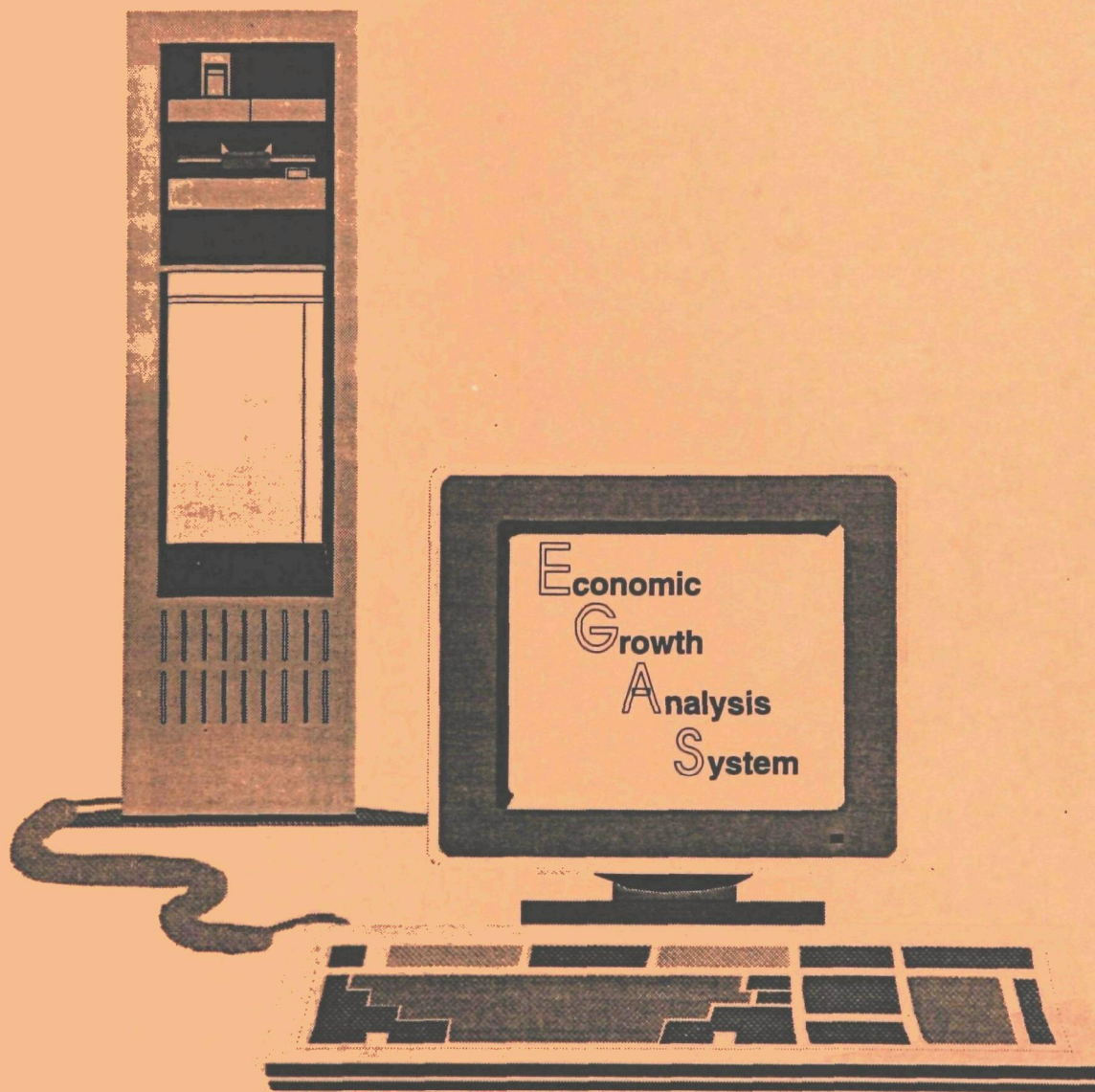


# EPA Economic Growth Analysis System: User's Guide



**J**oint **E**missions **I**nventory **O**versight **G**roup

Prepared for Office of Air Quality Planning and Standards

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**ECONOMIC GROWTH ANALYSIS SYSTEM:**

**User's Guide**

**FINAL REPORT**

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## **ABSTRACT**

This guide is intended to function as a manual for the Economic Growth Analysis System (E-GAS), which was developed under four work assignments under EPA Contract No. 68-D9-0173. The objective of this report was to describe the development of a prototype E-GAS modeling system. The E-GAS model will be used to project emissions inventories of volatile organic compounds, oxides of nitrogen, and carbon monoxide for ozone nonattainment areas and Regional Oxidation Model (ROM) modeling regions.

This guide describes in detail the workings of the E-GAS computer modeling software, and its relationships with internal modeling software components, like Regional Economic Models, Inc. (REMI) models, and external software, like ROM, the Aerometric Information Retrieval System (AIRS), and the Urban Airshed Model (UAM). The guide describes all inputs and outputs from the software, and includes a description of all variables used by the E-GAS system.

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## **LIST OF ACRONYMS**

<b>AIRS</b>	<b>Aerometric Information Retrieval System</b>
<b>BLS</b>	<b>Bureau of Labor Statistics</b>
<b>CAAA</b>	<b>Clean Air Act Amendments of 1990</b>
<b>CPI</b>	<b>Consumer Price Index</b>
<b>CSEMS</b>	<b>Commercial Sector Energy Model by State</b>
<b>DOS</b>	<b>Disk Operating System</b>
<b>DRI</b>	<b>Data Resources, Inc.</b>
<b>E-GAS</b>	<b>Economic Growth Analysis System</b>
<b>EPA</b>	<b>Environmental Protection Agency</b>
<b>EPV</b>	<b>Employees Per Dollar Added</b>
<b>FIPS</b>	<b>Federal Information Processing Standards</b>
<b>GNP</b>	<b>Gross National Product</b>
<b>GRP</b>	<b>Gross Regional Product</b>
<b>HH</b>	<b>Household</b>
<b>HOMES</b>	<b>Household Model of Energy by State</b>
<b>INRAD</b>	<b>Industrial Regional Activity and Energy Demand Model</b>
<b>NAAQS</b>	<b>National Ambient Air Quality Standards</b>
<b>RAM</b>	<b>Random Access Memory (main memory)</b>
<b>REO</b>	<b>Regional Economic Opportunity</b>
<b>RFP</b>	<b>Reasonable Further Progress</b>
<b>ROM</b>	<b>Regional Oxidation Model</b>
<b>RPC</b>	<b>Regional Price Coefficient</b>
<b>RSQE</b>	<b>Research Seminar in Quantitative Economics</b>
<b>RWM</b>	<b>Relative Wage Mix</b>
<b>RWR</b>	<b>Relative Wage Rate</b>
<b>SCC</b>	<b>Source Classification Code</b>
<b>SIC</b>	<b>Standard Industrial Classification</b>
<b>UAM</b>	<b>Urban Airshed Model</b>
<b>WEFA</b>	<b>Wharton Econometric Forecast</b>
<b>VGA</b>	<b>Video Graphics Adapter</b>
<b>VMT</b>	<b>Vehicle Miles Travelled</b>



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## **CHAPTER 1**

### **INTRODUCTION**

The Clean Air Act Amendments (CAAA) of 1990 were signed into law on November 15, 1990. The CAAA require that extreme, severe, serious, and multi-state moderate ozone non-attainment areas use photochemical grid modelling to demonstrate future attainment with the ozone national ambient air quality standard (NAAQS) [Section 182(e)(2)(A)]. In addition to photochemical grid modelling, the CAAA require that moderate, serious, severe, and extreme ozone nonattainment areas submit reasonable further progress (RFP) inventories demonstrating a 15 percent reduction in emissions from 1990 to 1996 [Section 182(b)(1)(A)]. Further, RFP inventories for serious, severe, and extreme areas must include demonstration of a three percent reduction (averaged over three years) from 1996 until attainment is achieved [Section 182(c)(2)(B)].

Section 182(b)(1)(A) of the CAAA specifies that the 15 percent redirection from baseline emissions accounts for any growth in emissions after 1990. A key component of the RFP inventories and photochemical grid modelling demonstrations will be the development of credible growth factors for the existing inventories.

Since growth in source emissions largely depends on the amount of economic activity growth in an area, a consistent set of growth factors requires forecasts using consistent Gross National Product (GNP) forecasts and a consistent methodology for estimating economic activity in Urban Airshed Model (UAM) and Regional Oxidant Model (ROM) modelling regions. The need for consistent economic growth factors, however, must be satisfied in a way that allows States to use their own estimates of national and regional economic activity. The Economic Growth Analysis System (E-GAS) is an economic and activity forecast model which satisfies both of these standards.

The existing inventories for RFP demonstration and photochemical modelling will be housed in the Aerometric Information Retrieval System (AIRS). E-GAS can be applied to AIRS inventories for the development of emission projections to 2010, when extreme areas must reach attainment. State users can create custom regional forecasts by modifying input assumptions for the regional models in the E-GAS system.

The E-GAS modelling system contains three tiers. The first tier includes available national economic forecasts which are used to drive the regional economic models. The second tier includes regional economic models for the UAM modelling areas, as well as the States in the ROM modelling regions. The third tier estimates fuel consumption, physical output, and vehicle miles traveled (VMT) based on the second tier's regional economic forecasts. The tiers must be sequentially executed, since data are created by and passed from early tiers for transfer to later tiers. The three-tiered structure of E-GAS allows users flexibility in modelling. Although a tier must be run before proceeding to later tiers, the system allows the models to be rerun at the user's discretion. For example, users may run the national model using either BLS or WEFA forecasts before performing regional modelling on the last national model run.

## 1.1 PURPOSE

The purpose of this User's Manual is to provide a guide through the E-GAS system. Chapter 1 of this document introduces the terminology used with the system as well as the syntax and format of the program and user guide. Chapter 2 discusses the use of E-GAS by explaining the logical progression of the program, presenting sample screens, providing explanations of input formats, and describing the E-GAS utilities found throughout the system. Chapter 3 describes the role of national economic models in E-GAS and the two options available to the user. Chapter 4 explains the general function of E-GAS's policy variables; it then describes the specific variables while explaining their input. Chapter 5 describes the role of model suppressions in E-GAS and describes all suppressions available to the user. Chapter 6 describes the operation of and data required for the E-GAS National Model (Tier 1). Chapter 7 provides similar descriptions of the Regional Model (Tier 2), and Chapter 8 describes the third tier, the Growth Factor Module. Chapter 9 identifies contacts for further information regarding the operation of E-GAS and the logic of the system.

## 1.2 BEFORE USING THE SYSTEM

The program has been designed for an IBM-compatible personal computer environment. The system requires the following *minimum* hardware configurations:

- IBM 80386 or 100 percent compatible personal computer
- Math coprocessor
- 640 Kilobytes Conventional Memory
- 100 Megabytes of available fixed disk storage
- VGA graphics capabilities
- DOS 5.0 or higher
- 5¼ or 3½ inch floppy disk drive

## 1.3 CONCEPTS AND KEYWORDS

Keywords and expressions used in this guide have specific meanings.

**Baseline Forecast:** The default economic activity forecast without any policy variable changes. Model responses can be suppressed in the Baseline Forecast.

**Demand Data:** Demand for products is usually measured in dollars and in many models is considered equal to the level of spending for a type of product. **Final demand** represents the demand for a finished product. Regional consumer and government spending are representative of final demand in an area. In contrast, **industrial demand** for products is typically for subsequent use in producing another product.

**Growth Factor Module:** The third tier of E-GAS. This system translates economic activity data from the first two tiers into Source Classification Code (SCC)-level growth factors.

**Model Response Suppression:** When running the national or regional tiers of E-GAS the user is given the option of suppressing model responses. Such suppressions dissolve links between key elements of the model, thus changing the simulation.

**National REMI Forecast:** An economic activity forecast for the entire United States. The user is given the choice of two forecasts: Bureau of Labor Statistics (BLS) and Wharton Econometrics Forecasting Associates (WEFA).

**Policy Variables:** E-GAS provides policy variables that can be used in scenario testing for a region. Changing policy variables allows the user to simulate the economic impact of anticipated government policy changes, market changes, or other exogenous changes to the regional economy. The effect of a policy change is the difference between a baseline forecast and the simulation forecast with policy variable changes.

**Regional REMI Model:** An economic model for a subset, or region, of the country.

**Relative Costs/Prices:** Some of the policy variables that can be defined in E-GAS are described as relative costs or prices. In these cases, the default cost per unit represents the average cost for the nation and is standardized to a value of one (1). Therefore, only the relative change in cost needs to be entered, rather than the actual local cost. For example, a 10 percent increase in the price of gasoline would indicate a relative gasoline cost of 1.1 and a 10 percent decrease would indicate a 0.9 relative cost.

**REMI Model:** An economic model developed by Regional Economic Models, Inc. (REMI). REMI models are incorporated into E-GAS to forecast economic activity.

**Simulation Forecast:** An economic activity forecast allowing policy variable changes. Model responses can be suppressed in the simulation forecasts. If model responses are suppressed at any point, they should be suppressed throughout the model.

**Tiers:** E-GAS is a series of three related tiers. The tiers must be executed consecutively, but may be run any number of times before proceeding to the next. The tiers are as follows:

- Tier 1: National REMI Model
- Tier 2: Regional REMI Model
- Tier 3: Growth Factor Module

## 1.4 PROGRAM INPUT AND USER GUIDE SYNTAX

E-GAS is a menu-driven system that guides the user through a series of screens which collect information for adapting the model to the user's needs. User input is limited to selecting menu items and setting parameters by entering data in text boxes.

It should be noted that, in both the E-GAS system and this guide, references to specific PC keys are enclosed with < > symbols, that is: the Escape key is identified as <Esc>, the Control key is <Ctrl>, and the function keys use <F1> notation.

Menu screens offer choices regarding progress through E-GAS. Vertical and horizontal movement is brought about with the cursor control keys (Up, Down, Left, and Right arrows). These screens only offer choices of data entry screens or other menu screens. Cursor keys are used to highlight the desired choice. The <Enter> key is then pressed to select the option. Pressing the highlighted letter in the choice can also select the option.

Text boxes provide users the means of answering system questions necessary for model execution. Data can be entered by basic typing, edited with the **<Backspace>** and cursor keys, and accepted with the **<Enter>** key.

## **CHAPTER 2 GETTING STARTED**

### **2.1 INSTALLING E-GAS**

E-GAS can be installed through the following steps:

1. Placing the E-GAS Program Diskette 1 in the appropriate disk drive.
2. Switching to the floppy disk drive containing the E-GAS diskette.  
e.g.: **A:<Enter>**
3. Running the Install Program.  
e.g.: **INSTALL<Enter>**
4. Following instructions printed to the screen by the install program.

The install routine will create an \EGAS directory on the destination (fixed) disk drive. Once installation is complete, the E-GAS system will automatically be started and the title screen will appear.

### **2.2 RUNNING E-GAS**

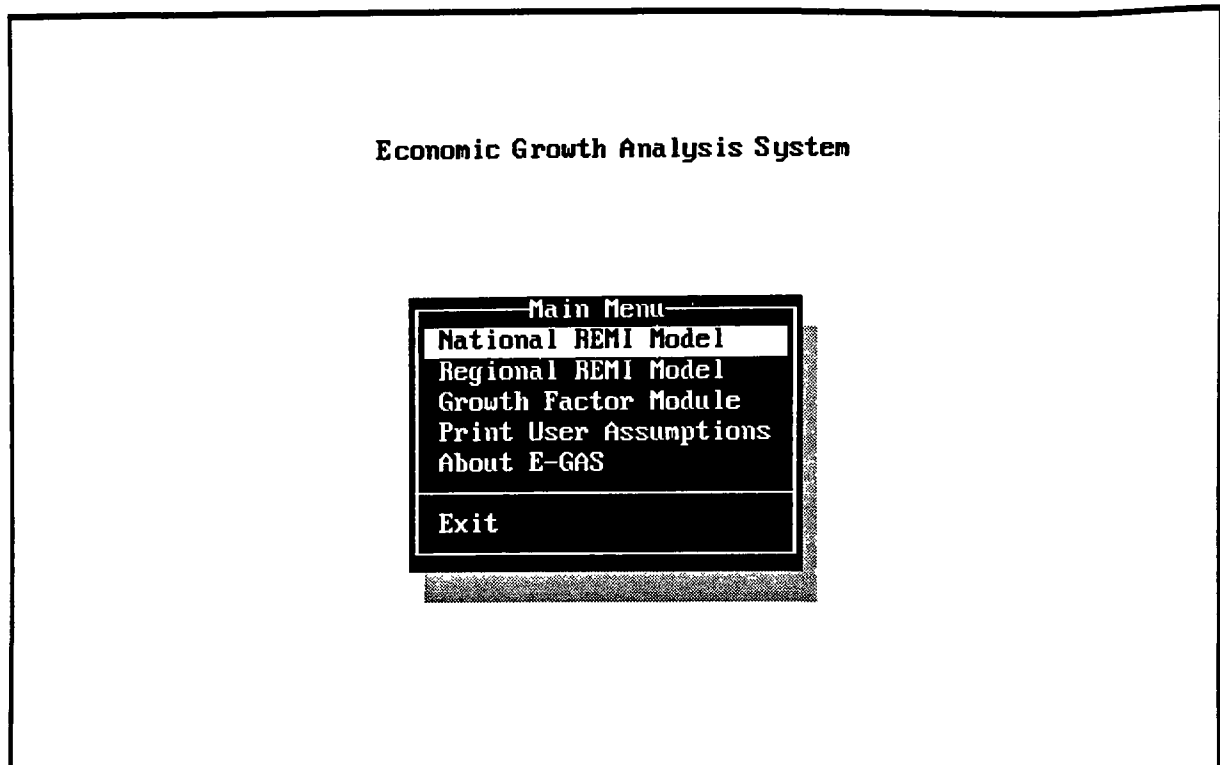
After E-GAS has been installed, the system can easily be run by:

1. Setting the default drive to the fixed disk containing E-GAS.  
e.g.: **C:<Enter>**
2. Setting the default directory to \EGAS by typing:  
**CD \EGAS<Enter>**
3. Typing **EGAS<Enter>** at the DOS prompt.

Upon successful start-up of the system, the title screen is presented, asking the user to press any key to continue.

## 2.3 MAIN MENU

After leaving the title screen, the user arrives at the E-GAS Main Menu.



**Figure 2-1. Main menu.**

The user can advance to the major tiers of E-GAS through the Main Menu. Options can be chosen by pressing the first letter of the option name or by highlighting the choice and pressing the <Enter> key. The Main Menu's options are as follows:

**National REMI Model:** This option allows the user to create a national-level economic forecast and is Tier 1 of the three-part process of creating estimated growth factors; it generates data to drive the Regional REMI Model (Tier 2). This tier may be rerun any number of times before proceeding to Tier 2. Use of the national model is the subject of Chapter 6 of this guide.

**Regional REMI Model:** This choice allows the user to develop a regional economic forecast. This is Tier 2 of the three-part process of creating estimated growth factors which generate data to drive the Growth Factor Module (Tier 3). This tier may be rerun any number of times before proceeding to Tier 3. Use of the regional model is the subject of Chapter 7 of this guide.

**Growth Factor Module:** This is the third tier where growth factors are generated and written to files in the \EGAS subdirectory. Tier 3 is discussed in Chapter 8.

**Print User Assumptions:** This option prints the user assumptions to the systems printer.

**About E-GAS:** This provides a summary of the E-GAS program and its components.

**Exit:** This option returns the user to the operating system after leaving E-GAS.



## 2.4 E-GAS UTILITIES

Several features are available to E-GAS users throughout the three tiers of the system. These features are available to users whenever they are indicated on the information bars. The screen below is from the National Model Tier.

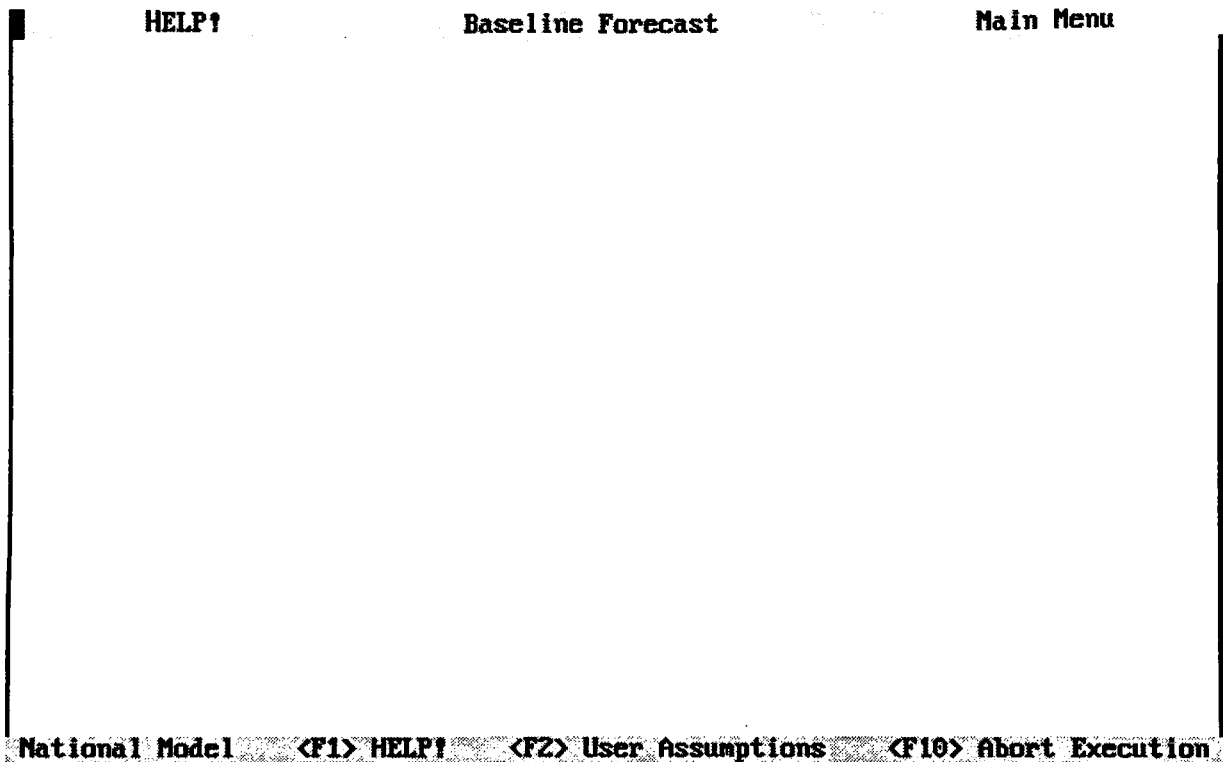


Figure 2-2. E-GAS utilities.

The E-GAS utilities include:

- **Help** screens summarizing system operation
- **User Assumptions** under which the model is currently being run
- **Main Menu** option

### 2.4.1 Help

Pressing <F1> while running E-GAS or <H> from the menu will display help text or a menu of topics associated with the part of E-GAS currently being used. When the system is at the menu, the Help screen is a menu from which the user can highlight the preferred topic and choose it by pressing <Enter>. The <F1> Help provides information about the specific topic and its relation to the current execution point of the system. Help screens include instructions on closing the help function and returning to regular system operation.

### **2.4.2 User Assumptions**

Pressing <F2> while running E-GAS returns information on the user assumptions under which the model is operating. The assumptions—including the chosen national model, changes in policy variables, and model response suppressions—are summarized in full-screen windows. The assumptions are presented for the current tier, if it has previously been run, as well as preceding tiers.

### **2.4.3 Abort Execution**

Pressing <F10> while the system is performing calculations will end the data processing and return the user to the menu bar. This is convenient when the user realizes that the current tier has been misspecified through choice of an inappropriate model, policy variable changes, or model response suppressions. Aborting execution of E-GAS calculations does not undermine data from previous runs of the current tier or data from other tiers.

In the Growth Factor Tier the <F10> option is labelled Main Menu. While this option still aborts execution of the third tier's data processing, it also returns the user to the E-GAS Main Menu.

## **CHAPTER 3**

### **ECONOMIC MODELS IN E-GAS**

E-GAS is designed such that growth factor projection scenarios for each nonattainment area and attainment portion of States can be made using a common assumption about future U.S. economic activity. The national economic forecasts in E-GAS can provide a common forecast with which to forecast regional economic growth. The nature of ozone formation requires attention to be paid to the location as well as the level of economic activity. National forecasts provide estimates of total economic activity. The regional model will distribute this activity among U.S. urban areas, States, and regions. The spatial characteristics of the regional forecasts are designed to meet the needs of the photochemical models used by the ozone nonattainment areas.

A major component of the E-GAS system is the REMI EDFS-14 economic model. The major advantage of the REMI system is its ability to distribute modelled national growth to smaller modelling regions comprising the United States. The REMI model also contains a national economic growth model, which creates national growth projections for distribution by the regional model. The REMI national model can create forecasts from its own data or other compatible national forecasts. E-GAS allows the user to specify national macroeconomic forecasts to produce the outputs necessary to run the regional model.

In the REMI regional models, growth is affected by a number of factors, including the performance of the national economy and the relative costs of doing business in the modeled region. The relative costs of doing business are determined endogenously, although the user may simulate policies which would affect the relative costs in a region. The growth or decline of the national economy, however, is determined outside of the regional model.<sup>1</sup> The choice of national forecast is left solely to the user. This choice can have a large impact on the estimates of growth in the region being modeled.

#### **3.1 THE BLS / REMI U.S. FORECAST**

The REMI U.S. forecast is based on the BLS Trend-2000 forecast. The BLS forecast provides "fundamental information" for use in the REMI national and regional models. The methodology for projecting U.S. final demand by industry relies on the creation of technical coefficient matrices for each historical and forecasted year. This methodology involves developing an input-output model for the years for which BLS provides input-output accounts (1982, 1986, and 2000).<sup>2</sup> The BLS forecasts include employment and output by industry, as well as Gross National Product (GNP). The final demand components of the BLS forecast are used to drive the input-output models, resulting in a prediction of intermediate demand for and output by industries.

#### **3.2 WHARTON ECONOMETRIC FORECASTING ASSOCIATES (WEFA)**

The WEFA Group produces short- and long-term economic forecasts of U.S. economic activity. The short-term forecasts range from 10 to 13 quarters (2.5 to 3.25 years) and are issued monthly. The long-term forecasts are 25-year forecasts which are issued quarterly. In addition to the baseline short-term forecast, the WEFA Group provides two alternative

forecasts focusing on macroeconomic risks and their probable effects on industries. The 25-year forecasts include trend, cycle, and two alternative forecasts.<sup>3</sup>

The WEFA Group uses Mark 9, a quarterly economic model developed at WEFA, to produce its short- and long-term forecasts. The model is comprised of over 1200 equations and contains a "satellite" industry model which produces detailed industrial forecasts using outputs from the core macroeconomic model.<sup>4</sup> The Mark 9 model contains the following nine major sectors:

1. personal consumption expenditures
2. fixed investment
3. inventory investment
4. government
5. international trade
6. labor market
7. wages and prices
8. financial market
9. income

Variables in the model include consumption, investment, income, and inflation data from the National Income and Product Accounts; population, employment, and wage rate data from the BLS; industrial production data from the Federal Reserve Board; and demand, production, and price data for the auto, housing, and energy sectors of the economy.<sup>4</sup>

The long-term economic forecasts are issued in a two-volume report. The first volume of the report covers the trend or moderate growth scenario and contains an overview of the forecast results and detailed sector reviews of the population, housing, investment, government, inflation, labor market, industrial activity, and energy forecasts in addition to tables detailing the sector forecasts.<sup>4</sup>

The REMI models may be run using 92 forecasted variables from WEFA. These 92 variables include 25 final demand variables. WEFA also forecasts housing and energy variables which may be used in E-GAS development and simulations. Mark 9 forecasts detailed energy price, supply, demand, and consumption variables. The model also forecasts housing variables including housing starts, sales, stocks, and prices. A REMI interface for WEFA data has been developed and tested.

### 3.3 REFERENCES

1. Regional Economic Models, Inc. *Operator's Manual for a Single Region EDFS-14 Conjoined Forecasting and Simulation Model*. REMI Reference Set, Volume 2. Regional Economic Models, Inc., Amherst, MA. 1991.
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## **CHAPTER 4**

### **POLICY VARIABLE CHANGES**

#### **4.1 INTRODUCTION**

By changing policy variables, the user is allowed to simulate the economic impact of anticipated government policy changes, market changes, or other exogenous changes to the regional economy. The effect of a policy change is the difference between a baseline forecast and the simulation forecast with policy variable changes.

In the E-GAS model, there are over 100 regular economic policy variables, translator policy variables (which control combinations of economic policy variables), and population variables that can be adjusted. These variables are accessed from the REMI EDF5-14 model and offer scenarios for changes in tax rates (corporate profit tax, equipment tax, investment tax, personal income tax, and property tax), costs (including relative production cost, import cost, and export cost), wage rate, employment transfer payments, purchasing power, and final demand.

Policy variables have default values for baseline scenarios. Variables which describe additive changes have defaults of 0 and multiplicative variables use 1 for the default. Therefore, entered values for additive changes will represent the injection (of dollars, employees, etc.) into the economy and values for multiplicative phenomena will represent the ratio of the new value (cost, tax points, etc.) to the default.

The policy variables in E-GAS are grouped into three categories, regular economic policy variables, translator variables, and population variables. These categories are broken into subcategories containing the individual variables which can be changed by the user. Category, subcategory, and variable descriptions follow.

#### **4.2 REGULAR POLICY VARIABLES**

##### **Employment**

EMPLOYMENT CHNG - DURABLE(24,25,32-39)	Durable Goods
EMPLOYMENT CHNG - NONDUR.(20-23,26-31)	Nondurable Goods
EMPLOYMENT CHNG - MINING(10,12-14)	Mining
EMPLOYMENT CHNG - CONSTRUCTION(15-17)	Construction
EMPLOYMENT CHNG - TRANSP+PUB UT(40-49)	Transportation and Public Utilities
EMPLOYMENT CHNG - FIN, INS,+ RE(60-67)	Finance, Insurance, and Real Estate
EMPLOYMENT CHNG - RETAIL TRADE(52-59)	Retail Trade
EMPLOYMENT CHNG - WHOLESALE TR(50,51)	Wholesale Trade
EMPLOYMENT CHNG - SERVICE(70-79,80-89)	Services
EMPLOYMENT CHNG - AGRI/F/F SERV(07-09)	Agriculture, Farm, and Fishing Services
EMPLOYMENT CHNG - STATE & LOCAL GOVT	State and Local Government
EMPLOYMENT CHNG - FEDERAL CIVILIAN	Federal Civilian Government
EMPLOYMENT CHNG - FEDERAL MILITARY	Federal Military
EMPLOYMENT CHNG - AGRICULTURE	Agriculture

Policy variables for employment can be used to simulate the growth of the labor force which is not attributable to factors from within the region. The opening of a major appliance manufacturing factory in the region would increase employment in the durable goods sector. The value entered should be in thousands (1000s) of employees.

## Non-government Final Demand

FINAL DEM - PCE AUTOS & PARTS	Autos and Parts
FINAL DEM - PCE FURN & HH EQUIP	Furniture and Household Equipment
FINAL DEM - PCE OTHER DURABLES	Other Durables
FINAL DEM - PCE FOOD & BEVERAGES	Food and Beverages
FINAL DEM - PCE CLOTHING AND SHOES	Clothing and Shoes
FINAL DEM - PCE GASOLINE & OIL	Gasoline and Fuel
FINAL DEM - PCE FUEL OIL & COAL	Fuel Oil and Coal
FINAL DEM - PCE OTHER NONDURABLES	Other Nondurables
FINAL DEM - PCE HOUSING	Housing
FINAL DEM - PCE HSEHLD OPERATION	Household Operation
FINAL DEM - PCE TRANSPORT + PUB UT	Transportation and Public Utilities
FINAL DEM - PCE HEALTH SERVICES	Health Services
FINAL DEM - PCE OTHER SERVICES	Other Services
FINAL DEM - INV RESIDENTIAL	Residential Investment
FINAL DEM - INV NON RESIDENTIAL	Nonresidential Investment
FINAL DEM - INV PROD DUR EQUIP	Durable Equipment Investment

Non-government final demand represents consumer spending and investment in the region. The combination of this section and government spending represent final demand for the region. Intermediate demand for products to subsequently be used in industry is not included. This section can be used to anticipate economic impacts of changes in consumer behavior. For example, the economic effects of introducing appealing, popular electric automobiles could be explored by deflating the consumer spending for gasoline and oil increasing the Transportation and Public Utilities (in areas where electricity is publicly provided). Consumer spending should be entered as millions of dollars.

## Government Final Demand

FINAL DEM - GOV ST/LOC-EDUC	State and Local Government Education
FINAL DEM - GOV ST/LOC HLTH/WLFAR	State and Local Government Health and Welfare
FINAL DEM - GOV ST/LOC SAFETY	State and Local Government Public Safety
FINAL DEM - GOV ST/LOC OTHER	State and Local Government Other

Government Final Demand represents the public sector's purchase of finished products. For example, purchase of new fire-fighting equipment would represent government spending for safety, but any increases in staff expenses would represent an increase in employment.

## Relative Cost Change

REL COST CHANGE - DURABLE(24,25,32-39)	Durable Goods
REL COST CHANGE - NONDUR.(20-23,26-31)	Nondurable Goods
REL COST CHANGE - MINING(10,12-14)	Mining
REL COST CHANGE - CONSTRUCTION(15-17)	Construction
REL COST CHANGE - TRANSP+PUB UT(40-49)	Transportation and Public Utilities
REL COST CHANGE - FIN, INS,+ RE(60-67)	Finance, Insurance, and Real Estate
REL COST CHANGE - RETAIL TRADE(52-59)	Retail Trade
REL COST CHANGE - WHOLESALE TR(50,51)	Wholesale Trade

REL COST CHANGE - SERVICE(70-79,80-89)  
REL COST CHANGE - AGRI/F/F SERV(07-09)

Services  
Agriculture, Farm, and Fishing Services

Relative cost change represents changes in production costs due to a policy change. The relative change in costs needs to be entered as a multiplier, where values greater than one represent increases in cost and values less than one represent lower costs. The default value of one equals the national average for the category. Therefore additional health regulations placed on agriculture could require entry of an AGRI/F/F variable greater than one.

## Industry Demand

DEMAND CHANGE - DURABLE(24,25,32-39)  
DEMAND CHANGE - NONDUR.(20-23,26-31)  
DEMAND CHANGE - MINING(10,12-14)  
DEMAND CHANGE - CONSTRUCTION(15-17)  
DEMAND CHANGE - TRANSP+PUB UT(40-49)  
DEMAND CHANGE - FIN, INS,+ RE(60-67)  
DEMAND CHANGE - RETAIL TRADE(52-59)  
DEMAND CHANGE - WHOLESALE TR(50,51)  
DEMAND CHANGE - SERVICE(70-79,80-89)  
DEMAND CHANGE - AGRI/F/F SERV(07-09)

Durable Goods  
Nondurable Goods  
Mining  
Construction  
Transportation and Public Utilities  
Finance, Insurance, and Real Estate  
Retail Trade  
Wholesale Trade  
Services  
Agriculture, Farm, and Fishing Services

Industry demand describes sales of intermediate goods which will be incorporated into the final product of another industry. Increased sales of motors for electric vehicles would be an increase in industrial demand. The default value of one equals the national average for the category. Changes in industry demand is entered in millions of dollars.

## (Relative) Fuel Costs

REL ELEC FUEL COSTS CHNG - COMM  
REL ELEC FUEL COSTS CHNG - IND  
REL NATRL GAS FUEL COSTS CHNG - COMM  
REL NATRL GAS FUEL COSTS CHNG - IND  
REL RESIDUAL FUEL COSTS CHNG - COMM  
REL RESIDUAL FUEL COSTS CHNG - IND

Relative Price of Commercial Electric  
Relative Price of Industrial Electricity  
Relative Price of Commercial Natural  
Relative Price of Industrial Natural Gas  
Relative Price of Commercial Oil  
Relative Price of Industrial Oil

Relative fuel cost change represents changes in industrial and commercial fuel costs due to a policy change. The relative change in costs needs to be entered as a multiplier, where values greater than one represent increases in cost and values less than one represent lower costs.

## Tax Rates

CORPORATE PROFIT TAX RATE  
EQUIPMENT TAX RATE  
INVESTMENT TAX CREDIT  
PROPERTY TAX RATE

Corporate Profit Tax Rate  
Equipment Tax Rate  
Investment Tax Credit  
Property Tax Rate

Changes in business tax rates attributable to policy changes are entered as the change in percentage points charged.



## **PERSONAL TAXES**

## **Personal Taxes**

Changes in personal taxes attributable to policy changes are entered as the change in millions of dollars collected.

### **Purchasing Power**

#### **CHANGE IN PURCHASING POWER**

#### **Change in Purchasing Power**

Purchasing power represents the amount of disposable income available to consumers. Changes in the purchasing power of consumers are entered as millions of dollars.

## **4.3 TRANSLATOR POLICY VARIABLES**

Translator policy variables can be used to automatically change the series of regular economic policy variables associated with the output of a variety of industrial/service/government sectors.

### **New Utilities and Facilities**

New communications facilities  
New electric utility facilities  
New water supply and sewer facilities  
New gas utility and pipeline facilities  
New roads  
New local transit facilities  
New conservation and development facilities

Changes in production from new utilities and facilities can be simulated by entering the changes in spending in millions of dollars.

### **Transit**

Local government passenger transit  
State and local electric utilities  
State and local govt enterprises, nec

Changes in production from transit and other public enterprises can be simulated by entering the changes in spending in millions of dollars.

### **Purchase of Electricity and Natural Gas**

Electricity; PCE  
Natural gas; PCE

Changes in the final demand for electricity and natural gas should be entered as millions of dollars.

## **Local Transportation Expenditures**

Bus and trolley car transportation; PCE  
Taxicabs; PCE  
Commuter rail transportation; PCE  
Railway transportation; PCE  
Intercity bus; PCE

Changes in final demand for the various modes of local transportation should be entered in millions of dollars.

## **State and Local Government Expenditures**

Elementary and secon. education; State & Local Govt (SL Govt)  
Higher education; SL Govt  
Other education and libraries; SL Govt  
Health and hospitals; SL Govt  
Public assistance and relief; SL Govt  
Sewerage; SL Govt  
Sanitation; SL Govt  
Police; SL Govt  
Fire; SL Govt  
Corrections; SL Govt  
Highways; SL Govt  
Water and air facilities; SL Govt  
Transit utilities; SL Govt  
Other commerce and transportation; SL Govt  
Gas and electric utilities; SL Govt  
Water; SL Govt  
Urban renewal and community facilities; SL Govt  
Natural and agricultural resources and recreation; SL Govt  
Other general government; SL Govt

Changes in final demand for the services of local government should be entered in millions of dollars.

## **4.4 POPULATION VARIABLE**

### **Public Amenity Term**

The public amenity term represents changes in the quality of life and appeal of a region. This term is an indicator for the morbidity, crime, visibility or other characteristics of a region. This is defined as a real wage gain to migrants and can be interpreted as the portion of a migrant's salary which is equivalent to the quality of living in the area.

The values for the public amenity term are entered as the equivalent proportion of migrant earnings gained in quality of life. For example, if it is estimated that migrants value the effects of certain pollution control measures at one half of one percent of their income, then the entered value should be 0.5. If the negative environmental and convenience effects of reducing public transit is equivalent to losing one percent of the migrants' income, then the entered value should be -1.0.

## **CHAPTER 5**

### **MODEL SUPPRESSIONS**

When running the national or regional tiers of E-GAS, the user is given the option of suppressing model responses. Such suppressions dissolve links between key elements of the model. The decision to suppress model responses should be carefully considered, since changes in the structure of the model can reverberate throughout the forecasting process and undermine the credibility of the results. The available model suppressions are described below.

#### **Wage Response Suppression**

If this response is suppressed, the wage rates in the baseline forecast and the simulation will not be connected to changes in occupational demand or changes in relative economic opportunity (REO).

#### **Labor Intensity Response Suppression**

If this is suppressed, labor intensity in the baseline forecast and in the simulation is not influenced by local determinants of the labor force, but instead maintains the value appearing for the most recent year recorded by the model.

#### **Net Migration Response Suppression**

If this is suppressed, net migration will not respond to changes in REO, relative wage rate (RWR), and relative wage mix (RWM) and will be kept at zero in the baseline forecast and the simulation.

#### **Regional Price Coefficients' (RPC) Response to Gross Regional Product (GRP) and Selling Price Suppression**

When this is suppressed, the regional purchase coefficients are fixed for the baseline forecast and simulated at the value appearing for the most recent year recorded by the model.

#### **Regional Price Coefficients' (RPC) Response to Gross Regional Product (GRP) Only Suppression**

This suppression changes exogenous RPC response to GRP to endogenous response (as output expands, RPC's will increase, and vice versa), but retains endogenous response to selling price with either setting.

#### **Export Response Suppression**

If this is suppressed, exports will not respond to changes in relative costs or changes in profitability.

#### **Consumer Price Index CPI-WAGE Response Suppression**

When this is suppressed, increases in the consumer price index (CPI) are not transmitted to wages.

**House-Land Price Response Suppression**

If this response is suppressed, house price and land price will not fluctuate with the market, but will be fixed in the forecast years with the value appearing for the most recent year recorded by the model.

**Property Income Response to Population Suppression**

If this response is suppressed, property income will not respond to a change in the population density (population of the region relative to the United States).

**Transfer Payment Response to Dependent Population Suppression**

Similar to property income, transfer payments will not respond to a change in the dependent population of the region relative to the United States.

**Local Consumption Suppression**

If it is suppressed, local consumption will not respond to a change in the real disposable income of the region relative to the United States in the forecast years.

**Investment Suppression**

If this response is suppressed, investment will not respond to changes in the local optimal capital stock.

**Changing the Default Status of Stock Adjustment Investment Process**

This option changes default Stock Adjustment Investment Process' status (either replaces old investment equations with stock adjustment investment equations, or vice versa). Use of the stock adjustment investment equations leads to more immediate investment impacts during simulations. The short-term properties will also differ.

**Government Demand Response to Population Suppression**

If this response is suppressed, government demand will not respond to a change in the population of the region relative to the United States.

**Changing the Default Status of Employees Per Dollar Value Added (EPV)**

Endogenous EPV will endogenize productivity so that when output increases, productivity will increase accordingly in the short run. This results in less new employment in the initial years of a simulation.

## **CHAPTER 6**

### **TIER 1: THE NATIONAL MODEL**

The national tier of E-GAS provides forecasts of national economic activity to drive the regional economic models and, subsequently, the growth factor tier. The user may choose one of the two forecasts (BLS or WEFA) to create the national forecast. The growth forecasted by this model is then distributed among and within regions in Tier 2. The national tier may be changed and rerun any number of times before proceeding to Tier 2. Unless the user chooses to change the national forecast, the national model data needs to be run only once before advancing to or subsequently rerunning the Regional Tier; output from the National Tier is maintained through multiple runs of subsequent tiers. Model responses may be suppressed in the national model. Any national model suppressions should also be chosen for the regional model and caution should be exercised before choosing any suppressions (see Chapter 5).

## 6.1 NATIONAL MODEL MAIN SCREEN

Upon entering the subsystem, the user is presented with this screen:

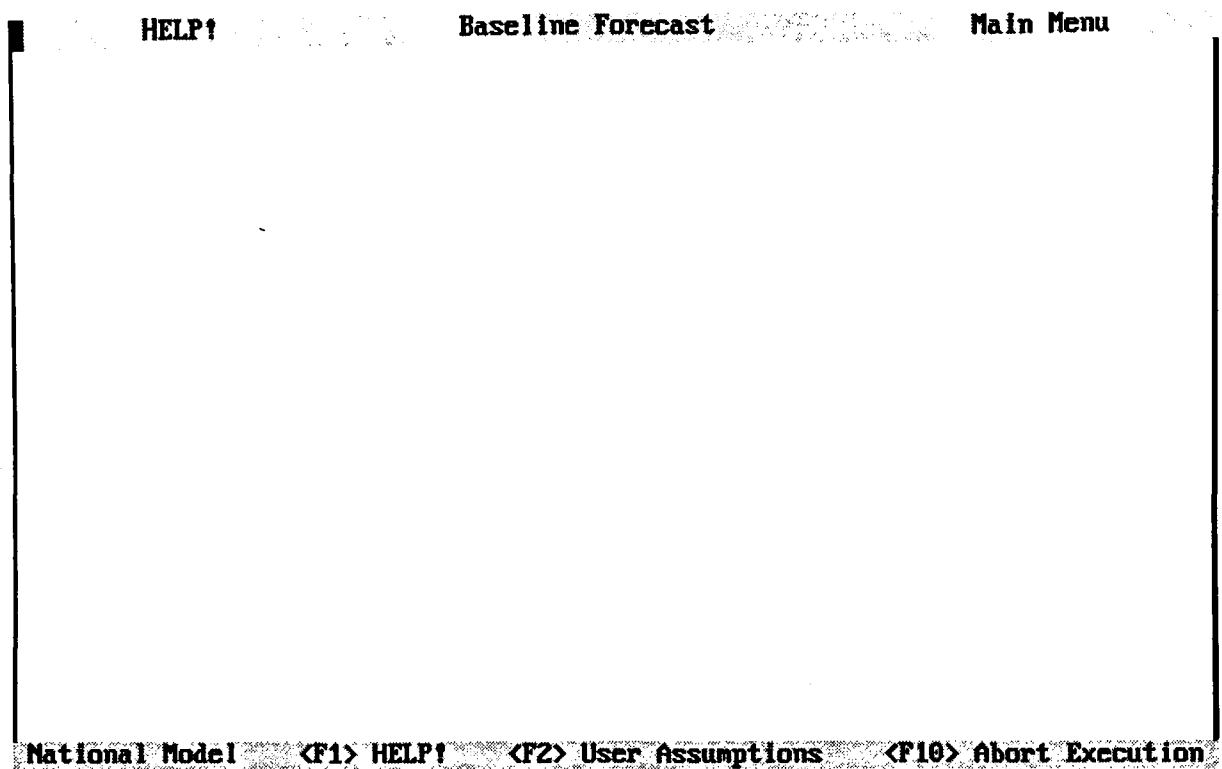


Figure 6-1. National model main screen.

At the top of the screen are options that can be selected by pressing the first letter of the option or highlighting the choice and pressing the **<ENTER>** key. These options are discussed in Sections 6.2 and 6.3.

## 6.2 BASELINE FORECAST

Choosing the **Baseline Forecast** option from the National Model Main Screen leads to the display of this screen:

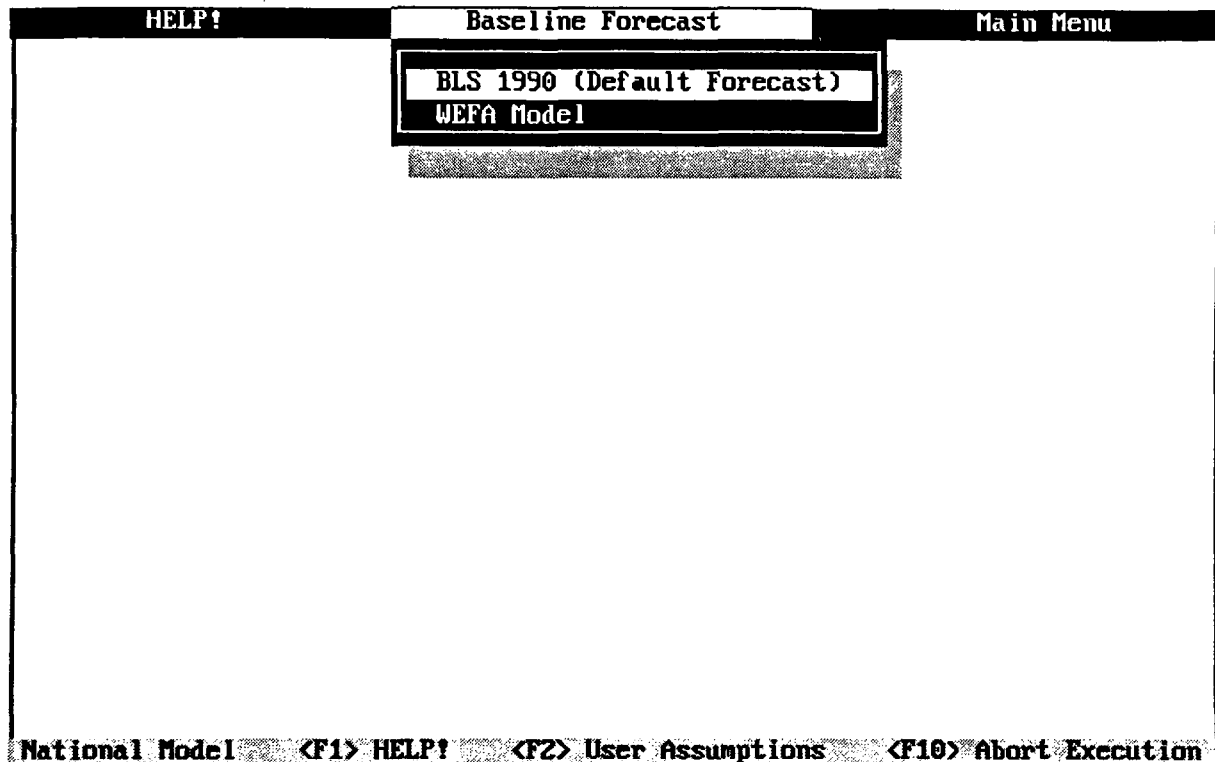


Figure 6-2. National model baseline forecast screen.

The menu items are the two national forecasts which can be baseline forecasts. The forecasts are listed below.

**BLS 1990:** Bureau of Labor Statistics  
**WEFA:** Wharton Econometrics Forecasting Associates

Further information on these forecasts can be found in this tier's help screens and Chapter 3 of this guide.

Choosing the BLS forecast—the REMI default forecast—results in the beginning of the tier 1 calculations. Selection of the WEFA model results in a series of user inputs needed to adjust the forecasts. The following is a numbered list of the data requirements found in the WEFA model.

1. New final demand data may be entered in real (1987) dollars or in percent changes. Percent changes will be used to recalibrate the REMI model to the new final demand data. Enter 1 for LEVELS or 2 for PERCENT changes to final demand data.



2. The REMI FORECAST has 20 time periods from 1991 to 2010. Enter the number of time periods for which new final demand data exist (include last historical period). NEW FINAL DEMAND TIME PERIODS MAY NOT EXCEED 20.
3. For the BASELINE FORECAST and any subsequent SIMULATION, do you want to SUPPRESS any of the normal model responses?
4. Input the last year you want the baseline forecast/simulation to extend to (latest year available is 2010).
5. Do you have Personal Income data from WEFA?

The Baseline models ask for user input from the above list:

**BLS 1990:** No further user input needed

**WEFA:** Questions 1 - 6

After supplying all of the required additional information, the system processes the data and returns the user to the National Model Main Screen.

### **6.3 MAIN MENU**

Choosing the **Main Menu** option from the National Model Main Screen returns the user to the E-GAS Main Menu.

## **CHAPTER 7**

### **TIER 2: THE REGIONAL MODEL**

The regional tier of E-GAS will provide economic growth factors for the UAM and ROM modelling regions. E-GAS will include separate economic forecasts for extreme, severe, serious, and moderate multi-state ozone nonattainment areas, as well as models for the attainment portions of these States. In addition, an economic model for each State in a ROM modelling region will be included in E-GAS.

The regional tier, Tier 2, takes input from the National Model and cannot be run unless the national model has been run at least once. Tier 2 can be adjusted and rerun any number of times without rerunning the national tier, unless the user wishes to change the national forecast. The regional tier must be run before proceeding to the Growth Factor Module.

Model responses can be suppressed in the regional model. The user's model suppression decisions in the national model must be repeated in the regional model.

A Baseline forecast must be generated within Tier 2. Baseline forecasts use the REMI/E-GAS default settings to distribute growth within the region. Simulation forecasts may be run if the user wishes to change policy variables for any area within their region (policy variables are described in Chapter 5). Tier 2 may be run several times before proceeding to the growth factor module (Tier 3): the latest regional model run will drive the growth factor module. The user may abandon the simulation forecast by running another baseline forecast and advancing to the Growth Factor Module. If the national forecast needs to be changed, the user should return to Tier 1.

## 7.1 REGIONAL MODEL TIER MAIN SCREEN

This is the regional model's main screen:

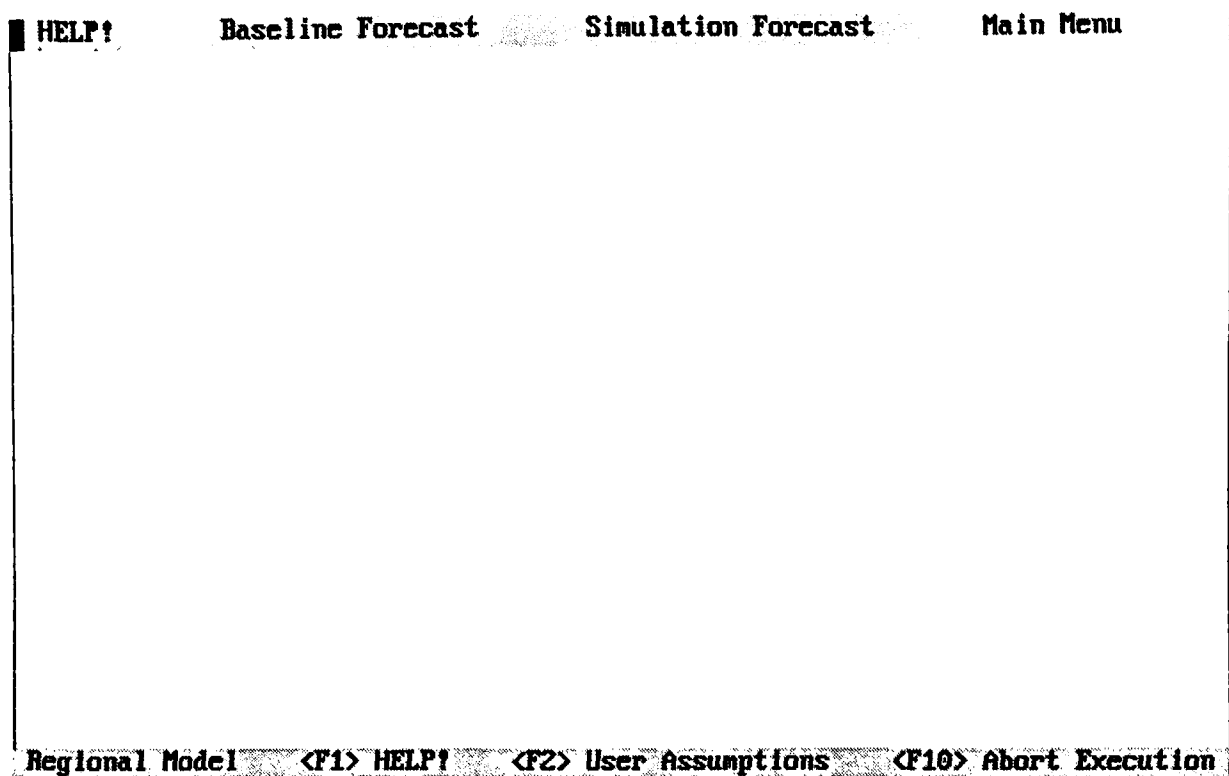


Figure 7-1. Regional model main screen.

At the top of the screen are four options that can be selected by pressing the first letter of the option or highlighting the choice and pressing the **<ENTER>** key. These options are discussed in Sections 7.2 through 7.4.

## 7.2 BASELINE FORECAST

Choosing the **Baseline Forecast** option from the Regional Model Main Screen causes E-GAS to take the parameters from the selected national economic forecast and apply them to the regional modelling program. Upon completion of the regional baseline, the user is returned to the Regional Model Tier Main Screen.

## 7.3 SIMULATION FORECAST

Regional simulation forecasting cannot be executed until a regional baseline scenario has been run. Choosing the **Simulation Forecast** option from the Regional Model Main Screen, after having run the baseline, leads to a sequence of screens soliciting input.

The user must provide additional information to execute simulation forecasts in Regional Simulation Forecasting. The system requires the user to enter the ending year, as well as any model suppressions (see chapter 5 for an explanation of model suppressions). The user may then change one or more policy variables for any of the areas within the user's region (chapter 4 describes the E-GAS policy variables). Multiple policy variable changes should be made with caution since excessive changes would distort any causality between results and policy variable changes.

After supplying all of the required additional information, the system processes the data and returns the user to the Regional Model Main Screen.

## 7.4 MAIN MENU

Choosing the **Main Menu** option from the National Model Main Screen returns the user to the E-GAS Main Menu.

## **CHAPTER 8**

### **TIER 3: THE GROWTH FACTOR MODULE**

The growth factor tier in E-GAS translates changes in the economic activity levels of the most recent regional forecast to growth factors for physical output, fuel consumption, and VMT. These growth factors will be developed for two-, three-, and four-digit SIC levels depending on available data for developing and disaggregating the factors. These SIC-level growth factors will be matched with SCC codes. The final output from this tier will be ASCII files containing SCC growth factors to be used for AIRS inventories.

The growth factor tier cannot be run unless tiers 1 and 2 have been run, generating the economic data necessary for energy consumption calculation. Tier 3 uses the following five modules to calculate the activity growth factors from the diverse economic data produced by the first two tiers:

- Household Model of Energy by State (HOMES)
- Commercial Sector Energy Model by State (CSEMS)
- Industrial Regional Activity and Energy Demand (INRAD) Model
- Vehicle Miles Traveled (VMT) Module
- Physical Output Module

E-GAS's crosswalk module translates the energy consumption factors to point, area, and mobile SCC growth factors. The output ASCII files are named:

- |                |   |
|----------------|---|
| • RES_FUEL.SCC | HOMES / residential fossil fuel                 |
| • COM_FUEL.SCC | CSEMS / commercial fossil fuel                  |
| • IND_FUEL.SCC | INRAD / industrial fossil fuel                  |
| • ELECTRIC.SCC | HOMES, CSEMS, and INRAD electric growth factors |
| • VMT.SCC      | VMT / transportation                            |
| • PHY.SCC      | PHYSICAL OUTPUT / industrial output             |
| • OTHER.SCC    | Growth for unclassified SCC's                   |

The user can exit E-GAS to read and print the E-GAS output (SCC) files with an ASCII file reader/editor.

## 8.1 OUTPUT FILE SELECTION SCREENS

The user has the opportunity to choose the nature of the information in the E-GAS final output. The first data entry screens of the Growth Factor Tier allow the user to choose the years and counties to be included in the output files.

### 8.1.1 Output File Format Selection Screen

Advancing from the User Assumption screen series provokes this screen:

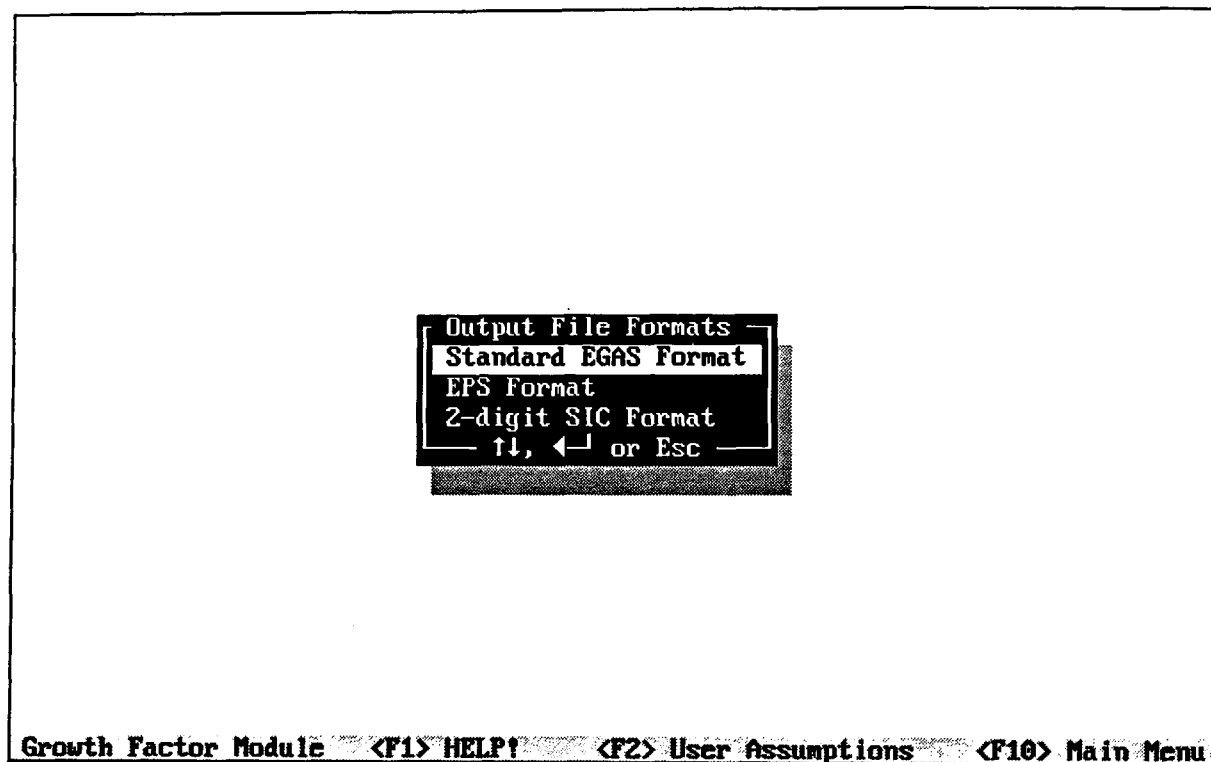


Figure 8-1. Output file format selection screen.

The user should press the letter of the desired choice or use the up and down cursor keys to highlight desired format and press the <Enter> key. E-GAS then proceeds to the Output File Year Selection Screen.

### 8.1.2 Output File Year Selection Screen

This screen appears after the file format has been chosen:

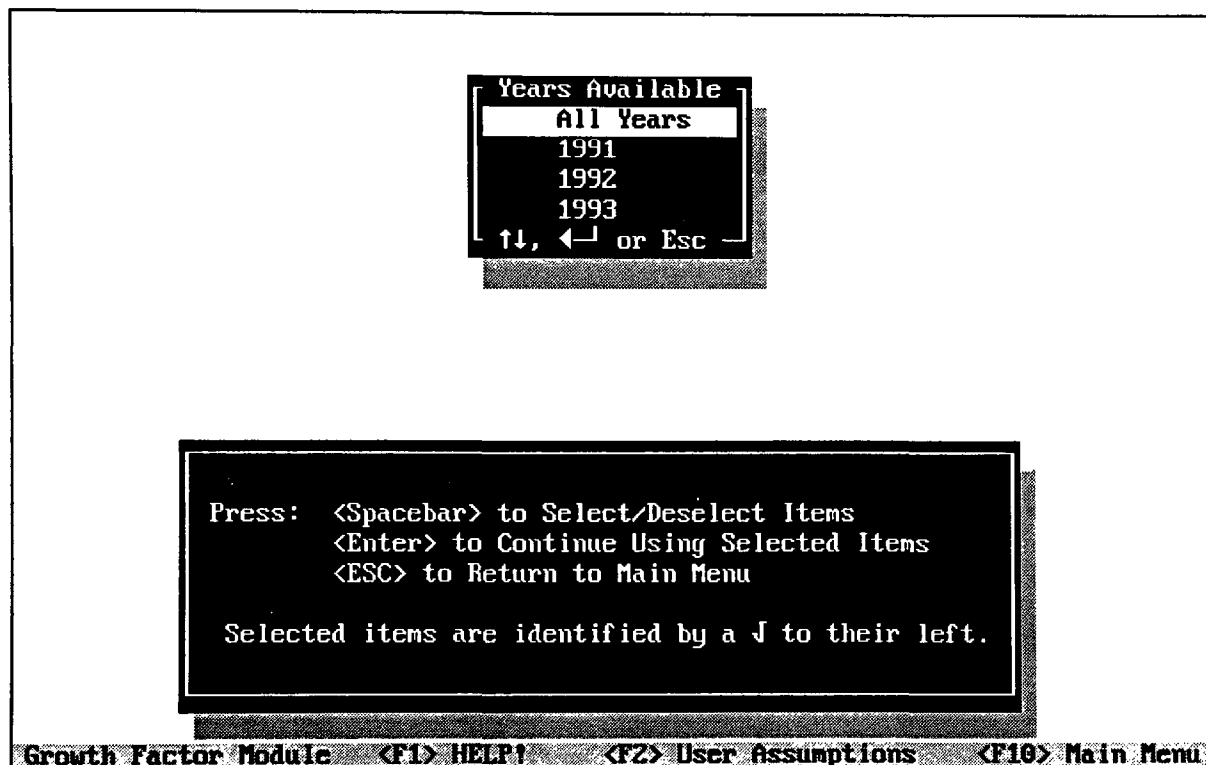


Figure 8-2. Output file year selection screen.

The user should use up and down cursor keys to highlight desired years—or the *All Years* option—and mark the highlighted selection by pressing the space bar. The user should press the **<Enter>** key when all of the desired choices have been marked. E-GAS then proceeds to the Output File Area selection Screen. If *All Years* is one of the marked choices, the system will ignore any individual year selections and print data for all of the available years.

The size of the output files will be significantly smaller if only the desired areas, counties, and years are selected.

### 8.1.3 Output File Area/State/County Selection Screens

After the years to be included in output have been selected, the desired areas of the REMI region can be chosen.

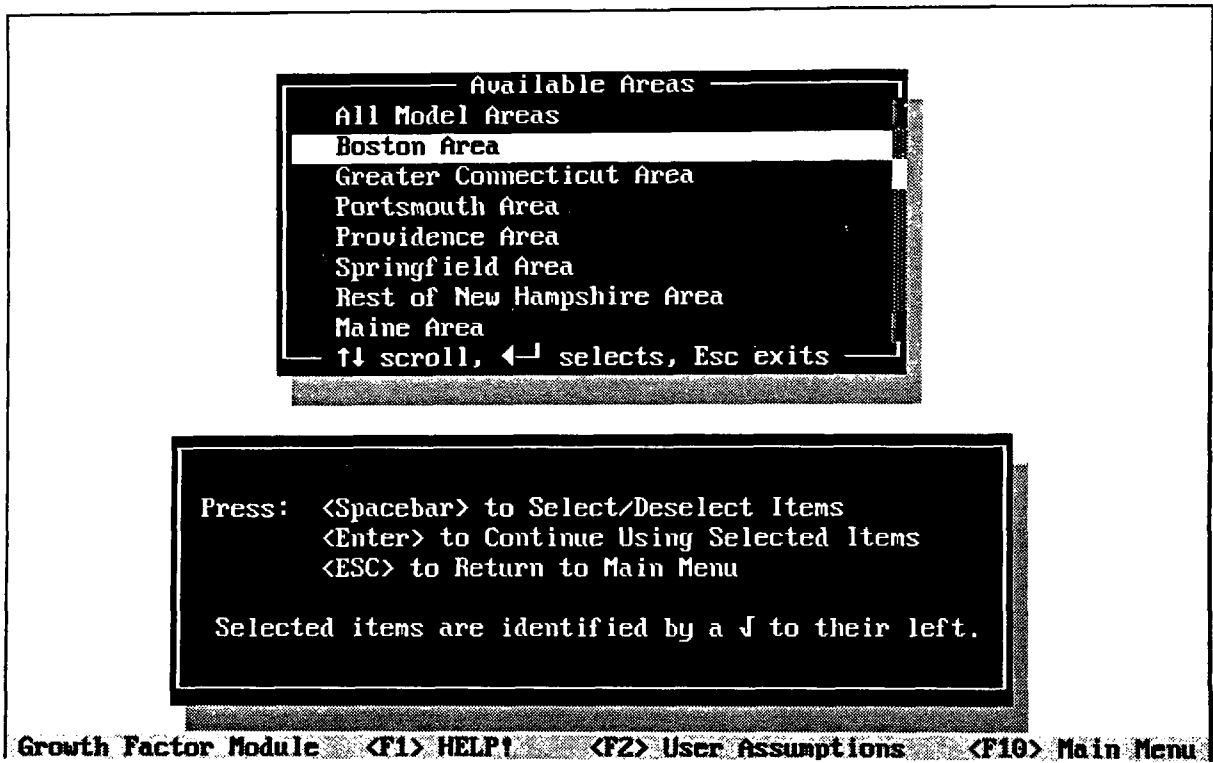


Figure 8-3. Output file area selection screen.

Use the up and down cursor keys to highlight desired areas—or the *All Model Areas* option—and mark the highlighted selection by pressing the space bar. The user should press the **<Enter>** key when all of the desired choices have been marked.

After the user chooses the area of interest, states and counties within the chosen area can be selected through similar screens. The system proceeds to the VMT Data Source Screen after the areas, states, and counties have been chosen.



## 8.2 VMT DATA ENTRY SEQUENCE

The user has several options for entering VMT data. The user can enter data from the keyboard or through user-prepared files. The E-GAS VMT module can be chosen, avoiding any need for user data, or the VMT section can be omitted from E-GAS.

### 8.2.1 VMT Data Source Screen

The following is the first screen in the VMT data entry sequence:

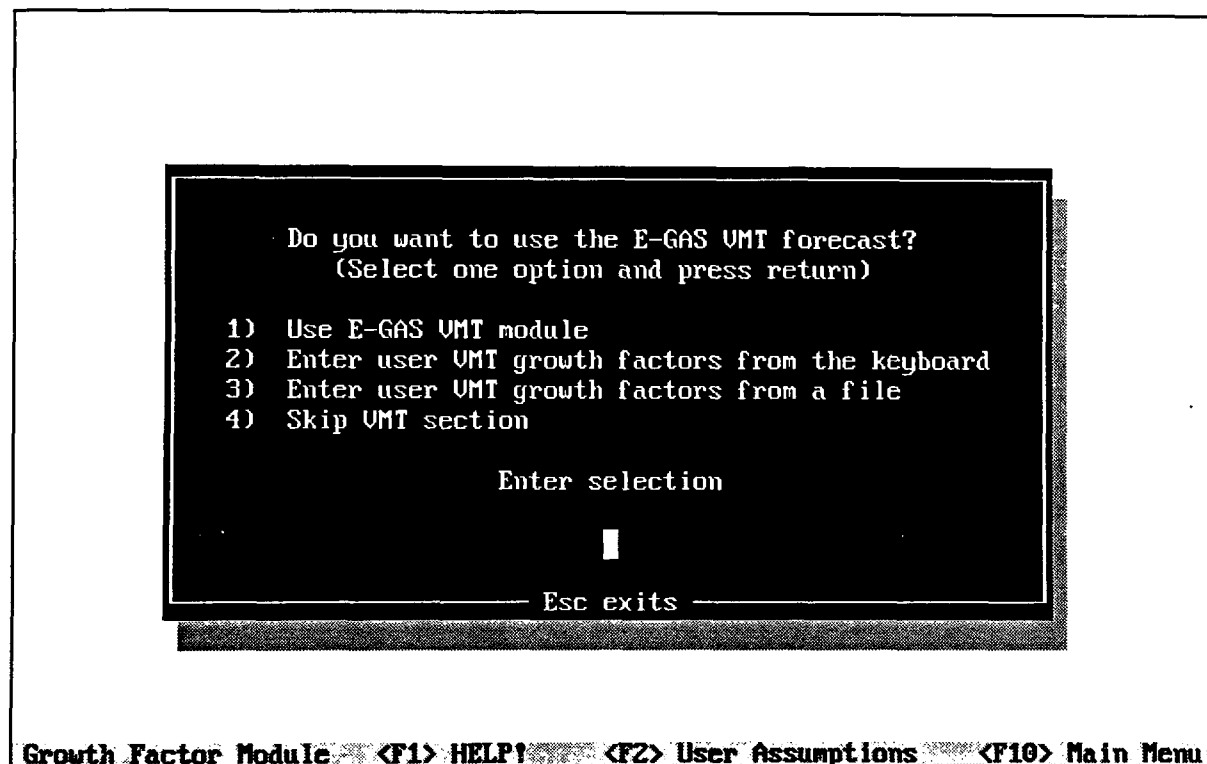


Figure 8-4. VMT data screen.

If the user selects the E-GAS VMT module or elects to skip the VMT module, the system proceeds to calculate the output files and returns to the Main Menu. If the *Enter user VMT growth factors from the keyboard* or *Enter user VMT growth factors from a file* are chosen, the system advances to the VMT Data Detail Screen. <Esc> exits the Growth Factor Module before data processing begins.

## 8.2.2 VMT Data Detail Screen

When the *Enter user VMT growth factors from the keyboard* or *Enter user VMT growth factors from a file* options are chosen from the VMT Data Screen, this screen is produced:

The screenshot shows a terminal window titled "SELECT METHOD TO BE USED FOR ENTERING VMT GROWTH FACTORS". Inside the window, the text "Barnstable County:" is displayed. Below it, the instruction "Select one option" is shown. A list of four options follows: "1) One growth factor for all VMT SCCs", "2) Growth factors by road type", "3) Growth factors by road type and vehicle type", and "4) No growth factors for this county". Below the list, the prompt "Enter selection" is displayed. A cursor, represented by a vertical bar, is positioned below the prompt. At the bottom of the window, the text "Esc exits" is shown. At the very bottom of the terminal window, a status bar contains the text "Growth Factor Module <F1> HELP! <F2> User Assumptions <F10> Main Menu".

```
SELECT METHOD TO BE USED FOR ENTERING VMT GROWTH FACTORS

Barnstable County:

      Select one option

1) One growth factor for all VMT SCCs
2) Growth factors by road type
3) Growth factors by road type and vehicle type
4) No growth factors for this county

      Enter selection

      |

      Esc exits

Growth Factor Module <F1> HELP! <F2> User Assumptions <F10> Main Menu
```

Figure 8-5. VMT data detail screen.

This screen is used to choose the VMT data inputs which are appropriate for the level of detail found in the user's data. The higher levels of detail are accommodated by the choices found lower on the list. When *Enter user VMT growth factors from a file* has been chosen from the VMT Data Screen, the user is prompted for the file name; if *Enter user VMT growth factors from the keyboard* is chosen, the system moves to the appropriate VMT data entry screen.

### **8.2.3 VMT Data Entry Screens**

After defining the VMT data table, a screen for entering data into the table is provided. The user can accept the entered data by pressing <F5> or exit by pressing <Esc>. The three available tables are shown here. Only the table chosen with the VMT Data Detail Screen is produced by the system.

If the VMT data are being entered from the keyboard, screens for choosing the area, state, and counties for the entered data are provided. These screens are identical to the output file area, state, and county screens (Section 8.1.3) in appearance and operation. Since there are no VMT defaults for manual data entry, VMT calculations will not be performed on counties not addressed in user input.

SELECT METHOD TO BE USED FOR ENTERING UMT GROWTH FACTORS

Input the growth factor to be used for all SCCs  
for Year 1991.

Growth Factor Module    <F1> HELP!    <F2> User Assumptions    <F10> Main Menu

Figure 8-6. Single growth factor screen.

ENTER UMT GROWTH FACTORS FOR Barnstable County, Massachusetts

Growth Factors by Road Type for the Year 1991			
	ROAD TYPE	USE	FACTOR
1	Interstate: Rural	[ ]	0.00
2	Other Principal Arterial: Rural	[ ]	0.00
3	Minor Arterial: Rural	[ ]	0.00
4	Major Collector: Rural Total	[ ]	0.00
5	Minor Collector: Rural Total	[ ]	0.00
6	Local: Rural	[ ]	0.00
7	Interstate: Urban	[ ]	0.00
8	Other Freeways & Expressways: Urban	[ ]	0.00
9	Other Principal Arterial: Urban	[ ]	0.00
10	Minor Arterial: Urban	[ ]	0.00
11	Collector: Urban	[ ]	0.00
12	Local: Urban	[ ]	0.00

<SPACE> Select Road Type    <F5> Save    <Esc> Exit Without Saving

Growth Factor Module    <F1> HELP!    <F2> User Assumptions    <F10> Main Menu

Figure 8-7. Growth factor by road type screen.

# ENTER UNIT GROWTH FACTORS FOR Barnstable County

Growth Factors by Vehicle and Road Types for Year 1991			
LDGV	1. Interstate: Rural	[ ]	0.0000
LDGV	2. Other Principal Arterial: Rural	[ ]	0.0000
LDGV	3. Minor Arterial: Rural	[ ]	0.0000
LDGV	4. Major Collector: Rural Total	[ ]	0.0000
LDGV	5. Minor Collector: Rural Total	[ ]	0.0000
LDGV	6. Local: Rural	[ ]	0.0000
LDGV	7. Interstate: Urban	[ ]	0.0000
LDGV	8. Other Freeways & Expressways: Urban	[ ]	0.0000
LDGV	9. Other Principal Arterial: Urban	[ ]	0.0000
LDGV	10. Minor Arterial: Urban	[ ]	0.0000
LDGV	11. Collector: Urban	[ ]	0.0000
LDGV	12. Local: Urban	[ ]	0.0000
<SPACE> Select    ↑↓ Scroll    <F5> Save    <Esc> Exit Without Saving			

Growth Factor Module    <F1> HELP?    <F2> User Assumptions    <F10> Main Menu

Figure 8-8. Growth factor by road and vehicle type screen.

## **CHAPTER 9**

### **FOR FURTHER INFORMATION**

In the event that the on-line help function and this user guide are unable to answer questions about E-GAS, please call Sue Kimbrough of the Environmental Protection Agency at (919) 541-2612 or write to

Sue Kimbrough  
AEERL/MD-62  
U.S. Environmental Protection Agency  
Research Triangle Park, NC 27711

Please have the following information available:

- Hardware issues
  - hardware configuration
  - type of computer
  - amount of memory
  - display type
  - peripherals
- Any memory-resident software used—including network drivers
- The version of DOS being used
- Specific description of the problem

**APPENDIX A**  
**E-GAS MODELLING AREAS**



## **MODELLING AREA 1: EPA REGION 1**

Boston-Lawrence-Worcester Nonattainment Area, except Rockingham CO (included in Portsmouth, NH area model)  
Greater CT Nonattainment Area, except Litchfield and Fairfield Counties (will be included in Region 2/3 NYC area model)  
Portsmouth-Dover-Rochester Nonattainment Area  
Providence Nonattainment Area (All of Rhode Island)  
Springfield (Western MA) Nonattainment Area  
Attainment Portion of New Hampshire  
State of Maine  
State of Vermont

## **MODELLING AREA 2: EPA REGIONS 2 AND 3**

New York-New Jersey-Long Island Nonattainment Area, including Connecticut counties of Fairfield and Litchfield  
Baltimore Nonattainment Area  
Philadelphia-Wilmington-Trenton Nonattainment Area  
Washington, D.C. Nonattainment Area  
Huntington-Ashland (WV-KY) Nonattainment Area, including Kentucky Counties of Boyd and Greenup  
Attainment Portion of New York  
Attainment Portion of New Jersey  
Attainment Portion of Pennsylvania  
Attainment Portion of Delaware  
Attainment Portion of Virginia  
Attainment Portion of West Virginia  
Attainment Portion of Maryland

### **MODELLING AREA 3: EPA REGION 4**

Atlanta Nonattainment Area

Cincinnati-Hamilton (OH-KY) Nonattainment Area, including Ohio counties of Butler, Clermont, Hamilton, and Warren

Huntington-Ashland (WV-KY) Nonattainment Area, Including West Virginia Counties of Cabell and Wayne

Louisville (KY-IN) Nonattainment Area, including Indiana Counties of Clark and Floyd

Attainment Portion of Kentucky

Attainment Portion of Georgia

State of Tennessee

State of North Carolina

State of Mississippi

State of Alabama

State of South Carolina

State of Florida

### **MODELLING AREA 4: EPA REGION 5**

Chicago-Gary-Lake County Nonattainment Area

Milwaukee-Racine Nonattainment Area

Muskegon Nonattainment Area

Sheboygan Nonattainment Area

Cincinnati- Hamilton (OH-KY) Nonattainment Area, including Kentucky counties of Boone and Campbell

Louisville (KY-IN) Nonattainment Area, including Kentucky counties of Bullit, Jefferson, and Oldham

St. Louis Nonattainment Area, including Missouri counties of Franklin, Jefferson, St. Charles, St. Louis, and the City of St. Louis

Attainment Portion of Illinois

Attainment Portion of Indiana

Attainment Portion of Wisconsin

Attainment Portion of Ohio

Attainment Portion of Michigan

## **MODELLING AREA 5: EPA REGION 6**

Houston-Galveston-Brazoria Nonattainment Area  
Baton Rouge Nonattainment Area  
Beaumont-Port Arthur Nonattainment Area  
El Paso Nonattainment Area  
Attainment Portion of Texas  
Attainment Portion of Louisiana  
State of New Mexico  
State of Oklahoma  
State of Arkansas

## **MODELLING AREA 6: EPA REGION 7**

St. Louis Nonattainment Area, including Illinois Counties of Madison, Monroe, and St. Clair  
Attainment Portion of Missouri  
State of Kansas  
State of Nebraska  
State of Iowa

## **MODELLING AREA 7: EPA REGIONS 8 AND 10**

State of Colorado  
State of Utah  
State of Wyoming  
State of North Dakota  
State of South Dakota  
State of Montana  
State of Idaho  
State of Oregon  
State of Washington

## **MODELLING AREA 8: EPA REGION 9**

Los Angeles-South Coast Air Basin Nonattainment Area  
Southeast Desert Modified AQMA Nonattainment Area  
San Diego Nonattainment Area  
Ventura County Nonattainment Area  
Sacramento Metro Nonattainment Area  
San Joaquin Valley Nonattainment Area  
Attainment Portion of California  
State of Nevada  
State of Arizona

**APPENDIX B**

**FILE FORMAT FOR E-GAS NATIONAL WEFA FORECAST**

## **WHARTON ECONOMETRIC FORECASTING ASSOCIATES (WEFA)**

**FILENAME: WEFADAT.US**

**FORMAT:**

**YEAR 1 VARIABLE 1 VARIABLE 2 VARIABLE 3 ..... VARIABLE 92**  
**YEAR 2 VARIABLE 1 VARIABLE 2 VARIABLE 3 ..... VARIABLE 92**  
**"**  
**"**  
**"**  
**YEAR N VARIABLE 1 VARIABLE 2 VARIABLE 3 ..... VARIABLE 92**

**WHERE:** Year 1 is the first year for which you have alternate source data  
(must be the same as the last year of REMI historical data)  
Year N is the last year for which you have alternate source data  
Variable 1 ... Variable 92 are the 92 alternative source variables  
for each year

**THE 92 VARIABLES CONSIST OF:**

1. Final demand - auto and parts
2. Final demand - furniture and household equipment
3. Final demand - other durables
4. Final demand - clothing and shoes
5. Final demand - food and beverage
6. Final demand - gasoline and oil
7. Final demand - fuel oil and coal
8. Final demand - other non-durables
9. Final demand - total services; used to calculate other services
10. Final demand - housing
11. Final demand - health services
12. Final demand - household operation
13. Final demand - transportation
14. Interest rate
15. Final demand - federal government military
16. Final demand - federal government civilian
17. Final demand - part of state and local government
18. Final demand - part of state and local government
19. Final demand - part of state and local government
20. Final demand - part of state and local government
21. Part 1 of prod. dur. equipment
22. Non-residential investment
23. Residential investment and part 2 of prod. dur. equipment
24. Part 2 of prod. dur. equipment
25. Final demand - CBI

26. Investment tax credit
27. Employment EDFS-53 Industry # 23
28. Employment EDFS-53 Industry # 31, 32, 33, 34
29. Employment EDFS-53 Industry # 51, 52
30. Employment EDFS-53 Industry # 50
31. Employment EDFS-53 Industry # 1
32. Employment EDFS-53 Industry # 2
33. Employment EDFS-53 Industry # 3
34. Employment EDFS-53 Industry # 4
35. Employment EDFS-53 Industry # 5
36. Employment EDFS-53 Industry # 6
37. Employment EDFS-53 Industry # 7
38. Employment EDFS-53 Industry # 8
39. Employment EDFS-53 Industry # 9
40. Employment EDFS-53 Industry # 10
41. Employment EDFS-53 Industry # 11
42. Employment EDFS-53 Industry # 12
43. Employment EDFS-53 Industry # 13
44. Employment EDFS-53 Industry # 14
45. Employment EDFS-53 Industry # 15
46. Employment EDFS-53 Industry # 16
47. Employment EDFS-53 Industry # 17
48. Employment EDFS-53 Industry # 18
49. Employment EDFS-53 Industry # 19
50. Employment EDFS-53 Industry # 20
51. Employment EDFS-53 Industry # 21
52. Employment EDFS-53 Industry # 22
53. Employment EDFS-53 Industry # 29
54. Employment EDFS-53 Industry # 24, 25, 26, 27, 28
55. Employment EDFS-53 Industry # 30
56. Employment EDFS-53 Industry # 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48
57. Employment EDFS-53 Industry # 35, 36, 37
58. Employment EDFS-53 Industry # 49
59. Unused (please put a zero)
60. Population
61. Consumer price index
62. Unused (please put a zero)
63. Final demand - exports - autos
64. Final demand - consumer goods - durable
65. Final demand - consumer goods - non-durable
66. Final demand - demand - food, feed, beverage
67. Final demand - industrial supply - durable
68. Final demand - industrial supply - non-durable
69. Final demand - capital goods, excluding autos
70. Final demand - other
71. Final demand - services including factor income

- 72. Final demand - imports - autos
- 73. Final demand - consumer goods - durable
- 74. Final demand - consumer goods - non-durable
- 75. Final demand - food, feed, beverage
- 76. Final demand - industrial supply - durable
- 77. Final demand - industrial supply - non-durable
- 78. Final demand - capital goods, excluding autos
- 79. Final demand - other
- 80. Final demand - petroleum
- 81. Final demand - services including factor income
- 82. Transfer payments
- 83. Personal contributions to social insurance
- 84. Corporate profit tax rate
- 85. Total wage bill
- 86. Dividends
- 87. Unused (please put a zero)
- 88. Unused (please put a zero)
- 89. Interest
- 90. Personal income
- 91. Disposable income
- 92. Rent

**APPENDIX C**

**FILE FORMATS FOR E-GAS VEHICLE  
MILES TRAVELED (VMT) INPUT**



## **E-GAS VEHICLE MILES TRAVELLED (VMT) INPUT FILE FORMAT**

Filename: chosen by user

1. For one growth factor for all VMT SCCs.

FORMAT:

STATE COUNTY YEAR FACTOR

2. For one growth factor for each road type.

FORMAT:

STATE COUNTY YEAR ROAD TYPE FACTOR

ROAD TYPE CODES:

11 - Interstate - Rural  
13 - Other principal arterial - Rural  
15 - Minor Arterial - Rural  
17 - Major Collector - Rural Total  
19 - Minor Collector - Rural Total  
21 - Local Rural  
23 - Interstate - Urban  
25 - Other freeways and expressways - Urban  
27 - Other principal arterial - Urban  
29 - Minor arterial - Urban  
31 - Collector - Urban  
33 - Local - Urban

3. For one growth factor for each road and vehicle type combination.

FORMAT:

STATE COUNTY YEAR ROAD TYPE VEHICLE TYPE FACTOR

ROAD TYPE CODES:

11 - Interstate - Rural  
13 - Other principal arterial - Rural  
15 - Minor Arterial - Rural  
17 - Major Collector - Rural Total  
19 - Minor Collector - Rural Total  
21 - Local Rural  
23 - Interstate - Urban  
25 - Other freeways and expressways - Urban  
27 - Other principal arterial - Urban  
29 - Minor arterial - Urban  
31 - Collector - Urban  
33 - Local - Urban

**VEHICLE TYPE CODES:**

1001 - Light duty gasoline vehicle  
1020 - Light duty gasoline truck 1  
1040 - Light duty gasoline truck 2  
1060 - Light duty gasoline truck total  
1070 - Heavy duty gasoline vehicle  
0001 - Light duty diesel vehicle  
0060 - Light duty diesel truck  
0070 - Heavy duty diesel vehicle

where:

STATE = 2-digit Federal Information Processing Standard (FIPS) code  
COUNTY = 3-digit FIPS code  
YEAR = 4-digit year  
ROAD TYPE = 2-digit road type code  
VEHICLE TYPE = 4-digit vehicle type code  
FACTOR = Growth Factor (e.g., .1, 1.1, 1.12, 1.123, etc.)

***NOTE: When creating this file, at least one space must exist between each field. Since the system is capable of handling floating point decimals, the growth factor character length and position of the decimal is flexible. In addition, do not use the following file names when creating the VMT file: VMT\_OUT.DAT or VMT\_OUT.SCC. These file names are created by the system when processing either the EGAS default VMT data or when processing user supplied VMT data. Using these file names could cause a loss of data or could cause the system to crash.***

# **TECHNICAL REPORT DATA**

*(Please read Instructions on the reverse before completing)*

1. REPORT NO. <b>EPA-600/R-93-067b</b>		2.		3. RECIPIENT'S ACCESSION NO.	
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16. ABSTRACT The two-volume report describes the development of, and provides information needed to operate, a prototype Economic Growth Analysis System (E-GAS) modeling system. The model will be used to project emissions inventories of volatile organic compounds (VOCs), oxides of nitrogen (NOx), and carbon monoxide (CO) for ozone nonattainment areas and Regional Oxidation Model (ROM) modeling regions. The report details the design and development of the E-GAS computer modeling software, and its relationships with internal modeling software components and external software. The system is an economic and activity forecast model which translates users' assumptions regarding regional economic policies and resource prices into Source Code Classification (SCC) level growth factors for VOCs, NOx, and CO. The report provides E-GAS users with sufficient background information to define and calibrate the E-GAS model, as well as the procedures and syntax necessary to operate the system. The organization of the document is determined by the process used in operating the system. The guide provides images of sample screens as well as text.					
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Mathematical Models	Emission	Stationary Sources	12A	14G	
Analyzing	Inventories	Economic Growth Analysis System (E-GAS)	05C	15E	
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