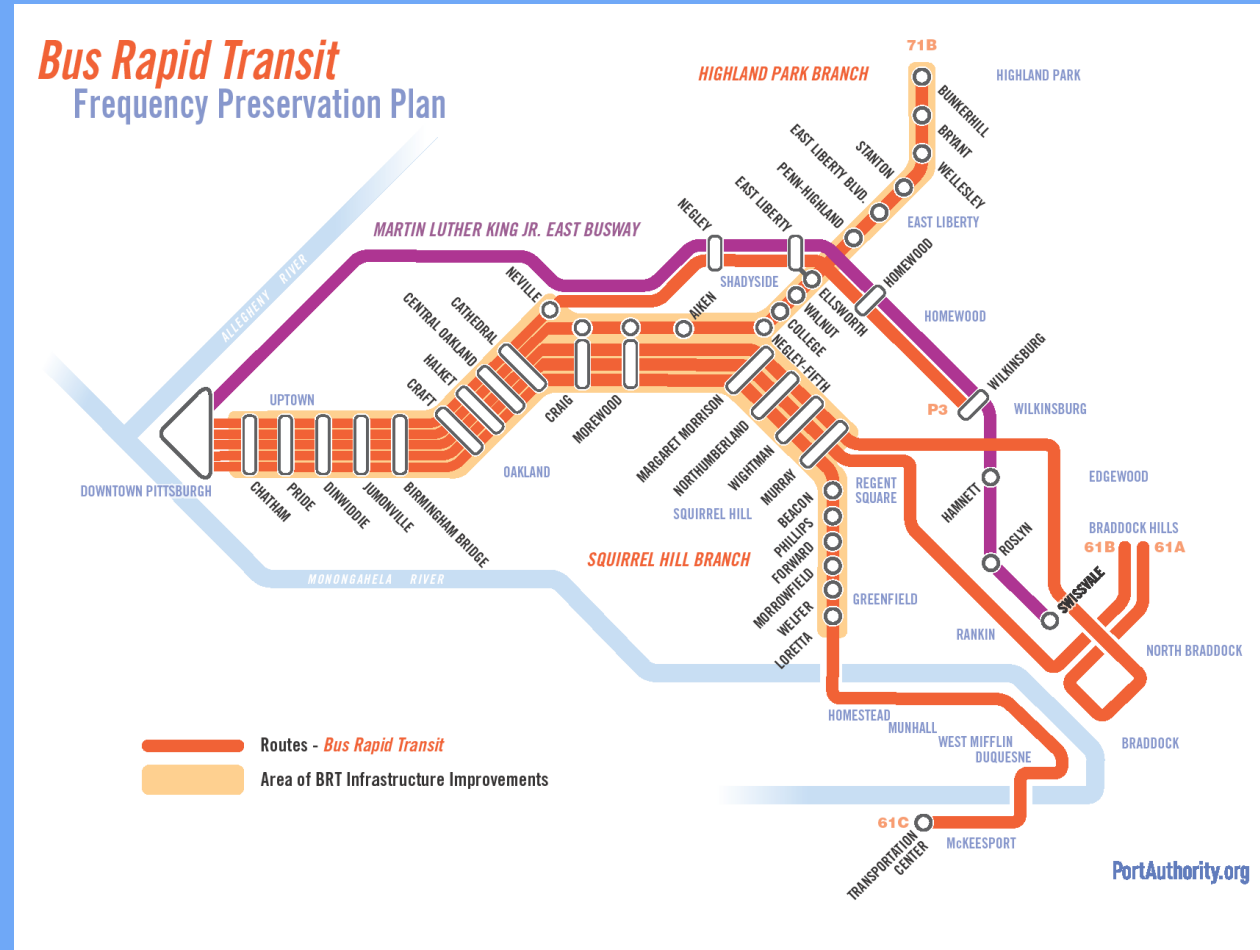
Pittsburgh Bus Rapid Transit Project

- 25 Battery Electric 60' Articulated Buses
- To be operated on core route serving Downtown, Uptown, Oakland and East Busway to Wilkinsburg
- Charging stations would be located in Wilkinsburg and East Liberty Garage
- Potential to operate on second route to Highland Park



Proposed Layover and Charging Station
At Wallace Terminal of Wilkinsburg Station

Pittsburgh Bus Rapid Transit Project





Source: PositiveNewsRomana.com

Thank you!

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PortAuthority

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RESILIENT PITTSBURGH

AIR QUALITY AND HEALTH

American Heart Association “State of the Air”

Failed for ozone and long and short term particulates

EPA Standards for PM 2.5

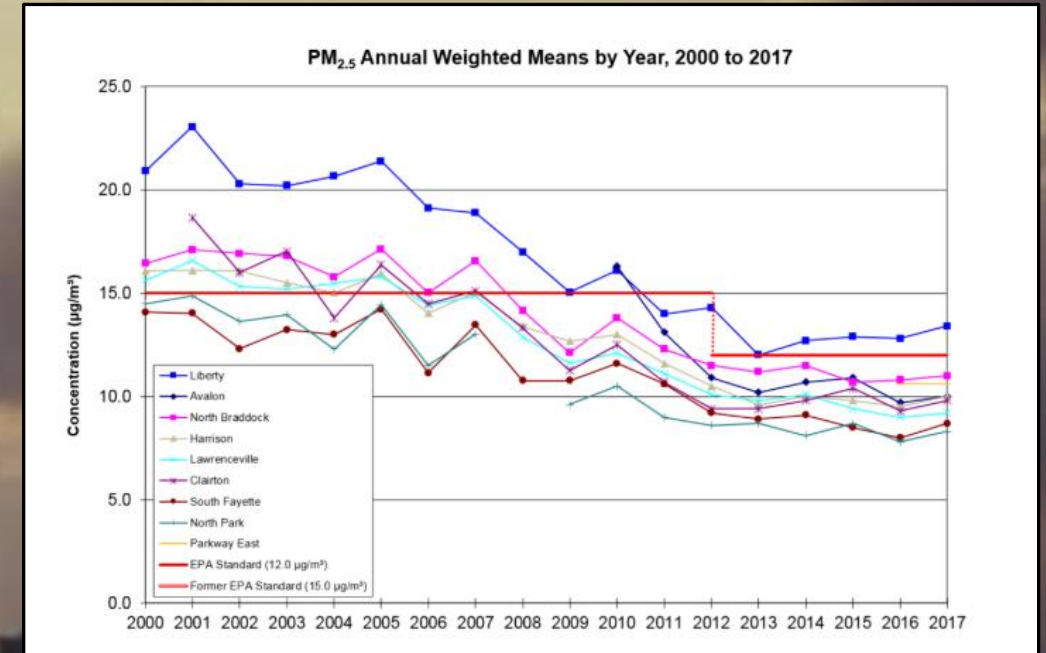
Has improved in past years, but beginning to show an uptick in pollution

PennEnvironment “Trouble in the Air” Report

Pittsburgh 4th in large metropolitan areas in number of days that air poses moderate to serious health risks

22% Childhood Asthma Rate in Some Schools

Compared to a 10% national average, study by local researcher

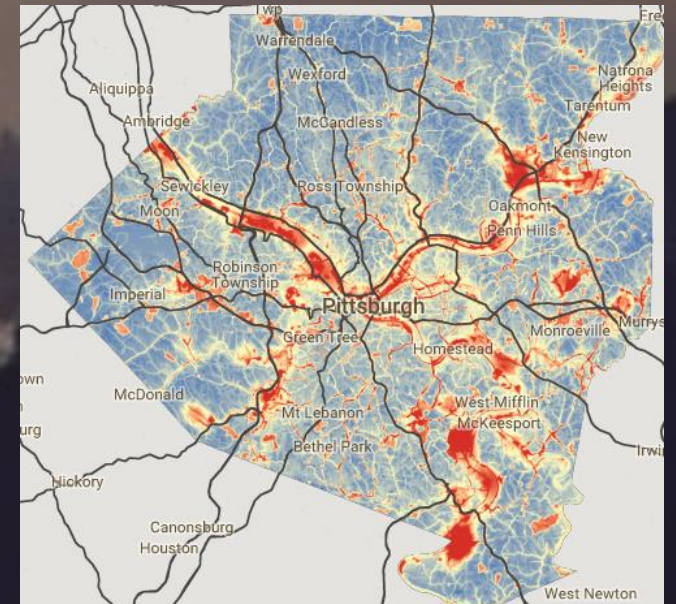
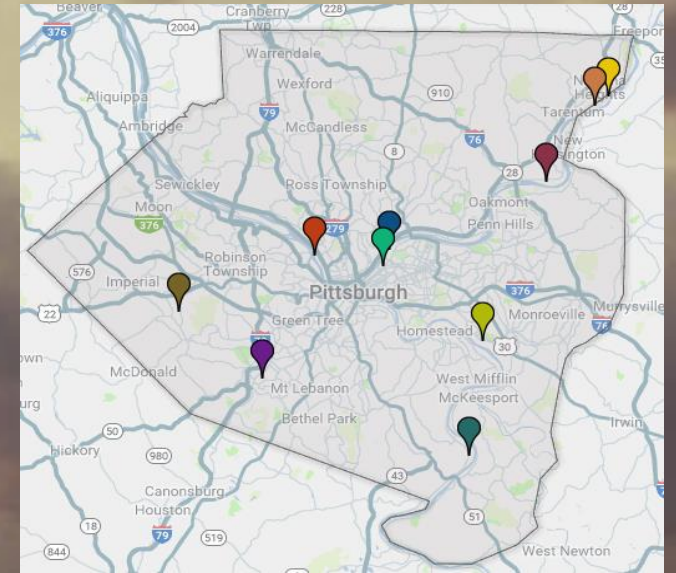


SOURCES OF POLLUTION

“Toxic 10” point source polluters

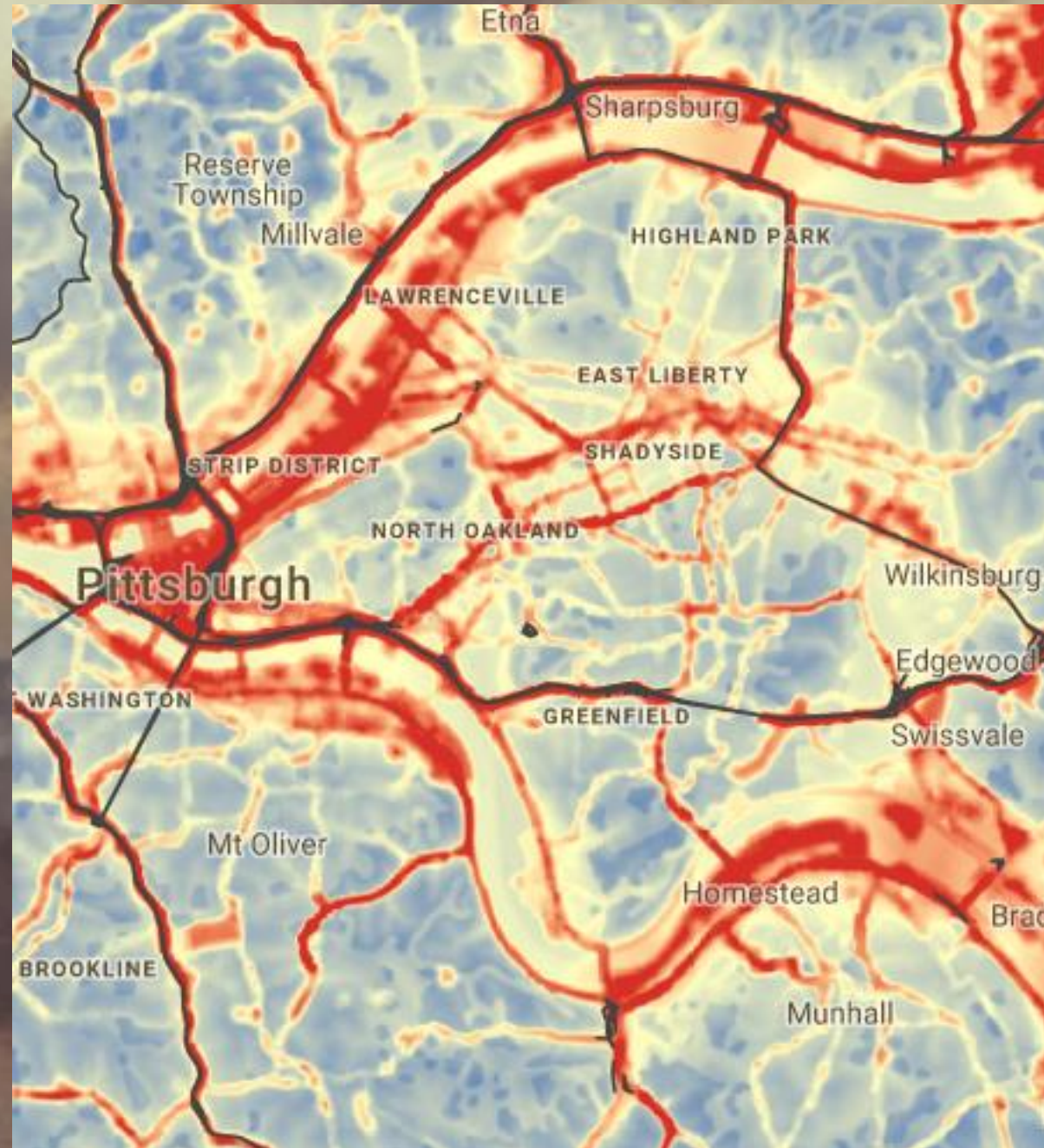
Pittsburgh’s topography lends itself to inversion events, causing pollution from regional energy generation to linger

Vehicle emissions

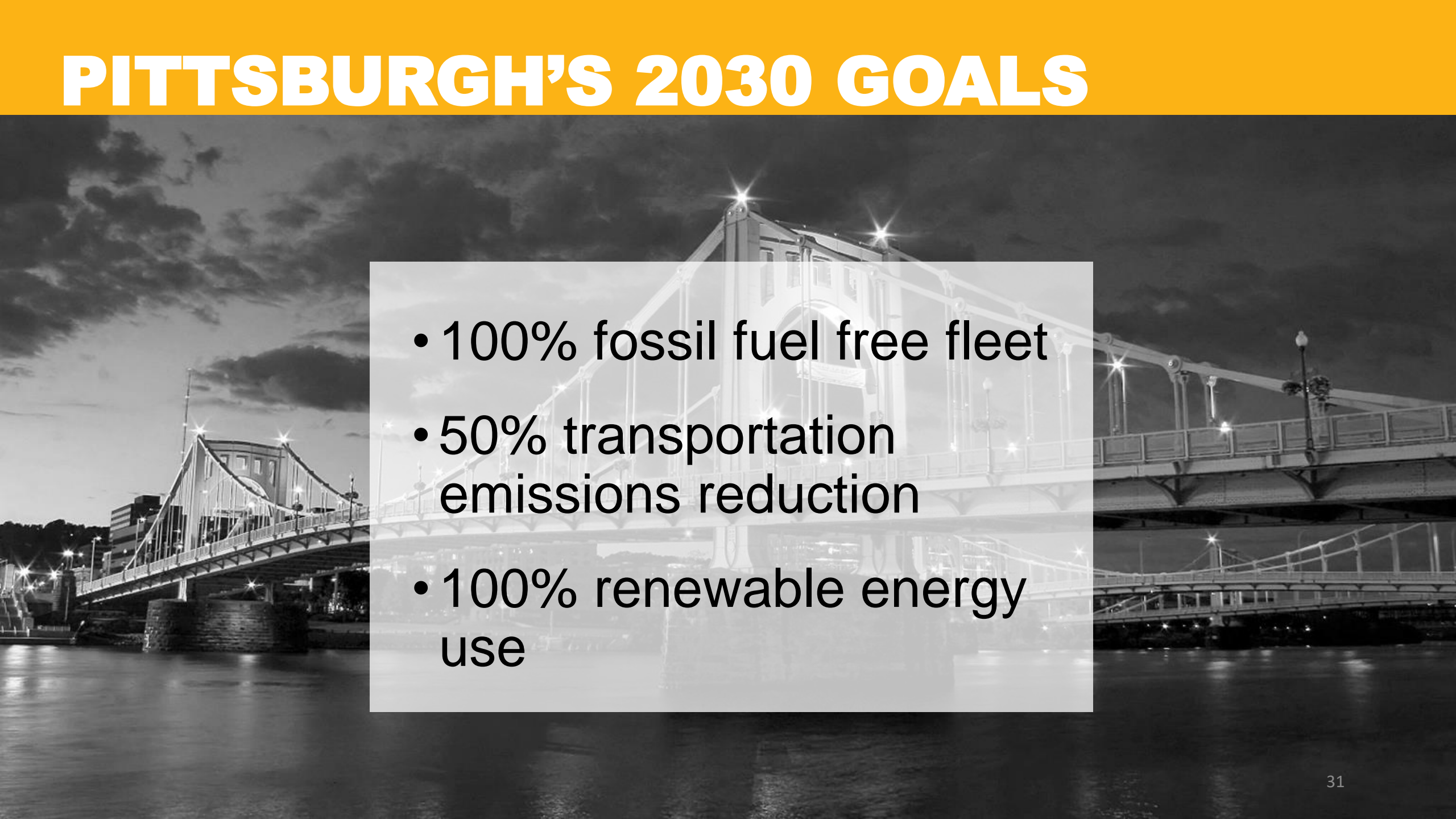


SOURCES OF POLLUTION

Vehicle Emissions



PITTSBURGH'S 2030 GOALS

- 
- 100% fossil fuel free fleet
 - 50% transportation emissions reduction
 - 100% renewable energy use

ELECTRIFICATION GOALS

EV Task Force formed September, 2018 to enable EV adoption city-wide.

Audience	Needs	Strategy
Municipal Fleet	Purchase and deploy vehicles	Start with sedans and existing infrastructure
	Purchase and deploy charging infrastructure	Couple with renewable energy generation, ensure ease of use
Other Fleets (car share, taxis, private businesses, etc.)	Enable and incentivize charging infrastructure development for fleets operating in City of Pittsburgh	DC fast charging in convenient locations for taxis
		Find opportunities to share fleet charging infrastructure with gov't or residential
Residential	Enable charging opportunities for residents (esp. those without driveways)	Permitting within the right of way, neighborhood hubs for level 2
	Reduce "range anxiety" for long trips	DC fast charging along interstates and main thoroughfares

CURRENT FLEET MAKEUP

1200 Total Fleet



24 Biofuel
Refuse Packers
(2 CNG on
order)



10 EV Sedans
(+ 10 in 2019)



10 Hybrid
Sedans
(7 on order)



Total and Phased PLI Fleet Conversion Estimated Annual Emissions Reductions

Total Conversion Annual Emissions Savings					
# Vehicles	VMT	GHG (MT CO2-e)	Nox (ton)	PM (lb)	HC (ton)
50	234,914	77.4	0.02	0.87	0.029
Phased Conversion Annual Savings					
# Vehicles	VMT	GHG (MT CO2-e)	Nox (ton)	PM (lb)	HC (ton)
6	28,190	9	0.002	0.1	0.003

CURRENT CHARGING INFRASTRUCTURE



Municipal Fleet

- 10 solar-powered mobile units for the Permits, Licensing and Inspections fleet (AFIG grant)
- 4 grid-tied units at the Motorpool lot



Public

- 11 level 2 chargers at Parking Authority Lots (AFIG grant)
- 8 on order (Duquesne Light Co. donation)

FUNDING OPPORTUNITIES



State Grants:

- Alternative Fuels Incentive Grant
- Clean Diesel Grant
- EV Fast Charging or Hydrogen Fuel Cell Equipment
- Level 2 Light Duty EV Charging Equipment Rebate

Electric Utility Incentives

Levaraging Private Companies

Return on Investment

THANKS!

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