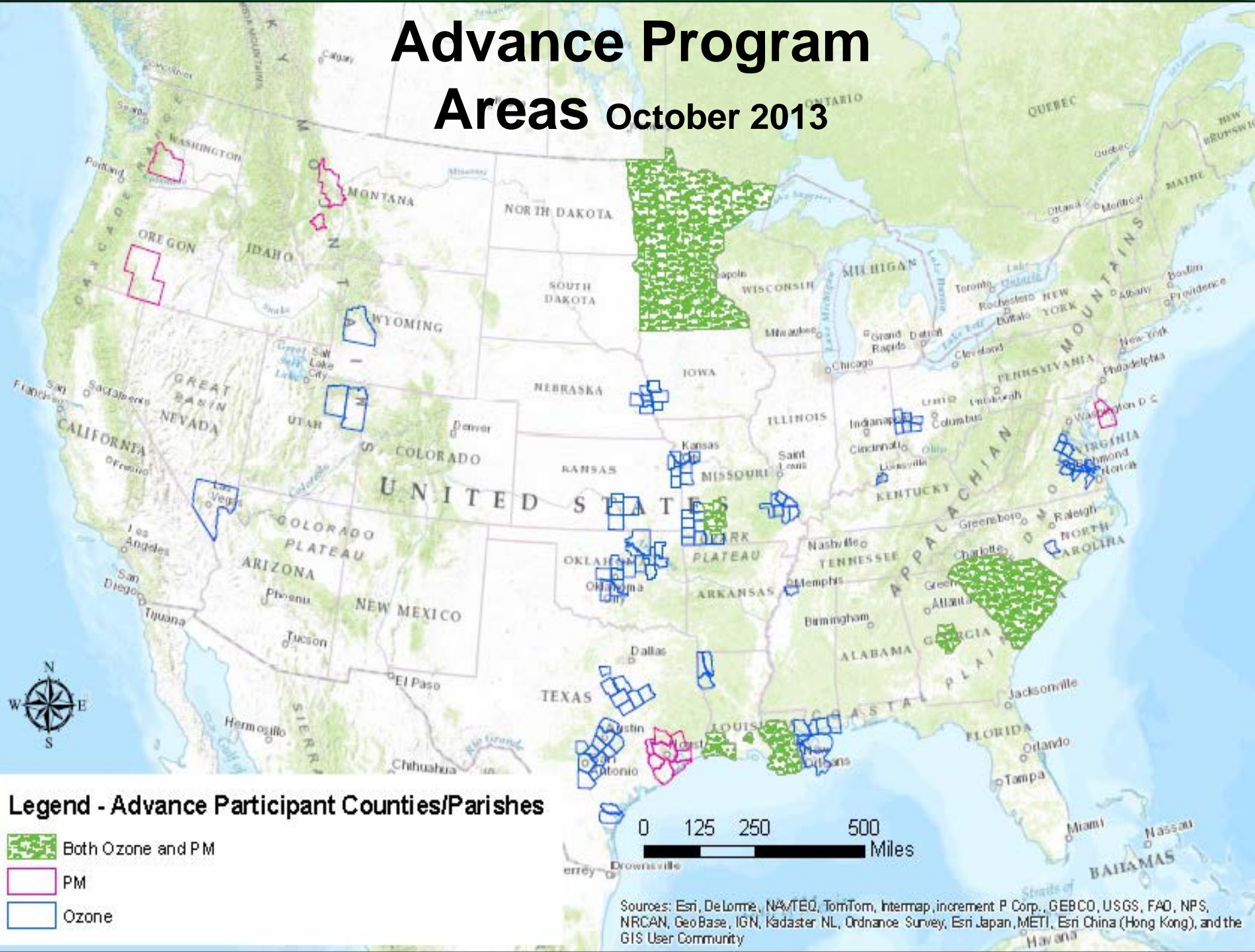
A large, faint watermark of the EPA logo is centered in the background. It features a stylized flower with three leaves and a circular top, surrounded by the text "ENVIRONMENTAL PROTECTION AGENCY" and "UNITED STATES".

PM Advance Measures to Address Mobile Sources




EPA Office of Transportation and Air Quality

November 14, 2013

Advance Program Areas October 2013



Legend - Advance Participant Counties/Parishes

-  Both Ozone and PM
-  PM
-  Ozone

0 125 250 500 Miles

Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

“Path Forward” Measures/Programs

- Awareness/education, voluntary, mandatory
- Short-term and longer-term
- Address an array of sources

See epa.gov/ozonepmadvance
“Measures and Programs”



WELCOME!

- Identifying the Impact of Mobile Sources in PM Advance Areas
- National Regulations Affecting Mobile Source Emissions
- PM 2.5 Reduction Programs and Initiatives
 - Diesel Emission Reduction Strategies

Current PM Advance Areas

Yakima
Region, WA

Helena, MT

Butte-Silver
Bow, MT

Lake View, OR

Minnesota

Delaware

Springfield, MO

South
Carolina

Middle
Georgia
(Macon)

Baton
Rouge,
LA

Lafayette,
LA

New
Orleans,
LA

Houston, TX

Southwest
Louisiana

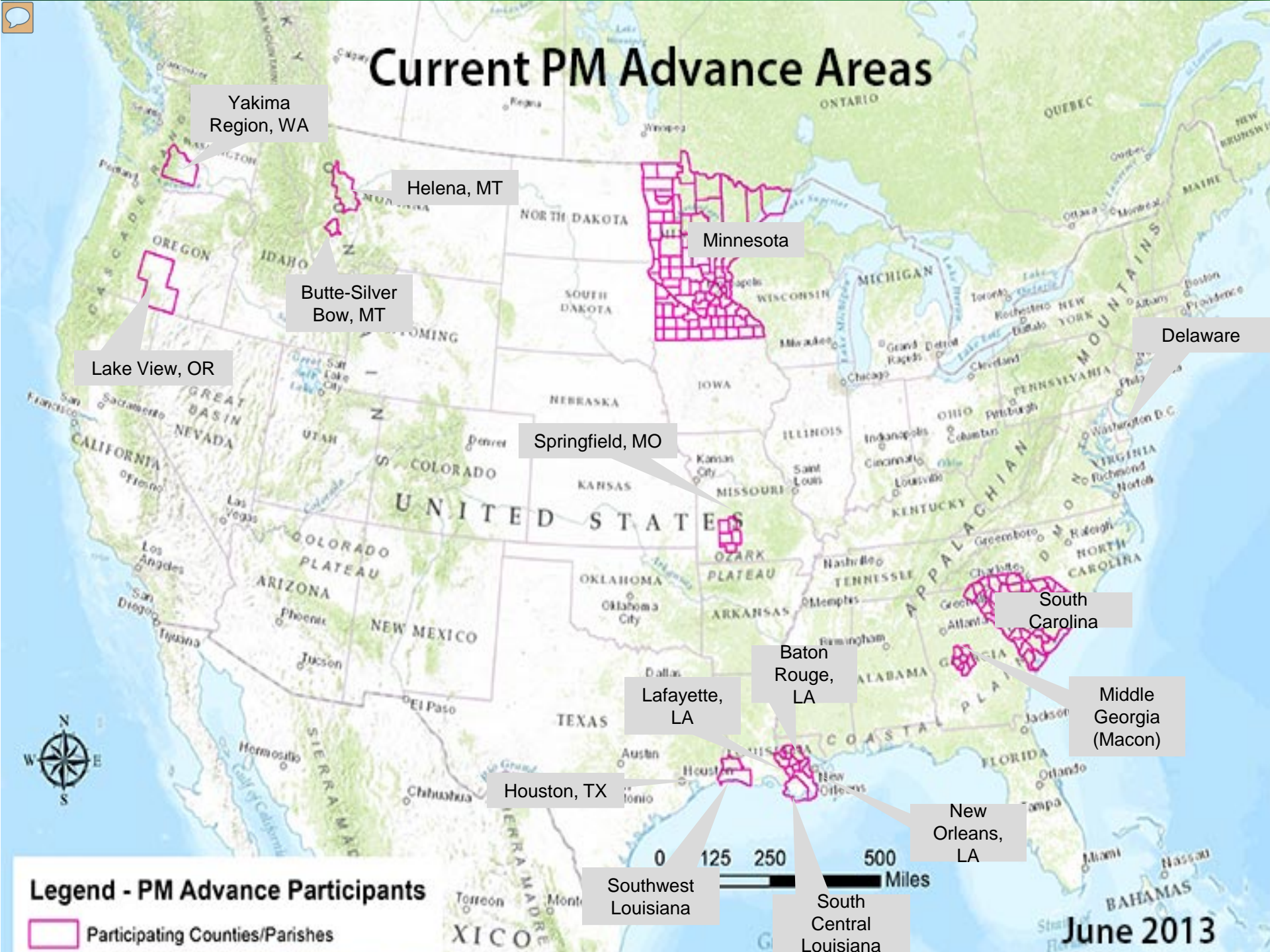
South
Central
Louisiana

Legend - PM Advance Participants

 Participating Counties/Parishes

0 125 250 500 Miles

June 2013





Data Sources

- **PM_{2.5} Design Values**
 - Used to designate and classify nonattainment areas, as well as to assess progress towards meeting the NAAQS
 - <http://www.epa.gov/airtrends/values.html>



PM2.5 Design Values 2010-2012

The level of the 2012 annual NAAQS for PM 2.5 is 12.0 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$).

The design value for the annual PM 2.5 NAAQS is the 3-year average annual mean concentration.

The level of the 2006 24-hour NAAQS for PM 2.5 is 35 $\mu\text{g}/\text{m}^3$.

The design value for the 24-hour PM 2.5 NAAQS is the 3-year average 98th percentile concentration.

For those PM Advance counties that are not shown, there is no design value data available.

County	Annual Standard ($\mu\text{g}/\text{m}^3$)	24-Hour ($\mu\text{g}/\text{m}^3$)
Kent, DE	9.0	23
Sussex, DE	9.0	24
Houston, GA	11.0	23
Calcasieu, LA	8.9	20
East Baton Rouge, LA	10.2	22
Iberville, LA	10.0	21
Lafayette, LA	9.1	21
Terrebonne, LA	8.4	18
West Baton Rouge, LA	1.1	22
Cass, MN	4.3	11
Hennepin, MN	9.0	25
Lyon, MN	7.0	20
Olmsted, MN	9.0	25
Ramsey, MN	9.7	28
St. Louis, MN	5.5	17
Scott, MN	8.6	25
Stearns, MN	8.5	24
Greene, MO	10.3	22
Lewis and Clark, MT	8.9	38
Silver Bow, MT	10.3	42
Lake, OR	8.8	34
Charleston, SC	8.9	22
Chesterfield, SC	9.3	20
Edgefield, SC	9.8	20
Florence, SC	10.4	22
Greenville, SC	10.9	23
Lexington, SC	11.1	23
Richland, SC	10.7	23
Harris, TX	12.1	24
Yakima, WA	8.7	31



Data Sources

- National Emissions Inventory (NEI)
 - The NEI is a comprehensive and detailed estimate of air emissions of both criteria and hazardous air pollutants from all air emissions sources.
 - To download the data, navigate to this site (<http://www.epa.gov/ttnchie1/net/2008inventory.html>) and scroll to the Sector Summaries section. Select “County or Tribe”, “CAP–PM 2.5”, your preferred geographic aggregation, and all sectors except for Biogenics and Fire



National Emissions Inventory

From this data source an area may calculate:

- Mobile Diesel Emissions as a % of Total PM 2.5 Emissions
- Tons of Mobile Diesel PM 2.5 Emissions
- Sources of Mobile Diesel PM 2.5 Emissions
 - On-Road
 - Non-Road
 - Locomotive
 - Marine

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Data Sources

- National Air Toxics Assessment (NATA 2005)
 - NATA provides estimates of the risk of cancer and other serious health effects from breathing (inhaling) air toxics in order to inform both national and more localized efforts to identify and prioritize air toxics, emission source types and locations which are of greatest potential concern in terms of contributing to population risk. EPA lists diesel exhaust as a mobile source air toxic.
 - Census Tract Diesel PM exposure Levels ($\mu\text{g}/\text{m}^3$)
 - <http://www.epa.gov/nata/>
 - Census Tract Shapefile
 - Census Tract Diesel Exposure Spreadsheet

Census Tract Diesel PM Exposure Levels (NATA)

County	$\mu\text{g}/\text{m}^3$
Calcasieu, LA	5.54
East Baton Rouge, LA	2.57
Iberville, LA	2.30
St. Charles, LA	2.54
St. John the Baptist, LA	2.22
West Baton Rouge, LA	3.57
Anoka, MN	2.13
Dakota, MN	2.01
Hennepin, MN	2.48
Ramsey, MN	2.03
St. Louis, MN	5.42
Charleston, SC	3.96
Greenville, SC	2.03
Galveston, TX	2.03
Harris, TX	4.87

5 $\mu\text{g}/\text{m}^3$ is EPA's reference concentration threshold for diesel exhaust inhalation exposure.

2 $\mu\text{g}/\text{m}^3$ is OSHA's occupation exposure threshold.



Developing a Mobile Source Inventory

- Good emission inventories are the basis for successful air quality planning
- Because aggregate mobile source emissions cannot be directly measured, computer models are used to estimate these emissions
 - MOVES2010b or MOVES2014 for on-road mobile sources
 - NONROAD2008a (or possibly MOVES2014) for most nonroad sources
- Models combine emissions data with meteorology, fleet, activity, fuel, and control strategy data to estimate emissions for a specific local area



MOVES2010b

- **Most current version of EPA's official model for on-road vehicles (Released April 2012)**
 - Model, guidance documents and documentation at:
www.epa.gov/otaq/models/moves/index.htm
- **Used to estimate emissions from all on-road vehicles**
 - Cars, trucks, buses, motorcycles
 - Gas and diesel (and CNG for buses)
- **Allows user input of local meteorology, VMT, vehicle population, age distribution, road type distribution, speed distribution and local fuel characteristics to estimate a current or projected on-road emissions inventory**



MOVES2014

- **Major revision to MOVES scheduled for release early 2014**
 - New vehicle and fuel regulations
 - Tier 3 Light Duty Vehicle Standards
 - New data
 - Evap, heavy duty, fuel effects, etc.
 - New features
 - More input options, better performance
 - Adds nonroad capability to MOVES
- **Will replace MOVES2010b**
 - EPA will issue guidance about the transition to MOVES2014 at the time of release



NONROAD2008a

- **Most current version of EPA's official model for nonroad equipment (Released April 2009)**
 - Model, guidance documents and documentation at:
www.epa.gov/otaq/nonrdmdl.htm
- **Used to estimate emissions for all categories of nonroad equipment except aircraft, locomotives, and commercial marine engines**
- **NONROAD includes a database of local fleet and activity information, but users can substitute their own local data if available**

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National Emission Inventory (NEI)

- **States are required to submit emissions information and EPA is required to compile that data into the NEI every 3 years**
- **For mobile sources, states can submit local modeling inputs and EPA calculates the inventory using MOVES and NONROAD**
- **NEI is a good source of basic inventory information but has limits:**
 - Level of input detail may not meet SIP requirements
 - Some states do not submit local inputs
 - Inventory is limited to NEI years (2008 is most current, 2011 in progress)



Mobile Source Clean Air Rules: *Comprehensively Addressing Air Pollutants*

- **Clean Cars and Passenger Trucks**
 - Tier 2 standards for new gasoline and diesel light trucks and cars began in 2004
 - More stringent Tier 3 standards for new gasoline and diesel light trucks and cars beginning in 2017
- **Clean Heavy-Duty Trucks and Buses**
 - Stringent NO_x and PM emissions standards for new buses & trucks beginning in 2007
- **Mobile Source Air Toxics Rule**
 - Portable fuel container requirements beginning in 2009
 - Cold temperature hydrocarbon standards for vehicles phased in between 2010 and 2015



Mobile Source Clean Air Rules:

Comprehensively Addressing Air Pollutants

- **Clean Non-road Diesel Engines and Equipment**
 - Stringent emissions standards many types of non-road equipment
 - Standards phase-in between 2008 and 2015 depending on engine size
- **Small Gasoline and Recreational Marine Standards**
 - New exhaust emission standards take effect in 2010-2012 depending on engine type/size
 - Covers lawn and garden, utility vehicles, generators, a variety of other equipment, personal watercraft and outboard engines

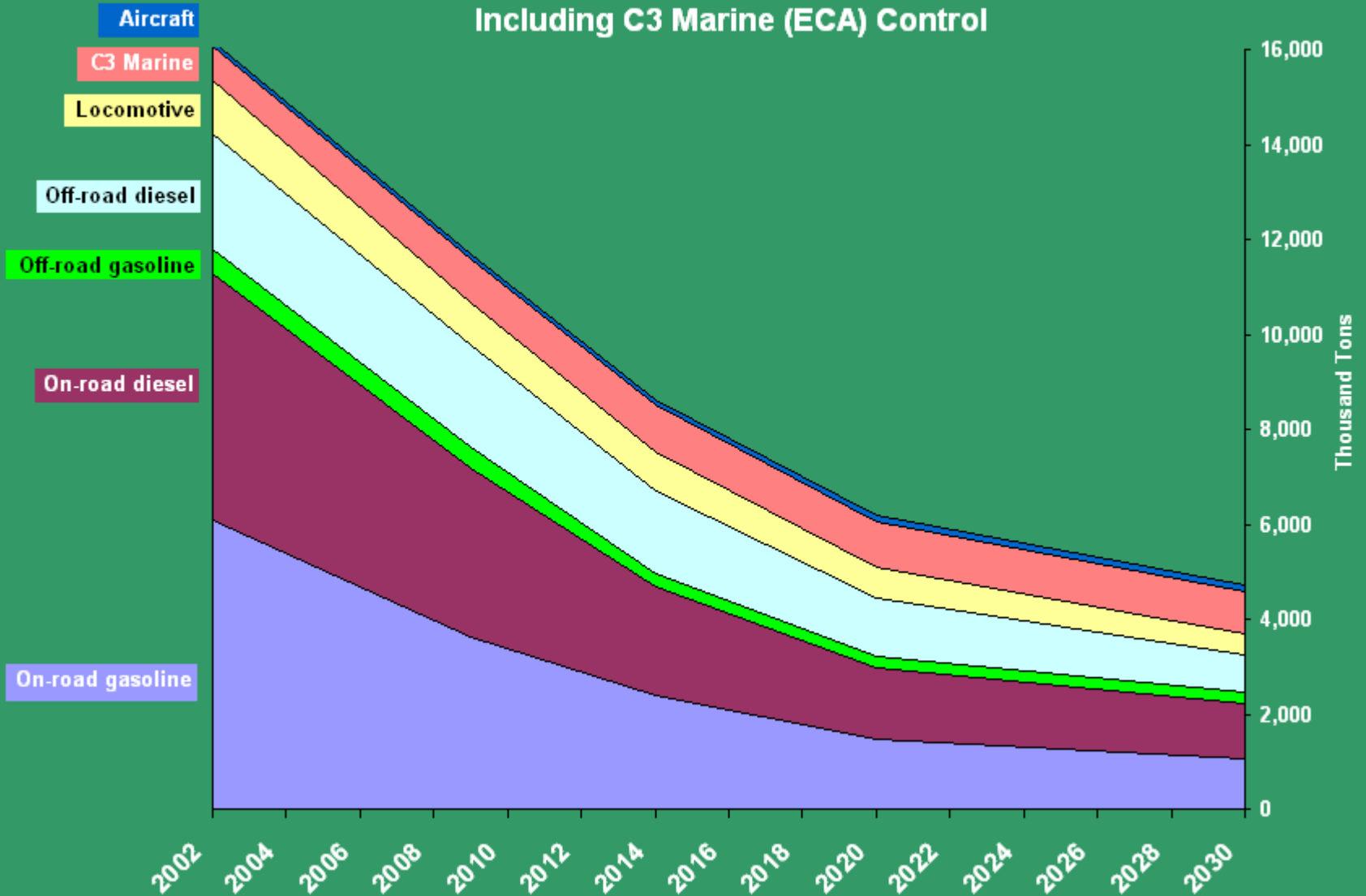


Mobile Source Clean Air Rules:

Comprehensively Addressing Air Pollutants

- **Locomotive and Marine Diesel Standards**
 - New engine standards phase-in beginning in 2009
 - Tightens standards for existing locomotives and large marine diesel engines when they are remanufactured
- **Ocean-going Vessels**
 - In March 2010, the International Maritime Organization designated US coastlines as Emission Control Areas resulting in:
 - New engine standards phase-in beginning in 2011
 - Existing engines –NOx reductions starting in 2010
 - Fuel Quality Standards: sulfur reductions beginning in 2012
 - EPA finalized regulations in December 2009 to implement these standards on US-vessels

Annual U.S. Mobile Source NOx Emission Projections Including C3 Marine (ECA) Control





PM 2.5 Reduction Programs and Initiatives

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Diesel Retrofit Programs

- Diesel retrofit devices for after-treatment pollution control can be installed on new or existing vehicles and equipment to reduce particulate matter (PM), nitrogen oxides (NO_x), and other air pollutants
- State or local agencies can implement mandatory or voluntary retrofit programs with grants or rebates to incentivize use of retrofit devices to reduce emissions from diesel vehicles.
- Federal funding is available to qualified applicants through EPA's DERA program and DOT's CMAQ program.



Diesel Retrofit Programs

- New Jersey's Mandatory Diesel Retrofit Program targeted diesel-powered vehicles
 - Approximately 8,000 of 10,000 eligible vehicles had tailpipe controls installed
 - PM 2.5 emissions had a reduction of around 136 tons per year
- Most benefit comes from engines from 1995 and later



Cargo Handling Equipment Programs

- Cargo handling equipment (CGE) have several options available for replacement:
 - new non-road diesel engines
 - alternative fuels such as propane
 - replacing the CGE with on-road engines
- The ports of Seattle and Tacoma retrofitted and replaced cargo-handling equipment, which will save an estimated 7 tons per year of PM 2.5 and 28 tons of NOx per year
- The Port of Long Beach reduced more than 70 tons of diesel PM per year through the Diesel Emissions Reduction Program and modernization of equipment fleets



Clean Construction Equipment

- Large, multi-year public works projects can generate substantial quantities of PM and NO_x emissions
- States, locals, and municipalities can use “contract specifications” to require or encourage the use of cleaner equipment
- Model contract specifications are available

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Construction, cont...

- A clean construction program implemented by New Jersey Department of Environmental Protection to retrofit non-road equipment is projected to reduce PM by 3.8 tons annually
- Reductions in construction emissions can be particularly important because they frequently occur during the summer ozone season

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Heavy Duty Truck Scrappage Programs

- Older heavy duty diesel trucks that move goods in and out of distribution centers can be a major source of NO_x and PM 2.5 emissions
- A combination of local ordinances or contract requirements combined with financial incentives may be used to encourage the scrappage of older, pre-1994 trucks and replace them with 2007 or newer trucks

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Drayage, cont...

- Many ports, including the ports of Los Angeles, Long Beach, Seattle, Tacoma, New York, Norfolk, and Charleston, have initiated successful clean truck programs to reduce emissions from these trucks
- The Scrappage and Retrofits for Air in Puget Sound (ScRAPs) Program replaced over 200 pre-1994 engined trucks with an estimated reduction of 5 tons of PM and 78 tons of NOx per year

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Long Duration Truck and Bus Idling

- Unnecessary truck and bus idling wastes fuel and increases NOx and PM 2.5 emissions
- Truck stops and rest areas are by far the largest source of idling emissions in most areas
- EPA has issued guidance to take emissions credit for reducing long duration truck and bus idling



Idling, cont...

Approximately 22 states and 27 cities have enacted idling ordinances or regulations to limit unnecessary idling

- New Jersey's 3 minute idling limit reduces PM 2.5 emission by 100 tons per year for areas near NYC and Philadelphia
- Dallas' idle reduction technology projects are reducing PM 2.5 emissions by 1.92 tons per year and Nox emissions by 64 tons per year
- Pennsylvania 5 minute idling limit reduces PM 2.5 emissions by 7.3 tons per year statewide

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Commercial Marine Engine Repowers and Rebuilds

- Older marine vessels can be a major source of NO_x and PM in and around ports
- Voluntary engine replacement (repower) and engine rebuild programs can provide significant emission reductions and fuel efficiency improvements
- Marine engine remanufacture kits are available for some engines and can achieve substantial NO_x emission reductions at about 50% the cost of a repower



Marine Vessels, cont...

- Repowering or rebuilding an older marine vessel with a new Tier 2-compliant engine can reduce NOx and PM emissions by up to 50%
- Pennsylvania's Department of Environmental Protection (PA DEP) repowered engines on the *Champion Coal* from EPA standards to cleaner Tier 2 standards through an ARRA grant and EPA assistance.
- The repower of the *Gulf Coast* marine tug reduced PM by 25% and NOx emissions by 41%

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Locomotive Repowers and Idle-Control Strategies

- Voluntary locomotive repower and idle-control programs can be an effective strategy for reducing NOx and PM 2.5 emissions near ports and rail yards
- Tier 0 switcher locomotive engines are excellent candidates for engine repowers because of the substantial emission benefits and their localized operations
- Auxiliary power units, shore power, and automatic start-stop mechanisms are becoming more popular because of the emission reductions and fuel savings (payback can be less than one year)



Locomotives, cont...

- In Albany NY, 1 switcher repower reduced PM 2.5 emissions by 1.1 tons per year
- In the CA South Coast Basin, 8 switcher locomotive repowers reduced PM 2.5 emissions by 2.2 tons per year
- Providence and Worcester Railroad Company installed 17 APUs, 9 AESSs and 5 DOCs on locomotives and reduced PM 2.5 emissions by approximately 1 ton per year

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Fleet Operation Efficiencies

- School buses, transit buses, refuse haulers and other municipal fleets can be significant contributors of localized PM and NOx emissions
- One of the easiest ways to reduce fleet emissions, and save money in fuel costs, is to reduce idling through anti-idling policies, driver education, and idle-reduction technologies
- Route auditing and optimization, as well as evaluating pick-up/drop-off placement and times, are all tools to improve efficiency

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Fleet Efficiencies, cont...

- In Kansas City, Springfield, and St. Louis, 56 municipal vehicles retrofit with idle-reduction devices reduced 0.2 tons of $PM_{2.5}$ per year representing a 50 % reduction
- In the City and County of Denver, 48 refuse haulers retrofit with direct fired heaters reduced 0.13 tons of $PM_{2.5}$ per year, representing an over 60% reduction
- The Mid-Dakota Education Cooperative installed direct fired heaters on 97 school buses and replaced another 19 to reduce $PM_{2.5}$ by 2.09 tons annually.

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Agricultural Equipment

- Agricultural diesel engines continue to emit harmful pollutants until they're retired.
- Some proven strategies to reduce diesel emissions include:
 - Switching to cleaner fuels, such as biodiesel, liquid petroleum gas, and compressed natural gas.
 - Retrofitting existing diesel equipment with verified technologies.
 - Replacing older diesel engines, or entire machines, with newer, cleaner engines.
 - Maintaining equipment.
 - Minimizing idling.
 - Implementing multi-tillage tools.

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Agricultural Equipment

- Miami-Dade County Clean Diesel Repower Program for Local Farmers provided a rebate to farmers who replaced their aging diesel irrigation set engines
 - The new engines reduced average fuel used by 3 to 6 gallons per hour, saving almost 1,000 gallons of fuel per year
 - The 223 new set engines replaced will reduce PM emissions by 8 tons per year



Funding Opportunities for Diesel Strategies

- Diesel Emissions Reduction Act (DERA) Grants
 - Port Request for Proposals (RFP)
 - Nonroad Rebate
- State Programs
- Congestion Mitigation and Air Quality Improvement Program (CMAAQ)



OTAQ Web Resources

- Topic-specific guidance documents that outline EPA policies for crediting programs that can help reduce transportation-related air pollution and emissions:

http://www.epa.gov/otaq/stateresources/policy/pag_transp.htm

- Accelerated retirement of Vehicles
- Airports
- Commuter Programs
- Idling
- Intelligent Transportation Systems Management
- Land Use
- Retrofits
- Transportation Control Measures
- Transportation Pricing

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 - Advance Program Website: www.epa.gov/ozonepmadvance



APPENDIX



Transportation Control Measures and Travel Efficiency

- Refers primarily to the 16 broad categories of strategies listed in Section 108(f)(1)(A) of the CAA, but also includes strategies such as pricing and land use that reduce travel activity.
- Effectiveness of these strategies can be highly variable depending on the existing transportation system in place and the scope of implementation.
- Combinations of travel demand management, transportation alternatives and supporting land use increase effectiveness

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Transportation Control Measures and Travel Efficiency

- For example:
 - Public Education and Outreach
 - Workplace Programs
 - Ridesharing
 - Public Transit
 - Pricing (Travel and Parking)
 - Land Use (fundamental building block for other strategies and long term effectiveness)

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Public Education and Outreach

- “*It All Adds Up to Cleaner Air*” is a public education and partnership-building initiative developed by several federal agencies for the purpose of informing the public about the impact of their transportation choices on traffic congestion and air quality <http://www.italladdsup.gov/>
- *It All Adds Up* provides state and local agencies free commercial-quality promotional materials that emphasize four simple, convenient actions people can take to improve air quality and reduce traffic congestion:
 - Trip chain, or combine errands into a single car trip
 - Keep cars properly maintained
 - Refuel in the evening and don’t top off the gas tank
 - Choose alternate modes of transportation, such as carpooling, mass transit, biking, or walking



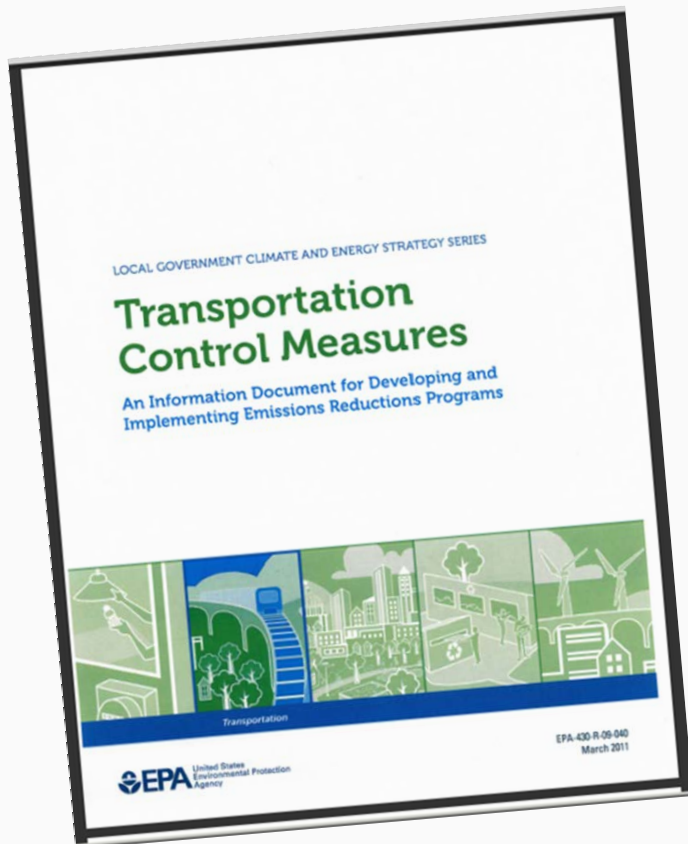
Work Place Programs

- Learn how to provide employees with a comprehensive package of commuter benefits (e.g. tax-free transit passes, vanpool subsidies, telecommuting options) that can improve air quality
- “Best Workplaces for Commuters” assists participating employers by offering public recognition and promotion, technical assistance, training, Web-based tools, and forums for information exchange

<http://www.bestworkplaces.org/>



TCMs: Basic Information and Examples

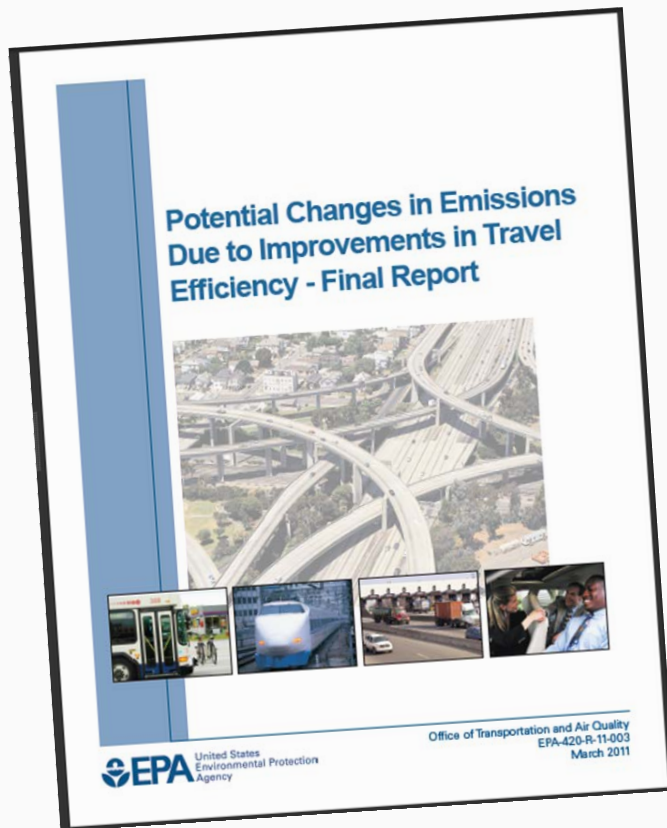


- Provides information on how local governments have planned and adopted TCMs
- Overview of measures, benefits, costs, sources of funding, examples and case studies

www.epa.gov/otaq/stateresources/policy/430r09040.pdf



TCMs: Effectiveness and Assessment



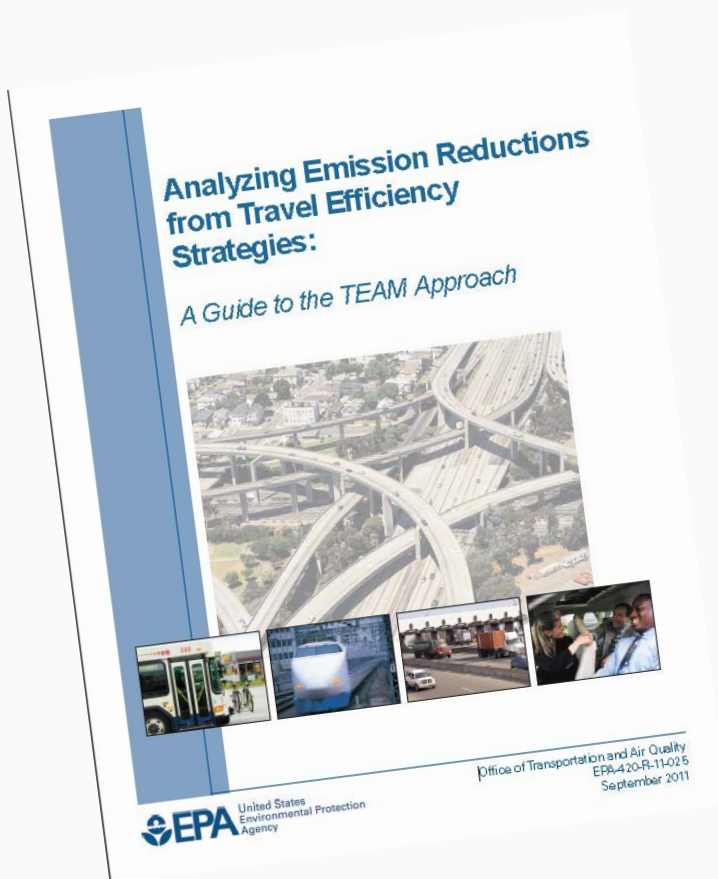
- A bottom-up assessment of the potential effectiveness of strategies at the national scale
- Provides information on effectiveness for a range of strategies
- The Travel Efficiency Assessment Method (TEAM) approach utilizes local travel activity data and information along with MOVES emission factors

www.epa.gov/otaq/stateresources/policy/420r11003.pdf



TCMs: Effectiveness and Assessment

- Provides guidance for using the Travel Efficiency Assessment Method (TEAM) approach for local/regional areas



www.epa.gov/otaq/stateresources/policy/420r11025.pdf