

# Improving Fleet Emissions

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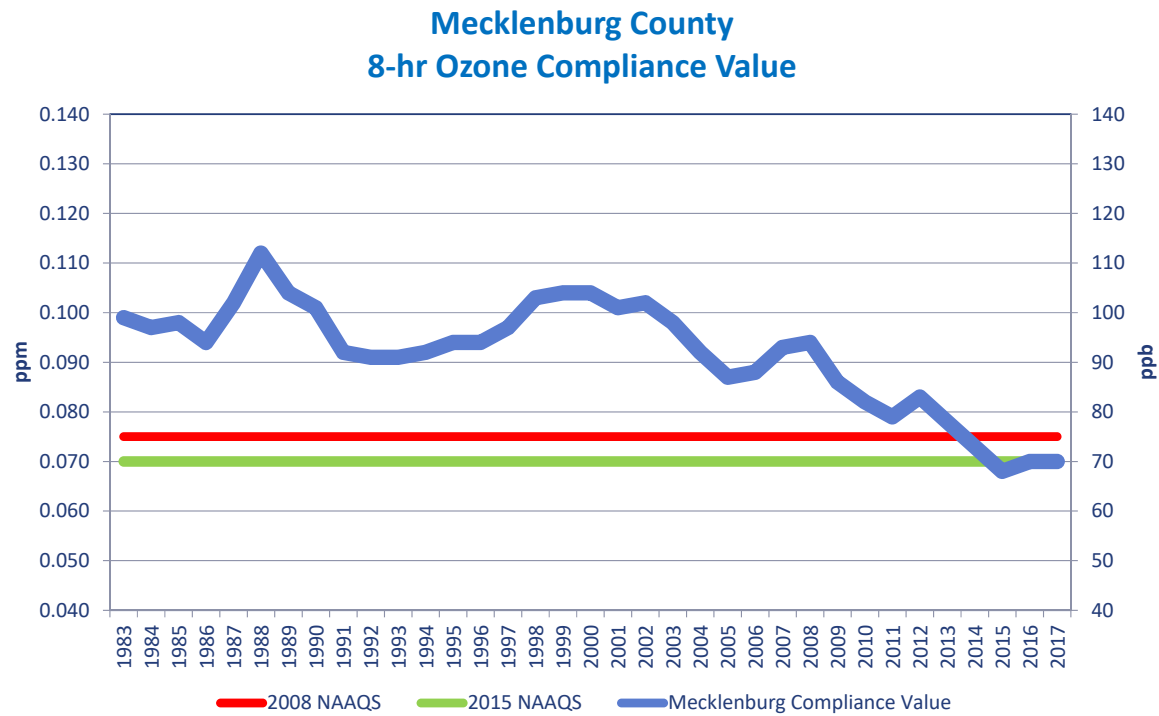
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# Some Quick Background – National Ambient Air Quality Standards (NAAQS)

- Established by the Clean Air Act, administered by the EPA
- Sets six principal pollutants as “criteria” air pollutants
  - Carbon Monoxide (CO)
  - Lead (Pb)
  - Nitrogen Dioxide (NO<sub>2</sub>)
  - Ozone (O<sub>3</sub>)
  - Particulate Matter (PM<sub>2.5</sub> and PM<sub>10</sub>)
  - Sulfur Dioxide (SO<sub>2</sub>)
- Standards are reviewed and revised periodically for each pollutant

# Ozone Standard Revisions



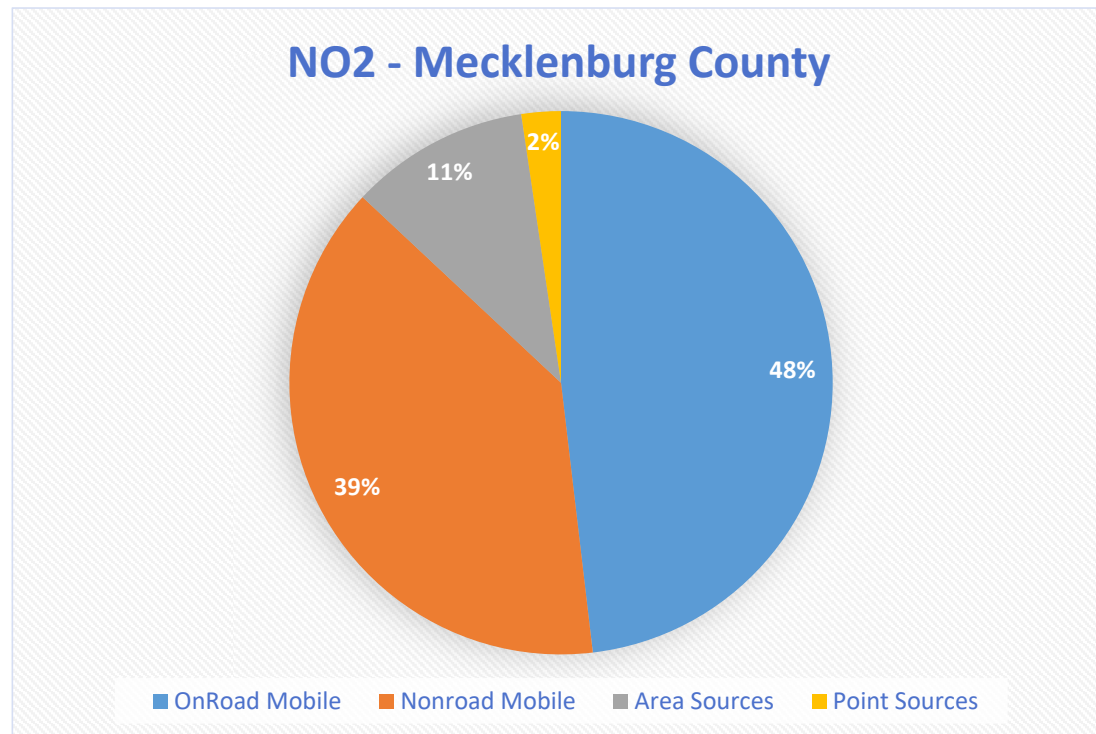
# What is Ozone?

- Ozone (O<sub>3</sub>) is a molecule that blocks UV light from the sun in the stratosphere but is harmful to human health at ground level.
- How it forms:



- Limit just one reagent, and you limit the amount of ozone
  - NOx is the most effective and practical to limit in our region

# Mobile Sources Are the Major Source of Ozone-Forming NO<sub>x</sub> in Our Region



# We Currently Meet the Ozone Health Standard

- Emphasis: We are **AT** the standard – **NOT below**.
  - No room for lesser efforts and investments
  - We must increase our actions to reduce ozone formation (reduce NOx)
- The standard may lower, so reducing our ozone-forming air pollutants is still critical.
  - Standard is reviewed every 5 years
  - Currently 70 ppb, may drop to 65 ppb for 2020

# All Action Is Important

- Because we are so close to ozone compliance values that would put us over the standard, even small actions to reduce ozone will go far to maintain meeting the standard.
  - Carpool to work
  - Mass transit for most trips
  - Walk and cycle for short trips
  - Adjust usage behaviors
  - Replace gas/diesel vehicles with zero and low-emission powertrains

# What Can Businesses and Governments Do?

- Join and/or work with groups dedicated to cleaner technologies
  - Clean Cities Coalitions
    - Centralina Clean Fuels, Land of Sky Clean Vehicles, Triangle Clean Cities, Palmetto Clean Fuels
  - Southeast Diesel Collaborative (SEDC)
    - Private-Public voluntary partnership
  - State and local Air Quality groups
- Change fleet vehicles to cleaner technologies
  - Utilize grants to increase adoption numbers and/or rate
- Educate employees to practice healthier behaviors
- Share information with colleagues
  - All parts make better informed decisions



# Clean Cities Coalitions

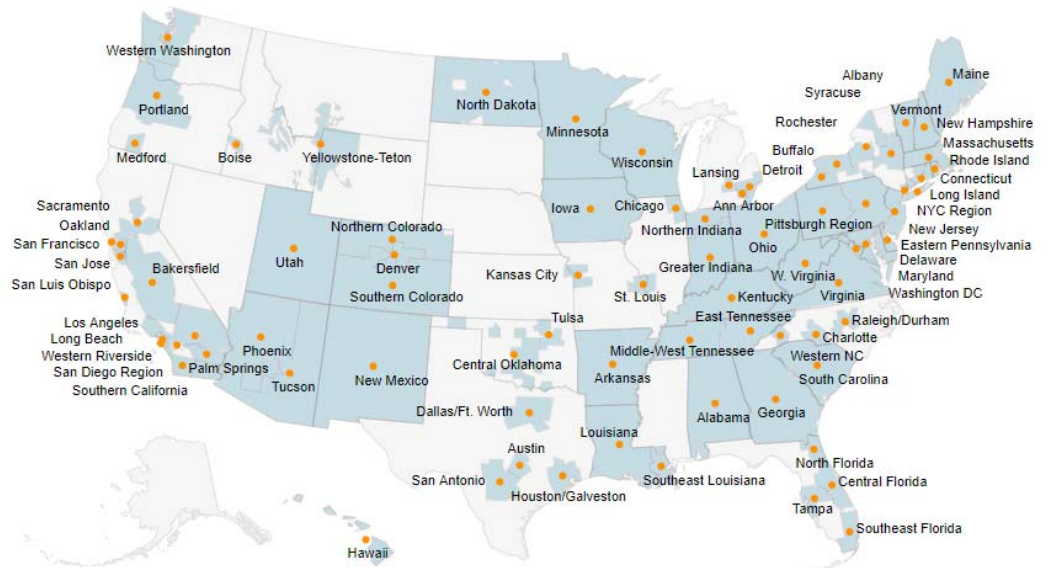
- Created by Department of Energy
- Nearly 100 coalitions across the United States
- 14,000 stakeholders
- Over 475,000 AFVs

U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy



U.S. Department of Energy



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# Clean Cities Portfolio of Technologies

## Alternative and Renewable Fuels (Replace)

- Biodiesel
- Electricity
- Ethanol (E85)
- Hydrogen
- Natural gas
- Propane

## Fuel Economy (Reduce)

- Fuel efficient vehicles
- Driving habits
- Vehicle maintenance

## Idle Reduction (Eliminate)

- Technologies
- Behavioral changes



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# Clean Cities Benefits

- Connecting fleets with fuel providers and industry partners
- Training and information
- Access to technical assistance
- Identifying funding
- Education and outreach to decision makers, fleets, and the public



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# Clean Cities Online Resources



CleanCities.energy.gov



AFDC.energy.gov



FuelEconomy.gov

# Coalition and Other Group Activities Help Reduce Mobile Source Emissions

- Reducing mobile source emissions is the best way to reduce ozone in our region.
  - Population is growing, more vehicles coming: must reduce their impact!
- Group actions, such as those involving fleets or organizations, are highly effective.
  - UPS: 125 electric semis ordered
  - PepsiCo: 100 electric semis ordered
  - Fleets drive change

# “But I’m Not Part of a Big Company”

- Small fleets have an impact
- May be easier to implement changes
  - E.g. less infrastructure, less overhead, easier calculations, easier approval
- Truck fleets do not have to be focus; passenger fleet is a substantial emissions contributor
  - Even a few cars here and there are beneficial
- Technologies and experiences on the job may translate to personal vehicle usage changes for employees as well

# Ways to Reduce Fuel Consumption

- APUs are still an effective fuel saver and emissions reducer
  - Fully electric versions available
  - Not just for semis, but also firetrucks, utility trucks, police cruisers, ambulances, etc.
  - Automatically switches off main engine
- Most fleet managers want these because they save money!
  - Air quality benefits are a bonus



# Ways to Reduce Fuel Consumption

- Many people falsely believe idling is good for vehicles, especially diesels
- Manufacturers are clear: Idling runs below operating temperature, clogs DPFs more often, damages engine components more quickly, increases maintenance frequency, and uses more fuel after just seconds than restarting
  - Yes, even on diesels!
- Create an idle-reduction policy at your workplace
  - Educate employees
  - Offer incentives
  - Create competition

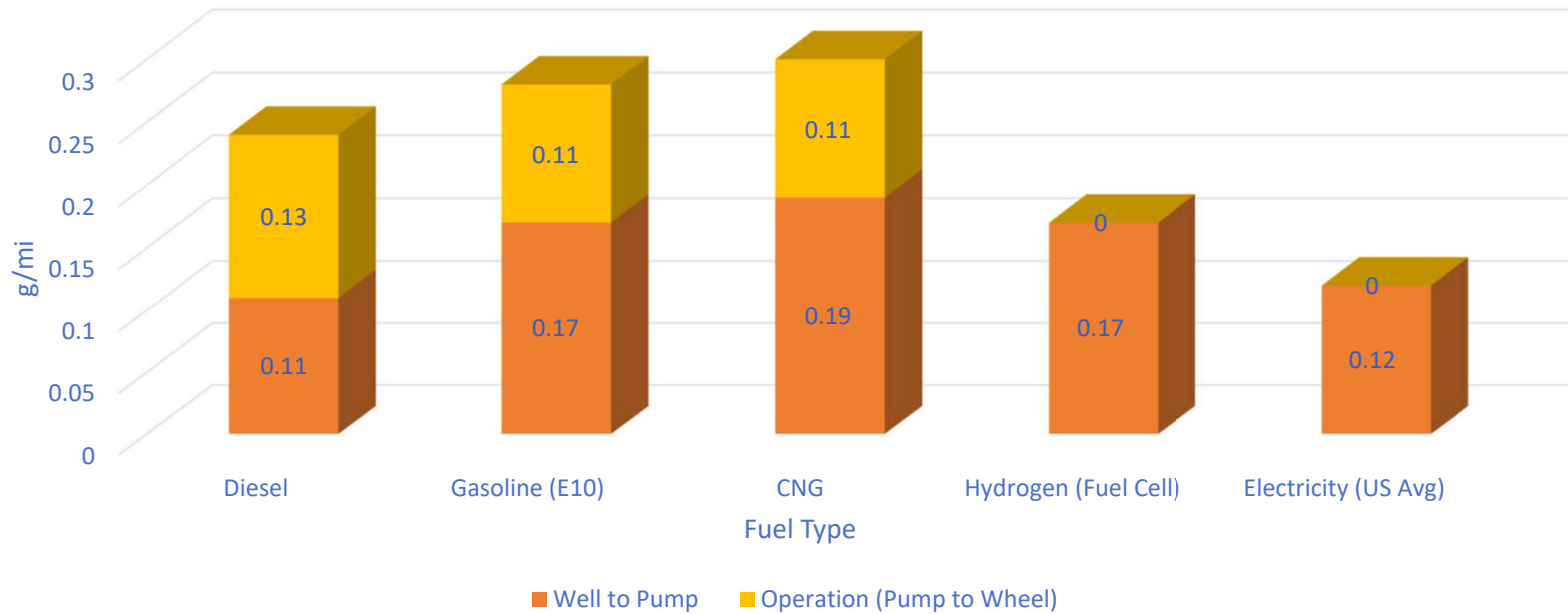


# New Vehicles – Which Fuel Type Should I Use?

- Look at your usage and find which fuels can meet your needs
- Determine if you will need additional infrastructure for fueling
  - Tanks, pumps, solar panels, etc.
- Think of employee experience
  - E.g. idling trucks or refrigerated units
  - Direct emissions may increase sick day usage
- Find the final costs
  - Different fuels may have different grants or variable amounts available dependent on fuel type
  - Some grants include infrastructure, most do not

# NOx Emissions Comparison Between Fuel Types

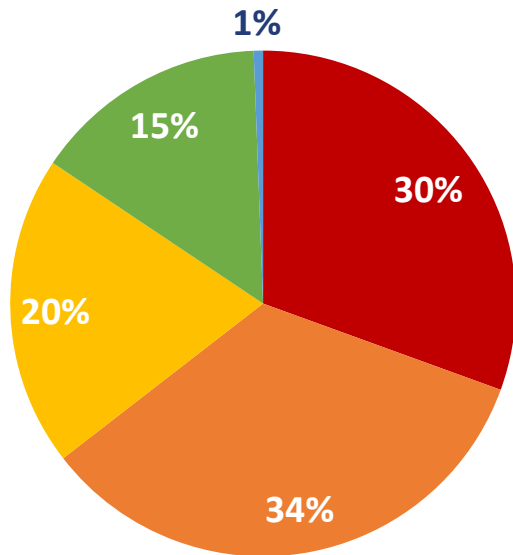
Well to Wheel NOx Emissions for a Car (GREET 2017)



# Electricity Production Distribution

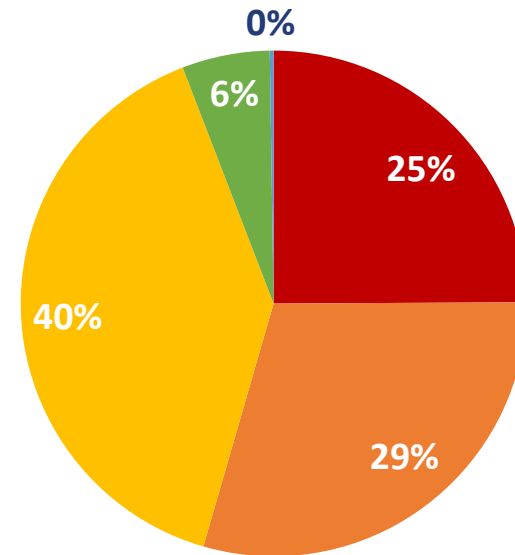
## U.S. Electricity Generation, 2016

■ Coal      ■ Natural Gas   ■ Nuclear  
■ Renewable   ■ Petroleum



## SRVC (Carolinas and Virginia) Electricity Generation, 2016

■ Coal      ■ Natural Gas   ■ Nuclear  
■ Renewable   ■ Petroleum

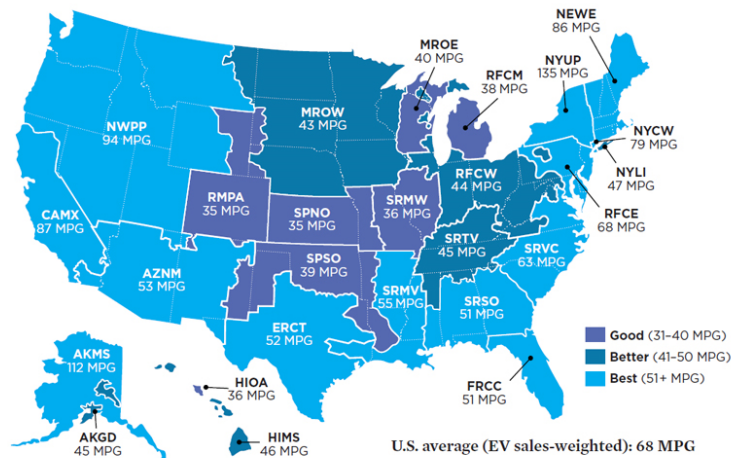


Source: US DOE eGRID 2016

# Average Electric Vehicle Efficiencies – Electric Grid Comparison

## eGRID 2012

Electric Vehicle Global Warming Pollution Ratings and Gasoline Vehicle Emissions Equivalents by Region

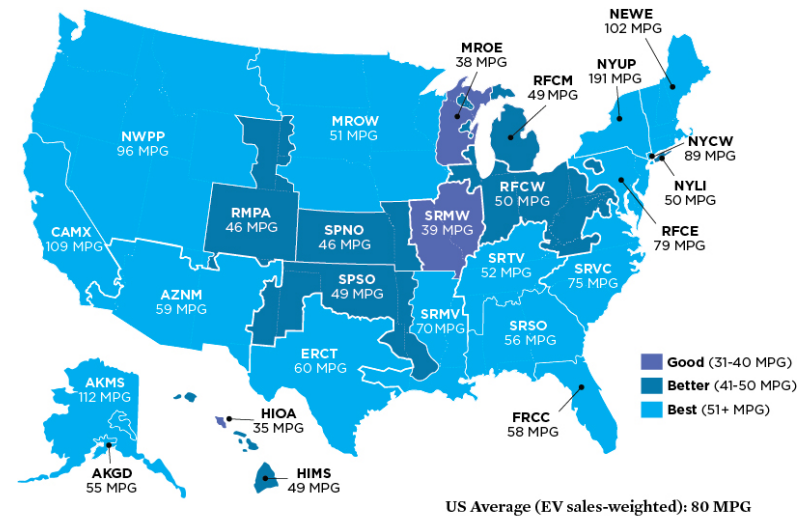


Note: The MPG (miles per gallon) value listed for each region is the combined city/highway fuel economy rating of a gasoline vehicle that would have global warming emissions equivalent to driving an EV. Regional global warming emissions ratings are based on 2012 power plant data in the EPA's eGRID 2015 database (the most recent version). Comparisons include gasoline and electricity fuel production emissions. The 68 MPG U.S. average is a sales-weighted average based on where EVs were sold in 2014.

SOURCE: EPA 2015C.

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## eGRID 2016



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# Examples in Centralina

- Piedmont Natural Gas
  - Converting vehicles to CNG during turnover
  - Aiming to use optional 0.02 g/bhp-hr NOx standard
  - Currently 520 CNG vehicles out of approximately 1,100
  - Limited to areas with fueling stations



# Examples in Centralina

- Duke Energy
  - Committed to 5% of annual purchases being electrified
    - BEVs and PHEVs
    - Applies to sedans AND work trucks
  - Close to 100% electrified rate for sedans



# Examples in Other Regions

- UPS
  - Wide range of alternative fuel projects worldwide
  - Over 2,500 alternative fuel vehicles in global fleet
  - In Carolinas: Greensboro 100+ CNG semi tractors, 26 in Columbia (both groups come to Charlotte, Asheville, and NC/SC as a whole)
  - In Georgia: Electric, Hybrid, Propane, and CNG box trucks



# Examples in Other Regions

- Catbus
  - Bus service for Clemson, Seneca, and surrounding towns
  - Committed to becoming the first fully-electric bus fleet in the US
  - Keith Moody, General Manager of Catbus: “I’m saving a dollar per mile on maintenance.”





# But Are There Any Electric Heavy-Duty Vehicle Manufacturers?

- Thor Trucks
- Tesla
- MAN (VW Group)
- Nikola
- Daimler
- Cummins
- Renault
- Transpower
- Kalmar Ottawa
- E-Force
- Wrightspeed
- Orange EV
- BYD
- EDI
- Motiv Power Systems
- Peterbilt
- Volvo
- MACK (Volvo)

# Funding For Alternative Fuels Projects – 2 Examples (There Are Others)

- **GRADE (Grants to Replace Aging Diesel Engines)** is our local program that has made a large impact over the last 11 years.
  - On-road and non-road projects
  - Repowers and replacements
- Volkswagen settlement funds will become available soon.
  - Funds focus on NOx reduction from mobile sources
  - Pays higher percentages for fully-electric projects (up to 100%)
  - \$92 million in North Carolina
  - NC RFP planned for this Autumn (2018)

# So, In Summation...

- We are close to the NAAQS for ozone
- Vehicle exhaust makes most of our ozone
- Joining Clean Cities, SEDC, or other groups is a good way to educate and find resources to reduce vehicle pollution
- Reduce idling, use APUs, switch to cleaner fuels
- Electrics are the lowest NOx emitters, and may get more grant money
- All vehicle types are available or coming soon

# Why is this guy telling us all of this?!

- Businesses and governments are the largest players – the daily decisions of fleet managers impact our region (and our air) more than most individuals.
- I encourage everyone here to either make a plan to implement these technologies in their own fleets – OR – speak about these technologies with your peers, customers, friends, families, etc.

# Questions?

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