Adding Particulate Matter to EPA's eGRID Database

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Abstract

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The U.S. Environmental Protection Agency's Emissions and Generation Resource Integrated Database (eGRID) is the preeminent source of information on emissions of greenhouse gases and criteria pollutants from the electric power sector. eGRID contains information on emissions and electricity generation for all electric generating units in the United States, and it is used widely to estimate the emissions associated with electricity use. The database currently includes emissions of carbon dioxide, methane, nitrous oxide, nitrogen oxides, and sulfur dioxide. In the next version of eGRID, U.S. EPA will also include emissions of fine particulate matter (PM$_{2.5}$), an important criteria pollutant with significant negative health impacts, by developing a linkage between eGRID and EPA's National Emissions Inventory. The addition of PM$_{2.5}$ will allow users of eGRID to more completely understand the air pollution implications of electricity use in the United States. This presentation provides an overview of the eGRID database, the methods used to add PM$_{2.5}$ to eGRID and the potential uses of the new PM$_{2.5}$ emissions data.
eGRID Overview

• EPA’s Emissions and Generation Resource Integrated Database (eGRID)

• Contains electricity generation and emissions data for all power plants in the United States

• The preeminent source of data for carbon-footprinting Scope 2 emissions
eGRID Overview

- eGRID provides data at multiple levels:
  - Unit
  - Plant
  - State
  - Balancing Authority
  - eGRID Subregion
  - NERC Region
  - US
eGRID Overview

• eGRID provides data on:
  – Net generation
  – Nameplate capacity
  – Fuel consumption
  – Emissions and emissions rates for:
    • CO₂, NOₓ, SO₂, CH₄, N₂O, and CO₂e
  – It currently does not include fine particulate matter (PM₂.₅)
PM$_{2.5}$ Overview

• PM$_{2.5}$ results in significant negative health impacts

• Causal link between PM$_{2.5}$ and premature mortality, respiratory effects, and cardiovascular effects

• Potentially linked to 55,000 deaths per year in the United States
PM$_{2.5}$ Emissions from Power Generation

Power Sector Generation and Emissions of Select Criteria Air Pollutants and Mercury in 2011

($\sim$180,000 tons PM$_{2.5}$)
Adding PM$_{2.5}$ to eGRID

- eGRID uses data reported to EPA from Continuous Emissions Monitors (CEMS) pursuant to 40 CFR Part 75
- Electric Generating Units (EGUs) generally do not report PM$_{2.5}$ emissions from CEMS
- Used PM$_{2.5}$ data from EPA’s National Emissions Inventory
Adding PM$_{2.5}$ to eGRID

• 4-step process for adding PM$_{2.5}$ emissions to eGRID (13,231 units in total)
  1. Direct unit-level match between eGRID and NEI (4,040 units)
  2. Average emissions factors by fuel type, unit firing type, and prime mover (570 units)
  3. Average emissions factors by fuel type and prime mover (2,922 units)
  4. Emissions factors from EPA’s AP-42 (5,699 units)
Results

PM$_{2.5}$ emissions rates (lbs./MWh) by eGRID Subregion
Results

Number of Units

- Matched to NEI: 34%
- AP-42 EF: 48%
- NEI avg. EF - PM and fuel type: 13%
- NEI avg. EF - PM, fuel, and firing type: 5%

PM$_{2.5}$ Emissions

- Matched to NEI: 84%
- AP-42 EF: 8%
- NEI avg. EF - PM and fuel type: 5%
- NEI avg. EF - PM, fuel, and firing type: 3%
Conclusions

• eGRID2018, scheduled for release later this year, is being updated to include PM$_{2.5}$ emissions
• PM$_{2.5}$ emissions are a significant source of health impacts and premature death in the United States.
• Understanding PM$_{2.5}$ emissions rates for electricity generating units will provide for a better understanding of how a change in electricity generation impacts emissions and ultimately ambient air quality and human health effects
• White paper detailing the methodology of adding PM$_{2.5}$ emissions to eGRID will be released later this year
• eGRID website is also being updated and will include interactive data exploration and visualization