EPRI | ELECTRIC POWER RESEARCH INSTITUTE

EPRI 2014 Emission Factors

What are EPRI's Emission Factors and what are they used for?

Emission factors are estimates of trace substances (hazardous air pollutants [HAPs] and other regulated chemicals) released from industrial sources to the atmosphere. EPRI's emission factors can be used to estimate annual emissions of trace substances from coal-, oil-, and petroleum coke-fueled power plants for Toxics Release Inventory (TRI) reporting, air permitting, facility design, and other purposes. Emission factors are developed by pooling results of many measurements at similar facilities, thus they generally provide better estimates of annual emissions than stack tests, which typically measure emissions over only a few hours of operating time and are only valid for the fuel burned during the test.

Why has EPRI published new Emission Factors?

EPRI's emission factors were first published in 1995, and updated in 2002 with results of mercury tests performed in response to the U.S. Environmental Protection Agency's (USEPA's) 1999 Clean Air Mercury Rule Information Collection Request (ICR). Since 2002, hundreds of additional emission tests have been performed at fossil fuel-fired power plants, more than doubling the number of available measurements for some chemicals. EPRI's 2014 emission factors merge the 2002 data with HAPs measurements made in response to the USEPA's 2010 ICR for the Mercury and Air Toxics Standards (MATS) rulemaking, as well as from other recent stack tests performed by power companies.

Pooling the older and more recent measurements created a much larger database than was available in 2002, particularly for power plants equipped with more modern, efficient pollution controls. The larger number of measurements allowed EPRI to develop more robust and accurate emissions factors for most types of power plants.

How were EPRI's Emission Factors developed?

The approach used to develop the 2014 emission factors was tailored to the chemical characteristics of the trace substances.

- Coal burned in power plant boilers produces fly ash particles, most of which are removed by particulate control devices before the combustion gases leave the stack. Some metals such as arsenic tend to attach to fly ash particles: emission factors for those metals are expressed as a mathematical relationship between the metal content of the coal, the ash content of the coal after it is burned, and how much particulate escapes into the atmosphere.
- For mercury and selenium, two metals that do not attach strongly to fly ash because they occur in combustion gas partially as a vapor, several different approaches were used, depending on the coal type and the presence of various pollution controls. For example, mercury emissions from coal units equipped with wet flue gas desulfurization scrubbers are lower when the coal contains a higher amount of the element chlorine.

A mathematical equation was used to relate coal chlorine to mercury removal. Another example: selenium removal in a scrubber increases and decreases along with the sulfur content of the coal; an equation was developed to reflect this pattern. For each substance and pollution control type, EPRI selected the best approach for predicting emissions from untested power plants.

- Emissions factors for hydrochloric acid and hydrofluoric acid from coal-fired units were obtained by averaging the removal efficiencies for specific types of pollution control equipment and for different coal types.
- Emissions of trace substances from fuel oil, petroleum coke, and natural gas-fired units, as well as emissions of organic trace substances from all fuel types, are expressed as pounds of chemical per million British Thermal Units (BTU) of fuel burned in the facility.

To develop the 2014 emission factors, EPRI reviewed the procedures used to collect the flue gas samples and to analyze the samples for trace substances. Some measurements were found to have poor quality due to incorrect procedures or calculation errors; those were left out of EPRI's calculations. Emission factors were not developed for chemicals that were never detected or for those that were found in a very small percentage of measurements. Most emission tests at individual power plant stacks consist of a series of three measurements (test runs) of each substance. EPRI averaged those three test runs to obtain a single emission value for each power plant stack. The averages for all similar power plants were combined in the emission factor calculations.

Many organic chemicals and a few metals are found in flue gas at such low levels that most samples were below the lowest concentration that the test method can measure (the detection limit). EPRI used a statistical approach, the Kaplan-Meier (K-M) procedure, to calculate an emission factor that accounts for those "nondetects." The K-M procedure produced more accurate estimates than the approach EPRI used for its previous emission factors, which involved substituting a single value (half of the detection limit) for each value that could not be measured.

What impact will the 2014 Emission Factors have on power plant emissions estimates?

Companies using EPRI's 2002 emission factors to estimate trace substance releases from coal- and oil-fired power plants may see changes in their annual Toxic Release Inventory reports when they switch to the 2014 emission factors. For some substances, the new factors will produce higher release estimates; while for other substances, lower releases will be estimated. This does not mean that the power plant is actually producing more or less of the substance; however, the factor used to estimate the amount released to the air has changed.

How can I obtain more information on the 2014 EPRI Emission Factors?

A copy of the 2014 Emissions Factor Handbook (EPRI Report No. 3002003848) can be purchased from EPRI's website, www.epri.com. This report provides detailed explanations of the methods used to calculate emission factors, as well as quality rankings for each emission factor.

Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

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