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Project Summary

Multiple Projections System (MPS) Version 2.0: User's Manual

Charles C. Monroe, T. Allan Dean, and William R. Barnard

The Clean Air Act Amendments of 1990 called for Reasonable Further Progress (RFP) inventories to be submitted to EPA for the purpose of demonstrating strategies by which a 15% reduction in volatile organic compound (VOC) emissions will be achieved over the years 1990 to 1996. This requirement applies to moderate, serious, severe, and extreme ozone nonattainment areas. In addition, serious, severe, and extreme areas must demonstrate at least a 3% annual average reduction beginning in 1996 and continuing thereafter until attainment is reached. In order to meet Section 182(b)(1) and 182(c)(2) requirements, state/local air agencies require a computer system capable of performing "what if scenario analysis" and reporting the final results (i.e., their RFP inventory) to EPA (i.e., Aerometric Information Retrieval System, AIRS). This system is based on the 3% RFP Tracking System that was developed in FY92/FY93. The 3% RFP Tracking System is a Windows* application, and enhancements to convert the 3% RFP Tracking System to a Multiple Projections System (MPS) have continued to be within the framework of a Windows application. The system will support RFP inventories for ozone and carbon monoxide (CO) and thus will contain VOC, nitrogen oxide (NO_x), and CO data. The most significant change from the original 3% RFP Tracking System and MPS is the ability to submit a "final" projection emissions inventory in the format required by the AIRS Facility Subsystem and the AIRS Area and Mobile Source Subsystem.

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).

Purpose

The Multiple Projections System (MPS) is designed to facilitate the projection of future emissions of ozone precursors, specifically carbon monoxide (CO), volatile organic compounds (VOCs), and oxides of nitrogen (NO_x), in any given geographic area. The MPS gives state/local air agencies a computer system capable of performing "what if scenario analysis" and reporting the final results (i.e., their Reasonable Further Progress inventory) to EPA [(i.e., Aerometric Information Retrieval System (AIRS) Facility Subsystem (FS) and Area and Mobile Source Subsystem (AMS)].

System Requirements

The prototype MPS was developed using Superbase 4, a Microsoft Windows data base package that can be compiled and distributed as a stand-alone product. As a Windows product, it requires Windows in order to run. The MPS user is referred to the Microsoft Windows manual for information on general Windows operating procedures. Additionally, a computer with a 386SX or better microprocessor is

* Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

suggested as the platform on which to run the prototype. Because the system was developed using a Windows-based product, it has been configured to run entirely using a mouse to point and click on various buttons to perform commands or functions. However, all functions can also be accessed via the keyboard. A hard disk drive is required to store all input and output data files. Disk space required depends on the number and size of geographic areas to be studied.

An advantage of developing the system using a Windows-based product is that certain tasks can be performed in the "background," since Windows can perform multitasking operations when running on a 386SX or better platform. Thus, when the system is performing disk intensive or processor intensive tasks (such as file imports or emission projection calculations), the program can be minimized to an icon, and the user can work on documents in a word processor or on a spreadsheet until the task is complete. The system is designed to beep when these tasks are complete, and the icon's title will reflect that the task is complete. At that point, the user can return to the program and continue the analysis.

The system can project emissions out to the year 2010 in 1-year intervals. In addition to projecting emissions, the system can make projections in the form of percent reduction relative to base year emissions. The system is designed to accept input data from either the AIRS FS or AMS. Output from the system is in the form of tables or graphs, which can be directed to the computer screen or a printer. Tabular results can also be output to an ASCII file, allowing the user to subsequently import the reported information into other software for further analysis (either numeric or graphic). Data contained in the output file can also be exported to Lotus 123, dBaseIII, or Excel. As indicated above, the principal output types are batch transactions in AIRS FS and AMS format.

Overview

As was stated earlier, the purpose of the MPS is to facilitate the projection of future emissions of CO, VOCs, and NO_x. To this end, the interactive mode of the MPS was created with the following basic capabilities:

- import emissions data for 1990 and control efficiency (CE), rule effectiveness (RE), rule penetration (RP), and growth factor data for 1990 and later years;
- import 1990 activity level data, projected growth factors, and projected emission factor data for on-road mobile sources;
- allow for an alternate base year;
- accept user-specified criteria for selecting imported records;
- allow editing of imported CE, RE, RP, and growth factor data prior to projection of future emissions;
- project future emissions for the selected records based on these data;
- export projected emissions data as dBaseIII, Lotus, and Excel files;
- generate tabular reports of projected emissions out to the year 2010;
- generate graphs depicting projected emissions out to the year 2010; and
- generate batch transaction files of projected emissions data for import into FS or AMS.

Necessary input from the user to the MPS may be apparent from this list. The user must provide files containing the 1990 emissions data and the CE, RE, RP, and growth factor data for future years. The projected growth factor file is generated by the Economic Growth Analysis System (E-GAS).

E-GAS is a menu-driven software system, developed by EPA, that can produce growth factors for the extreme, severe, serious, and multi-state moderate ozone nonattainment areas that must, under the Clean Air Act Amendments of 1990 (CAAAs), use photochemical grid modeling to demonstrate future attainment with the ozone national ambient air quality standard [Section 182(e)(2)(A)]. Since growth in source emissions largely depends on the amount of economic activity growth in an area, a consistent and reliable set of growth factors requires forecasts using consistent Gross National Product forecasts and a consistent methodology for estimating economic activity in Urban Airshed Model and Regional Oxidant Model modeling regions. This consistency and reliability in forecasts and methodologies is important for two reasons: 1) the interactive nature of forecasting future emissions levels and the effects of regulations and corresponding emission control strategies and 2) state/local air agencies will be developing control strategies, in part, based on anticipated growth in these nonattainment areas in order to meet the mandated CAAA reductions.

The 1990 emissions data files are retrieved from the appropriate AIRS subsystem. The projected emission factor data must be compiled by the user. The remainder of the user's input is supplied via the screen buttons and mouse or keyboard. After the data have been imported, the user is then presented with a series of screens, each of which allows the user to select a value for a single parameter (e.g., pollutant). The MPS uses these parameters (which also include geographic area and projection year) as criteria for selecting the imported records for which projections are to be made. Then the user may edit the imported CE, RE, RP, and growth factor data; at this point the MPS can project the future emissions. Equations 1 and 2 are used to forecast projected area sources (adjusted base year inventory).

$$UE = DCONE + [1-(CE * RE * RP)] \quad (1)$$

where:

UE	=	Daily Uncontrolled Emissions
DCONE	=	Daily Controlled Emissions
CE	=	Adjusted Base Year Control Efficiency
RE	=	Adjusted Base Year Rule Effectiveness
RP	=	Adjusted Base Year Rule Penetration (not applicable to point sources)

$$PCONE = UE * [1-(PCE * PRE * PRP)] * GF \quad (2)$$

where:

PCONE	=	Projected Year Actual Emissions
PCE	=	Projected Year Control Efficiency
PRE	=	Projected Year Rule Effectiveness
PRP	=	Projected Year Rule Penetration (not applicable to point sources)
GF	=	Growth Factor

Equation 3 is used to forecast projected emissions for on-road and nonroad mobile sources:

FPE =
BVMT (or BNRAR) * EF * CF * GF (3)

where:

FPE	=	EPA Forecasted Projected Emissions
BVMT	=	Base Vehicle Miles Traveled by Vehicle Class by Calendar Year
EF	=	Emission Factor (output of Mobile Model)
CF	=	Conversion Factor (grams to pounds or tons)
GF	=	Growth Factor Calculated by E-GAS
BNRAR	=	Base Nonroad Activity Rate

These projected data, which are stored in a Superbase file, can be exported as a Lotus, dBase, or Excel file. Using screen buttons, the user can generate several types of reports, graphs, and files based on the data in the Superbase file.

Charles C. Monroe, T. Allan Dean, and William R. Barnard are with E. H. Pechan and Associates, Inc., Durham, NC 27707.
***E. Sue Kimbrough** is the EPA Project Officer (see below).*
The complete report, entitled "Multiple Projections System (MPS) Version 2.0: User's Manual," includes diskettes (Order No. PB95-503223; Cost: $90.00; subject to change) will be available only from:
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650
The EPA Project Officer can be contacted at:
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U.S. Environmental Protection Agency
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