Preparation of the 2005 Point Sources National Emissions Inventory for Risk and Technology Review

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ABSTRACT

Every three years, the U.S. Environmental Protection Agency (EPA) prepares the National Emissions Inventory (NEI), an air quality emissions inventory dataset that serves numerous stakeholders, including federal, regional, state, local, and tribal agencies. Uses of the NEI data include: evaluating emission trends; preparing inputs for air quality modeling; and evaluating the need for additional control technology standards. The NEI consists of stationary, mobile, and biogenic emission sources. Stationary sources can be classified as point major and area or nonpoint area sources, whereas mobile sources are categorized as onroad or nonroad sources. At present, the NEI houses criteria and hazardous air pollutants. Over the last two years, the EPA has been actively engaged in its Risk and Technology Review (RTR) Program. The RTR Program is a combined effort to evaluate both risk and technology after the application of maximum achievable control technology (MACT) standards, as required by the 1990 Clean Air Act Amendments. RTR evaluates the effectiveness of technology-based standards, using cancer and noncancer risk as metrics, and determines the need for implementing additional and/or more stringent control requirements on specific source categories to reduce cancer and noncancer risk. A number of data sources, augmentation techniques, and quality assurance checks were used to prepare the point sources inventory. This paper describes recent efforts in the preparation of the 2005 NEI for RTR purposes.

INTRODUCTION

The Clean Air Act (CAA), as amended in 1990, requires the U.S. Environmental Protection Agency (EPA) to identify the sources of, quantify the emissions of, and assess the public health and environmental impacts of, criteria air pollutants and hazardous air pollutants (HAPs).[1] EPA houses these data in its National Emissions Inventory (NEI), which covers stationary (point major and area and nonpoint area) and mobile (onroad and nonroad) source emissions. Point source data are maintained at the process-level, while nonpoint area, onroad, and nonroad emissions are at the county-level. The NEI is a tool that can be used to conduct the analyses required by the 1990 CAA, such as for State Implementation Plans (SIPs), compliance demonstrations, emissions trading, modeling activities, as well as store and share data being generated through various EPA programs, including the National-scale Air Toxics Assessment (NATA).[2] From a geographic standpoint, the NEI covers the entire United States, the District of Columbia, Puerto Rico, and The Virgin Islands. For the 2005 baseyear, oil and natural gas platform emissions from the Gulf of Mexico Outer Continental Shelf (OCS) are also included. The 2005 NEI also includes airports and wildfires/prescribed burns as point sources. Previous NEI cycles include 1990, 1996, 1999, and 2002.

Criteria air pollutant (CAP) and their precursor emissions in the NEI are collected under the Consolidated Emissions Reporting Rule (CERR).[3] Under the CERR, EPA requires states to report sulfur dioxide (SO_2), volatile organic compounds (VOC), nitrogen oxides (NO_x), carbon monoxide (CO), lead (Pb), particulate matter-10 (PM_{10}), particulate matter-2.5 ($PM_{2.5}$), and ammonia (NH_3). The CERR specifies two sets of reporting thresholds for CAPs. Type A (large sources) must report annually, while Type B sources must report every three years. The actual thresholds differ by pollutant and depend upon whether the source is in a nonattainment area or not. For the 2005 NEI, EPA collected information on both Type A and Type B sources.

For HAPs, major sources are defined in the CAA as stationary sources that:

- Have the potential to emit 10 tons per year (tpy) or more of one HAP; or
- Have the potential to emit 25 tpy or more of any combination of HAPs.

Smaller point source facilities with annual emissions below these thresholds can be defined as nonpoint area sources and inventoried as such. While states are more likely to report major sources as point sources and smaller sources as nonpoint sources, there are no reporting thresholds for the NEI, and EPA encourages states to submit small sources to the point inventory. In particular, some source categories which are composed of smaller facilities may emit pollutants which have a high toxicity weighting, and states may give these categories high priority in data collection efforts.

METHODOLOGY

The goal in developing the point source NEI was to obtain and compile facility-specific data such as facility name, location, stack information, emissions, and unit and process descriptions. It was hoped that the data would be sufficient to support modeling and risk assessment needs. The starting point for obtaining this facility-specific data was, therefore, state and local air pollution control agencies and tribes, who are most likely to have this type of detailed inventory data, as well as EPA regulatory databases.

Data Sources

The following data sources were used to compile the 2005 NEI for point sources:

- State, Local, and Tribal Agency Data: Table 1 presents the 71 state, local, and tribal air agencies that provided point source data to EPA; this total was comprised of 48 state air agencies, 19 local air agencies, and 4 tribal air agencies. All of the agencies provided CAP data, while 53 of the 71 provided HAP data. Colorado CAP and HAP data were recently added.

- Risk and Technology Review (RTR) Data: The RTR project is an effort to conduct residual risk assessment and technology review under CAA sections 112(f) and 112(d)(6), respectively.[4] Section 112(f)(2) requires EPA to conduct risk assessments on the source categories subject to MACT standards to determine if additional standards are necessary to reduce the residual risk. Section 112(d)(6) requires EPA to review and revise MACT standards taking into account developments in practices, processes, and control technologies. The RTR program has prepared and/or extensively reviewed and updated emission estimates for 54 MACT sources categories, as shown in Table 2. Pesticide Active Ingredient Production and Polymers/Resins III-Amino/Phenolic Resins Production are newly reviewed and revised MACT source categories.

- Emission Inventory and Analysis Group (EIAG) Data: EPA used emissions and heat input data from the Department of Energy's (DOE) Energy Information Agency (EIA) and EPA's Clean

Air Markets Division (CAMD) Emission Tracking System/Continuous Emissions Monitoring (ETS/CEM) data for electric generating utilities (EGUs).[5] Emissions for SO_2 and NO_x were available for 2005; all other pollutants were scaled from their 2002 emissions to base year 2005 using the ratio of the heat inputs for 2005 and 2002. Additionally, EIAG prepared point source estimates for airports. CAP and HAP estimates were provided for these source categories.

- Sector Policies and Programs Division (SPPD) Data: For certain MACT source categories, EPA routinely prepares periodic emission inventories. For the 2005 NEI, emission inventories were available for: large municipal waste combustors; small municipal waste combustors; and hazardous waste combustors.[6,7,8,9] SPPD also provided a number of MACT- and area-source facility lists that were applied to the final inventory. CAP and HAP estimates were provided for these source categories.

- Regional Planning Organization (RPO) Agency Data: Base year 2002 tribal data that were compiled by the Western Regional Air Partnership (WRAP) for five tribes that were not in the 2005 NEI. The pollutant coverage consists of CAPs only.[10]

- Toxic Release Inventory (TRI) Data: The TRI database is required as part of Title III of the Superfund Amendments and Reauthorization Act (SARA).[11] TRI data are collected and compiled on a facility-specific basis, as opposed to the process-level. Facilities that are required to report into TRI are only those that meet certain reporting criteria (thus not accounting for smaller sources that may fall within an industry group). HAP and NH_3 estimates were obtained from this inventory.

- Version 3 of the 2002 NEI Data: Where facilities were deemed missing from the compilation of the above data sources, version 3 of the 2002 NEI were retrieved and supplemented for the 2005 effort.[12] CAP and HAP estimates were provided for these source categories.

- Gulf of Mexico's Oil and Gas Platform Data: The Minerals Management Service (MMS) developed a base year 2005 emission inventory for nearly 1,600 oil and natural gas platforms operating in the Gulf of Mexico OCS.[13] This inventory consists of CAPs only.

Additional Sources of Data and Revisions

Throughout calendar year 2008 and 2009, EPA has continued to make improvements to the 2005 point source NEI. Quality assurance/quality control (QA/QC) assessments of the state, local and tribal data have resulted in some data corrections (i.e., removal of duplicate emission estimates from different data sources). Additional data corrections are expected from state, local, and tribal reviewers of the lead National Ambient Air Quality Standards (NAAQS) data files, the draft 2002 National Air Toxics Assessment (NATA) results, and RTR data review. EPA anticipates primarily locational coordinate revisions based on the NATA review, which will be incorporated as appropriate into the 2005 NEI. In particular, the draft 2002 NATA results highlighted the need to investigate and improve upon the locations assigned to landfills throughout the country. RTR lead engineers have continued to review the Group 3 MACT data files and make revisions, and state, local, tribal agency and industry comments will be addressed after the release of the Advanced Notice of Proposed Rulemaking (ANPRM) for the Group 3 source categories. Comments are also anticipated for the upcoming Notice of Proposed Rulemaking (NPRM) for the Group 2 categories.

Other improvements to the 2005 point source NEI consisted of:

- Augmenting the PM emission estimates such that all PM species (PM_{10} and $PM_{2.5}$ filterable and primary and condensable) are represented for each applicable emission process;
- Correcting emissions, facility, and locational corrections after EIAG review;
- Revising and updating lead emissions based on the Lead NAAQS rule;
- Identifying and correcting emissions and locational data after EPA's review of NEI data near schools;
- Identifying and correcting emissions and locational data after state, local, and tribal review of NATA02; and
- Developing surrogate HAP emission estimates for boilers for which only CAP emission estimates were originally provided.

2005 and 2002 COMPARISONS

Table 3 presents a comparison of selected parameters between Version 3 of the 2002 point source NEI and the current version of the 2005 point source NEI. The number of annual emission records was comparable between the two inventories. The 2005 point source NEI contained more unique facilities, additional tribal areas, additional counties, and Gulf of Mexico OCS oil and gas production platforms. Table 3 also presents a comparison of the total point source CAP and HAP emission estimates contained in each inventory.

EXAMPLES OF USES OF THE NEI

Most people familiar with the NEI are also familiar with many of the uses of the NEI emissions data in air quality assessments, including assessing emissions trends, developing emissions projections, and conducting modeling analyses to support policy and regulatory decisions. Other recent applications have included:

- Siting lead monitors for Lead NAAQS and siting air toxics monitors at schools
- Identifying Best Available Retrofit Technology (BART) emission units;
- Identifying New Source Review/Prevention of Significant Deterioration (NSR/PSD) emission sources; and
- Identifying facilities subject to EPA Regional Office enforcement.

As technology has advanced, the uses and applications of NEI data are becoming more commonly available to researchers and the general public. For example, EPA's *Where You Live* website[14] links NEI data such that it can be viewed in Google Earth.™ EPA's NATA program[15] is a state-of-the-science screening tool used to assess national cancer and noncancer risks associated with air toxics. The website provides links to emission density maps, modeled ambient concentration maps, and estimated risk data summary tables. In the future, NEI data are likely to be used to support air toxics monitoring initiatives such as the upcoming Schools Monitoring Initiative. Locations of schools can be mapped to point source facilities in the NEI to assist in interpreting ambient monitoring concentration data. Similar analyses are performed in the EPA's Urban Air Toxics Monitoring Program (UATMP),[16] and site-specific investigations conducted by the Agency for Toxic Substances and Disease Registry (ATSDR).

The NEI data can also be used to support greenhouse gas and climate change initiatives. For example, updates to the landfill locational coordinates are obtained from, and shared with the EPA's Landfill Methane Outreach Program (LMOP), a voluntary assistance and partnership program that promotes the use of landfill gas as a renewable, green energy source. Point source NEI data were also used in technical analyses for March 10, 2009 proposed Mandatory Greenhouse Gas (GHG) Reporting Rule.

CONCLUSIONS

The variety of NEI data uses demonstrates the need for better inventory data. Inventory developers need to provide more detailed and accurate data in the future to meet the increasing demand for use of NEI data in regulatory actions. Integrated multi-pollutant inventories containing CAPs, HAPs, and GHGs are also needed to perform sector analyses and integrated modeling. The incorporation of NEI data into GOOGLE Earth™ applications requires improved geographical coordinates and emissions estimates. Increased QA of inventory data by data developers and stakeholders is needed to meet these increasing demands. EPA encourages state and local agencies, tribes, industry and the public to provide improved inventory data to the NEI and to review inventory data used in regulatory applications.

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KEYWORDS

National Emissions Inventory (NEI)
Point Sources
Hazardous Air Pollutants
Criteria Air Pollutants
Residual Risk
Maximum Achievable Control Technology (MACT)
National Air Toxics Assessment (NATA)

Table 1. State, Local, and Tribal Agency submittals.

State	Submitting Agency	Type	CAP	HAP
Alabama	Alabama Department of Environmental Management	State	X	X
Alabama	Alabama: Jefferson County Health Board	Local	X	X
Alaska	Alaska Department of Environmental Conservation	State	X	
Arizona	Arizona Department of Environmental Quality	State	X	X
Arizona	Arizona: Maricopa County Environmental Services Department	Local	X	
Arizona	Arizona: Navajo Nation, Arizona, New Mexico & Utah	Tribal	X	
Arkansas	Arkansas Department of Environmental Quality	State	X	X
California	California Air Resources Board	State	X	X
Colorado*	Colorado Department of Public Health and Environment	State	X	X
Delaware	Delaware Department of Natural Resources	State	X	X
Dist. Of Columbia	District of Columbia Department of Health	State	X	
Florida	Florida Department of Environmental Protection	State	X	X
Georgia	Georgia Department of Natural Resources	State	X	
Hawaii	Hawaii Department of Health, Clean Air Branch	State	X	
Idaho	Idaho Department of Environmental Quality	State	X	X
Illinois	Illinois Environmental Protection Agency	State	X	X
Indiana	Indiana Department of Environmental Management	State	X	X
Iowa	Iowa Department of Natural Resources	State	X	X
Kansas	Kansas Department of Health and Environment	State	X	X
Kansas	Kansas: Sac & Fox Nation of Missouri in Kansas and Nebraska	Tribal	X	
Kentucky	Kentucky Division of Air Quality	State	X	X
Kentucky	Air Pollution Control of Jefferson County	Local	X	X
Louisiana	Louisiana Department of Environmental Quality	State	X	X
Maine	Maine Department of Environmental Protection	State	X	X
Maryland	Maryland Department of Environment	State	X	X
Massachusetts	Massachusetts Department of Environmental Protection	State	X	X
Michigan	Michigan Department of Environmental Quality	State	X	X
Minnesota	Minnesota Pollution Control Agency	State	X	X
Mississippi	Mississippi Department of Environmental Quality	State	X	X
Missouri	Missouri Department of Natural Resources	State	X	X
Montana	Montana Department of Environmental Quality	State	X	
Montana	Montana: Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation	Tribal	X	X
Nebraska	Nebraska Department of Environmental Quality	State	X	X
Nebraska	Nebraska: Winnebago Tribe	Tribal	X	X
Nebraska	Lincoln-Lancaster County Health Department	Local	X	X
Nebraska	City of Omaha Public Works Department	Local	X	X
Nevada	Nevada Bureau of Air Quality	State	X	
Nevada	Clark County Department of Air Quality and Management	Local	X	
Nevada	Washoe County Air Quality Management Division	Local	X	
New Hampshire	New Hampshire Department of Environmental Services	State	X	X
New Jersey	New Jersey Department of Environmental Protection	State	X	
New Mexico	City of Albuquerque	Local	X	X
New York	New York Department of Environmental Conservation	State	X	X
North Carolina	North Carolina Division of Air Quality	State	X	X
North Carolina	Western North Carolina Regional Air Quality Agency – Buncombe County	Local	X	X
North Carolina	Forsyth County Environmental Affairs Department	Local	X	X
North Carolina	Mecklenburg County Air Quality	Local	X	X
Ohio	Ohio Environmental Protection Agency	State	X	X
Oklahoma	Oklahoma Department of Environmental Quality	State	X	X

Table 2. State, Local, and Tribal Agency submittals (Cont.).

State	Submitting Agency	Type	CAP	HAP
Oregon	Oregon Department of Environmental Quality	State	X	
Oregon	Lane Regional Air Pollution Authority	Local	X	
Pennsylvania	Pennsylvania Department of Environmental Protection	State	X	X
Pennsylvania	Allegheny County Health Department	Local	X	X
Pennsylvania	City of Philadelphia	Local	X	X
Puerto Rico	Puerto Rico Environmental Quality Board	Territory	X	
Rhode Island	Rhode Island Department of Environmental Management	State	X	
South Carolina	South Carolina Department of Health and Environmental Control	State	X	X
South Dakota	South Dakota Department of Environment and Natural Resources	State	X	
Tennessee	Tennessee Department of Environment and Conservation	State	X	X
Tennessee	Chattanooga Hamilton County Air Pollution Control Bureau	Local	X	X
Tennessee	Memphis and Shelby County Health Department	Local	X	X
Tennessee	Metro Public Health Dept. Nashville/Davidson County	Local	X	X
Texas	Texas Commission on Environmental Quality	State	X	X
Utah	Utah Division Of Air Quality	State	X	X
Vermont	Vermont Department of Environmental Quality	State	X	
Virginia	Virginia Department of Environmental Quality	State	X	X
Washington	Washington State Department of Ecology	State	X	X
Washington	Olympic Region Clean Air Agency	Local	X	X
Washington	Puget Sound Clean Air Agency	Local	X	X
West Virginia	West Virginia Division of Air Quality	State	X	X
Wisconsin	Wisconsin Department of Natural Resources	State	X	X
		TOTALS	71	53

* New state data set

Table 2. RTR phases and groups for source category review.

Phase I	
Coke Ovens	Halogenated Solvents
Dry Cleaning	Hazardous Organic NESHAP (HON)
Ethylene Oxide Sterilizers	Industrial Cooling Towers
Gasoline Distribution	Magnetic Tape
Phase II	
Group 1	
Polymers/Resins I-Polysulfide Rubber	Polymers/Resins II-Epoxy Resins
Polymers/Resins I-Ethylene-Propylene Rubber	Polymers/Resins II-Non-nylon Polyamides
Polymers/Resins I-Butyl Rubber	GMACT- Hydrogen Fluoride
Polymers/Resins I-Neoprene	GMACT- Acetal Resins
Group 2A	
Marine Vessel Loading	Polymers/Resins I-Hypalon Production
Mineral Wool	Polymers/Resins I-Nitrile Butadiene Production
Petroleum Refineries	Polymers/Resins I-Polybutadiene Rubber
Pharmaceuticals	Polymers/Resins I-Styrene-Butadiene Rubber/Latex
Polymers/Resins I-Epichlorohydrine Elastomers	Printing and Publishing
Group 2B	
Aerospace	Oil & Natural Gas
Natural Gas Transmission	
Group 2C	
Polymers/Resins IV-Acrylonitrile-Butadiene-Styrene	Polymers/Resins IV-Polystyrene
Polymers/Resins IV-Methyl Methacrylate-Butadiene-Styrene	Polymers/Resins IV-V-Styrene-Acrylonitrile
Polymers/Resins IV-Methyl Methacrylate-Acrylonitrile-Butadiene-Styrene Resins	Primary Aluminum
Polymers/Resins IV-Nitrile Resins	Ship Building
Polymers/Resins IV-Polyethylene Terephthalate	
Group 3	
Acrylic and Modacrylic Fibers	Polymers/Resins III-Amino/Phenolic Resins Production*
Chrome Electroplating (3 subcategories)	Primary Lead Smelting
Ferroalloys Production	POTWs
Flexible Polyurethane Foam	Pulp and Paper Production
Offsite Waste and Recovery	Secondary Aluminum Production
Pesticide Active Ingredient Production*	Secondary Lead Smelting
Phosphoric Acid/Phosphoric Fertilizer Production	Steel Pickling-HCl Process
Polycarbonates Production	Wood Furniture
Polyether Polyols Production	Wool Fiberglass

***** New category

Table 3. Data comparison of selected parameters.

Parameter	2005 NEI	2002 NEI
Annual emission records	4.4 million	3.5 million
# Unique Facilities	>101,600	>85,000
# Tribal Areas	23	15
# U.S. Counties	3,108	3,027
# Gulf of Mexico OCS Areas	1,079	0
Total CO emissions (tpy)	3,987,864	3,833,574
Total NH_3 emissions (tpy)	181,502	184,884
Total NO_x emissions (tpy)	6,168,911	7,080,750
Total PM_{10} PRI emissions (tpy)	1,306,002	1,233,399
Total $PM_{2.5}$ PRI emissions (tpy)	953,775	883,449
Total SO_2 emission (tpy)	12,502,152	12,637,803
Total VOC emissions (tpy)	1,490,170	1,472,238
Total HAP emissions (tpy)	886,473	910,620