Regional Air Quality Impacts from Light-Duty Vehicle Electrification

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American Council for an Energy-Efficient Economy





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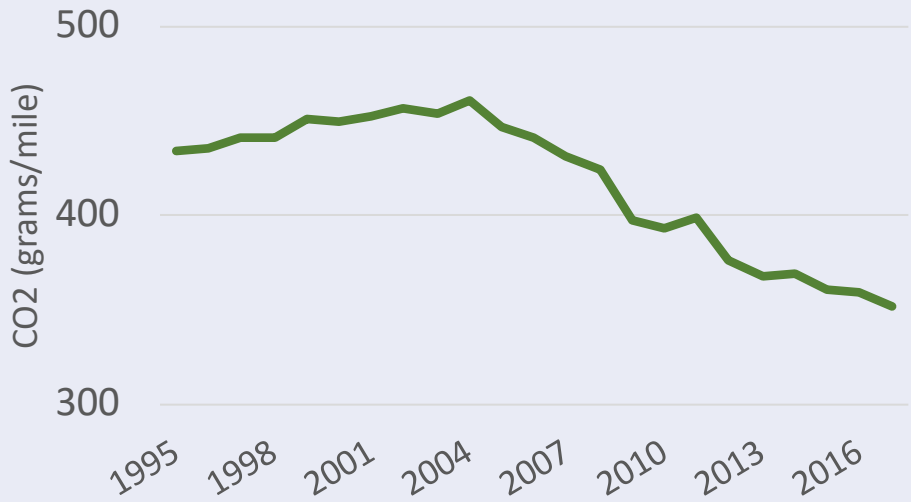
Why passenger vehicles?

- 88% of America's commuters use private vehicles
- Transportation sector accounts for 29% of U.S. energy consumption
  - **62% percent of that by personal vehicles**
- Global market shifting to plug-in electric vehicles
  - **Battery electric vehicles (BEV); e.g. Chevrolet Bolt, Tesla Model S**
  - **Plug-in gasoline hybrids (PHEV); e.g. Chevrolet Volt, BMW 530e**
- Mobility services

Current light-duty vehicle emissions standards

	EPA Tier 3 Emissions Standard	EPA Greenhouse Gas and NHTSA Fuel Economy Standards
Regulates	NMOG, NOx, PM, CO, Formaldehyde Gasoline fuel sulfur content	CO_2 and other greenhouse gasses
Impacts	By 2030, prevents… 2,000 premature deaths 2,200 hospital admissions 19,000 asthma attacks annually 1.4 million lost school/work days	• By 2030, light-duty vehicle GHG emissions reduced by 300 million metric tons 

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*EPA and NHTSA recently proposed to roll back the standards, such that no reduction in GHG emissions of fuel consumption would be required after 2020

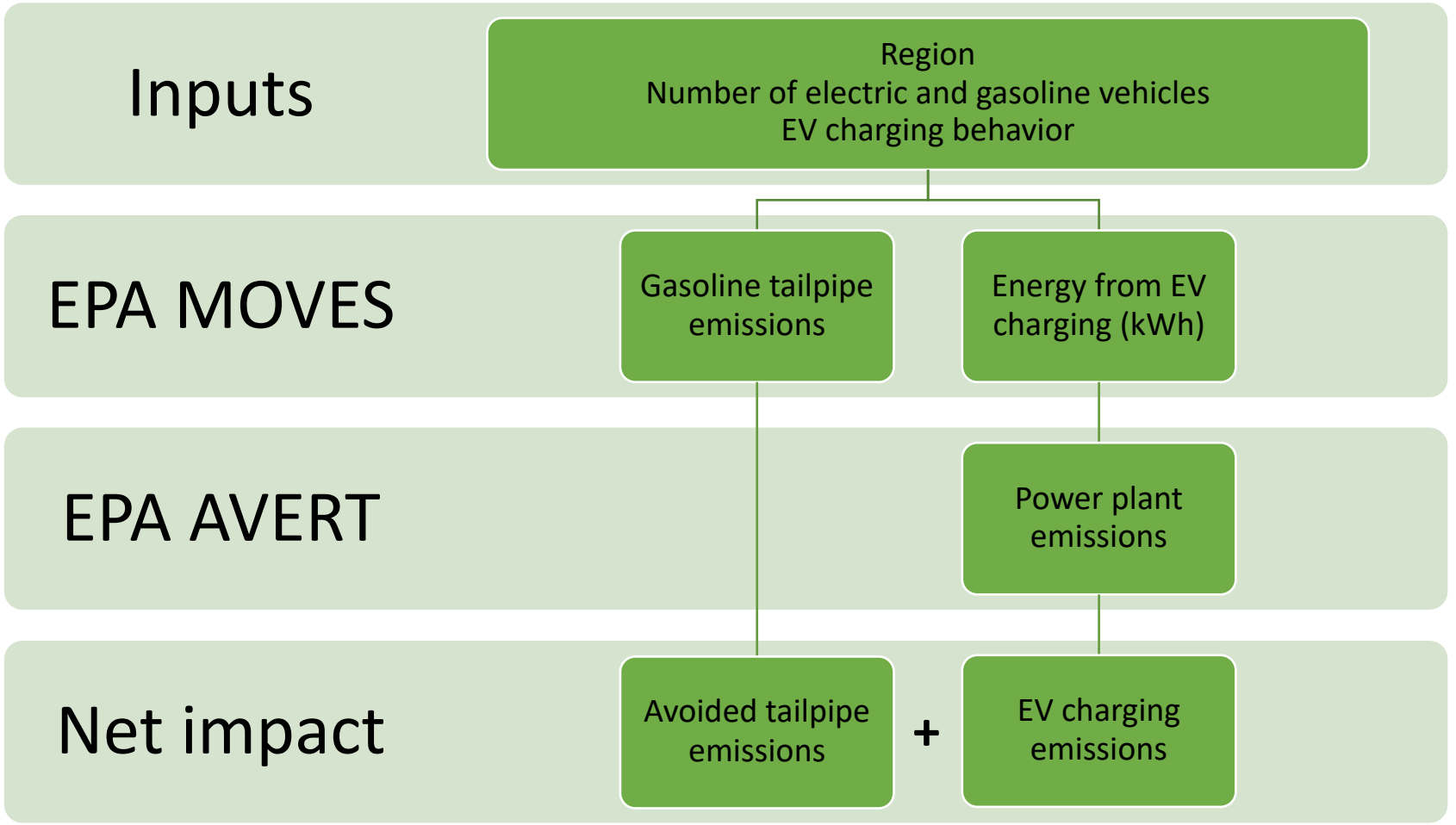
Impacts: EV vs. Gasoline

- Energy and CO_2 benefits are well known
- No tailpipe emissions, but electricity is generated with fossil fuels
- Regional mix of generation often different than national average
- Generation facilities often near economically disadvantaged areas

- How does a state or region plan for this?
- Can we use existing tools to determine the impacts?

Determining BEV impacts

- EPA MOVES – **MO**tor **V**ehicle **E**mission **S**imulator (mobile source emissions)
- EPA AVERT – **AV**oided **E**missions and gene**R**ation **T**ool (generation emissions)



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Scenario

- Southeast region
- Emissions impact over single calendar year
- Replace 10% of MY 2017 gasoline vehicles with electric
- Explore various charging scenarios
  - **Uncontrolled charging**
  - **Time-of-use (TOU) utility rate programs**

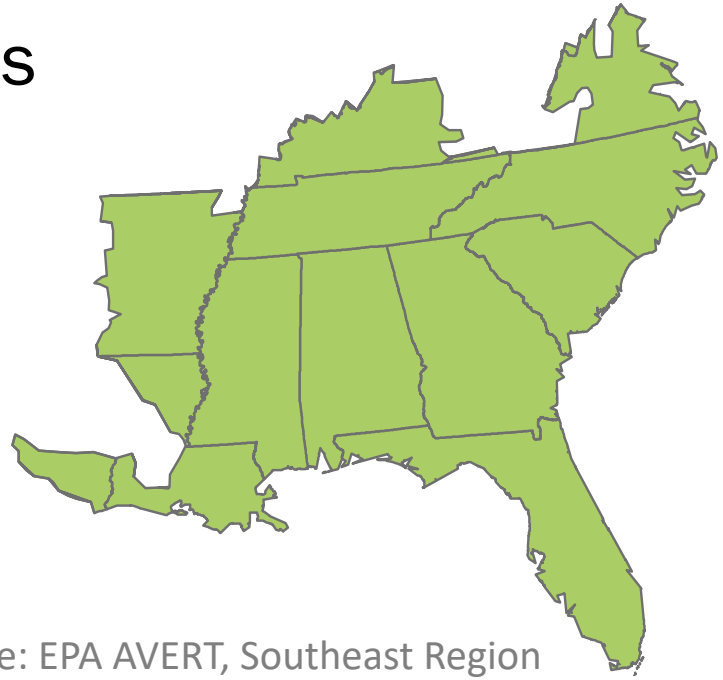

Image: EPA AVERT, Southeast Region

Findings for Southeast region

- Significant net reduction in greenhouse gas emissions
- Slight net increase in criteria emissions
- Charging behavior can impact net emissions
  - **Time-of-use rate scenario shows a smaller increase in generation emissions**
  - **Charging requires same number of kilowatt hours, regardless of when it occurs**

Takeaways

- Produced realistic results
- Modeling - refine and expand capabilities
- Plug-in vehicles are coming* - with varying regional impacts
- Regulators need tools to guide policy
  - **Contracting the analysis can be expensive**
  - **Many states have in-house expertise with EPA MOVES, AVERT, and other tools**
- Utilities will play a role

* not just in California!

Next steps

- Expand the analysis
  - **Emissions across the full life of vehicles (about 25 years)**
  - **Entire fleet and all model years**
  - **Charging scenarios that reduce emissions**
  - **Include fuel cycle emissions**
- Recommend that EPA consider expanding these tools
- Engage and support stakeholders
- Support future reductions in power sector emissions

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Thank you!

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