



Project Summary

Baseline Emissions Forecasts for Industrial Non-Boiler Sources

Tim Hogan

The Process Model Projection Technique (PROMPT), one of a number of National Acid Precipitation Assessment Program emission forecasting models, projects the emissions of nitrogen oxides and sulfur oxides from industrial sources such as process heaters, wood boilers, furnaces, dryers, kilns, engines, and turbines through the year 2030. PROMPT excludes emissions from the combustion of natural gas, distillate or residual fuel oil, or coal in industrial boilers.

This document presents regional air emission forecasts from three PROMPT runs. These estimates are intended to illustrate a range of possible future emissions.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

This report presents outputs from the Process Model Projection Technique (PROMPT), developed for EPA in cooperation with the National Acid Precipitation Assessment Program (NAPAP). By design it is a simple, low-cost model which will provide an initial assessment of the role and magnitude of industrial process emissions in the control of acid deposition sulfur oxides/nitrogen oxides (SO_x/NO_x) precursors.

PROMPT projects the emissions of NO_x and SO_x from industrial sources such as process heaters (including reactors, furnaces, dryers, and kilns), wood boilers, engines and turbines. Projections of emissions for industrial boilers are developed through the companion Industrial Combustion Emissions (ICE) Model.

This report contains baseline uncontrolled NO_x and SO_x emissions forecasts based on projections of industrial production growth rates and energy prices from the three August 1985 NAPAP test energy/economic scenarios. The PROMPT input assumptions and projections do not necessarily reflect EPA, DOE, or Interagency Task Force on Acid Precipitation policies or forecasts. The PROMPT air pollution emission estimates for industrial non-boilers are intended to illustrate a range of possible future uncontrolled emissions under specific energy/economic scenarios.

Objectives and Approach

PROMPT has been developed to forecast NO_x and SO_x emissions from industrial process sources and to provide a framework for evaluating the role and magnitude of these emissions sources in the control of acid deposition SO_x/NO_x precursors.

The primary objectives of the PROMPT are to:

- Forecast baseline uncontrolled NO_x and SO_x emissions estimates, and
- Compute emission reductions and control costs to meet a user-specified NO_x or SO_x air pollution control strategy

The baseline NO_x and SO_x emissions estimates are based on industrial non-boiler fuel demand projections generated by the Industrial Sector Technology Use Model (ISTUM). ISTUM is a process engineering model of industrial sector energy use that allows for technology competition at a detailed process level. The model provides a forecast of the mix of fuels used by the industrial sector on a regional basis.

The ISTUM non-boiler energy demand projections (and resulting PROMPT baseline air pollution emissions forecasts) were developed using energy/economic scenarios from NAPAP's August 1985 test "reference," "low," and "high" cases. The three sets of energy/economic driver data, developed by Argonne National Laboratory, provide regional forecasts of industrial production growth rates and fuel prices to run ISTUM.

Before the non-boiler energy forecasts are entered in PROMPT, they are aggregated into large categories of fuel use called emission source groups. The number of emissions source groups has been kept small to simplify the model framework for forecasting emissions and control costs. Two aggregations of non-boiler fuel demand are contained in PROMPT. Emission source groups exist separately for NO_x emissions versus sources of SO_x emissions, based on the similarity of emissions among various energy uses.

For each emission source group, NO_x or SO_x emission factors are applied to the projected fuel demand. The emission factors generally vary by fuel type except for emission source groups that emit significant amounts of process-related rather than fuel-related emissions. SO_x emissions for two source groups, smelters and sulfuric acid/sulfur recovery plants, are not fuel-related and thus are not derived from energy demand data. Their emissions are an exogenous input to the model.

A set of air pollution emission control strategies is available to evaluate the potential SO_x or NO_x emissions reductions for industrial non-boilers and the resulting aggregate costs of pollution control. PROMPT computes the potential emission reductions within each emission source group for the control strategy selected and the stringency specified by the user.

NO_x or SO_x emissions, plus control costs, are output at the Federal region level by emission source group. Aggregate emissions and cost projections are also provided by State. The emission and cost outputs are generated at 5-year intervals for 1980-2000, and every 10 years for 2000 through 2030.

User Options

The model allows the user to vary the inputs for the:

- Non-boiler energy demand projections, and
- NO_x or SO_x emissions control strategy.

PROMPT presently contains the three alternative energy demand forecasts based on ISTUM runs using the three August 1985 NAPAP test energy/economic scenarios. The user must select one of these cases to initiate a PROMPT run.

An air pollution control strategy can be selected for either NO_x or SO_x emissions to assess alternative methods of acid deposition reduction. The following strategies can be used:

- 1) *Uniform percent reduction:* Emissions of each source group are reduced by the same percentage.
- 2) *Emissions limits:* The emissions of each source group are limited, not to exceed a specified emission rate.
- 3) *Cost-effectiveness limit:* The cost of control is limited, not to exceed specified ratio.
- 4) *Aggregate percent or amount reduction:* Total emissions are reduced by a specified percentage or amount.

This report contains only baseline uncontrolled emissions projections for the three NAPAP test cases; it does not present results for potential emission control strategies.

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The complete report, entitled "Baseline Emissions Forecasts for Industrial Non-Boiler Sources," (Order No. PB 89-118 723/AS; Cost: \$21.95, subject to change) will be available only from:

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Springfield, VA 22161

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The EPA Project Officer can be contacted at:

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