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Overview

- EGAS 4.0 Update Objectives
- Description of EGAS Version 3.0
- Development of EGAS Version 4.0
- Model Strengths, Limitations, and Potential Future Enhancements
Project Objectives

- Incorporate Current Information
  - Economic Data/Models
  - Forecasting Procedures
  - Source Category Lists
- New Model Environment
  - Windows 95/98/NT
  - Improve User Friendliness
EGAS Version 3.0

- DOS-Based Software Model
- Three-Tiered Approach
  - 1: National Economic Tier
  - 2: Regional Economic Tier
  - 3: Growth Factor Tier
- Each Tier Follows Sequentially from Preceding Tier Run
EGAS Version 3.0 (cont’d.)

- National Economic Tier
  - Bureau of Labor Statistics (BLS) or Wharton Econometric Forecasting Associates (WEFA) Projection
    - Final Demand Forecasts from Above Used to Drive Input-Output Models to Yield Forecasted Intermediate Demand for and Output by Industries
Regional Economic Tier

- Regional Economic Models, Inc. (REMI)
- Modeling Regions for:
  - Each Serious and Above Ozone Nonattainment Area
  - All Multi-State Moderate Nonattainment Areas
  - All Attainment Portions of States
- Nonattainment Areas as Defined at Time of EGAS Development
EGAS Version 3.0 (cont’d.)

➤ Growth Factor Tier

➤ Translates Economic Activity Projections from Regional Tier into Growth Factors by SCC

➤ Physical Output Module
➤ Household Model of Energy by State (HOMES) Module
➤ Commercial Sector Energy Model by State (CSEMS) Module
➤ Industrial Regional Activity and Energy Demand (INRAD) Module
➤ Neural Network Electric Utility Model (NEUMOD) Module
➤ Vehicle Miles Traveled (VMT) Module
➤ Crosswalk Module
Physical Output Module
- Output and Value Added from REMI Models
  - Regression Approach for 11 Major VOC Source Categories

HOMES Module
- Uses Projected Housing Starts and Household Income Data to Project Residential Energy Use
EGAS Version 3.0 (cont’d.)

➤ CSEMS Module
   ➤ Uses Forecasts of Fuel Prices, Disposable Personal Income, and Population to Project Energy Consumption in Commercial Sector

➤ INRAD Module
   ➤ Uses Forecasts of Capital, Labor, Energy, and Materials Costs and Capacity Utilization to Project Industrial Fuel Consumption
Neural Network Electric Utility Model (NEUMOD) Module

- Artificial Intelligence to Learn How Utilities Generate Electricity
- Uses Data Describing Generating Capacity, Climate, Peak Loads, Fuel Prices, and Power Pool Effects
- Projects Annual Electricity Generation from Combustion of Coal, Oil, and Natural Gas
Vehicle Miles Traveled (VMT) Module

Two Projection Methods

- Linear Regression of 1985-1990 Highway Performance Monitoring System (HPMS) VMT Data
  - Used for 1991-1996 Projections

- Allocation of National VMT Projections from EPA’s MOBILE4.1 Highway Fuel Consumption Model Based on Population Growth
  - Used for Post-1996 Projections
Crosswalk Module

- Assigns Growth Factors from Other Modules to SCCs
  - Determined by Information in SCC Description (e.g., Residential Fuel Combustion, Natural Gas)
  - SCCs Assigned Default Growth Factor of 1.0 if Not Specifically Projected by EGAS Module
BEAFAC Utility

- Develops Growth Factors from Bureau of Economic Analysis (BEA) Projections Data
  - Projections Represent Earnings Data
  - Standard Industrial Classification (SIC) Code-Basis
  - State-Level

- Developed for Use in the Emissions Preprocessor System (EPS) of the Urban Airshed Model
EGAS Version 4.0

- Base Year of 1996
- Projections Capability Through 2020
- Version 3.0 Modeling Regions Except Addition of 3 North Carolina Areas
  - Charlotte
  - Greensboro-Winston Salem
  - Raleigh-Durham
Physical Output Module

- Incorporation of Latest REMI Models
- Elimination of Some Sector Detail by BLS
- Elimination of Policy Simulation Capabilities
- New Regression Analyses Relating REMI Socioeconomic Variables to Emissions Activities
- Incorporation of NONROAD Model Growth Rates
EGAS Version 4.0 (cont’d.)

➤ HOMES, CSEMS, INRAD, NEUMOD

➤ Outdated Model Parameters/Modeling Approach

➤ Incorporated Department of Energy Forecasts from “Annual Energy Outlook”
  ➤ Additional Fuels
  ➤ Less Geographic Detail
EGAS Version 4.0 (cont’d.)

- **VMT Module**
  - **Phase I (1997-2002) Forecasting**
    - HPMS VMT Data for 1984-1997 Used in Area-Specific Time-Series Regressions
  - **Phase II (2003-2020) Forecasting**
    - Updated REMI Population Data
    - Correction of EGAS 3.0 Disconnect with Phase I Growth Factors
EGAS Version 4.0 (cont’d.)

- Crosswalk Module
  - Approximately 2,600 New SCCs
  - Reviewed/Revised Previous SCC Assignments
    (e.g., reduction in BLS sector detail)

- BEAFAC Utility
  - Most Recent (and Last) Set of BEA Projections
    - Value Added (Gross State Product) Data
EGAS Version 4.0 (cont’d.)

- Windows 95/98/NT and Revised User Interface
  - Model Selections More Intuitive
    - User Settings Summary Screen
    - Previous Model Run Settings Saved
    - User-Specified Output Directory
  - Processing Status Screen
EGAS Strengths and Limitations

➤ **Strengths**
  ➤ Comprehensiveness
    ➤ Geographic
    ➤ Source Category
  ➤ User Friendly

➤ **Limitations**
  ➤ Some Generic Forecasting Approaches
    ➤ Geographic Detail
    ➤ Source Category Detail
Potential Future EGAS Enhancements

- Updates to Model Input Data
- Re-specification of Modeling Regions
  - Revisions/Additions to Nonattainment Areas
- North American Industry Classification System (NAICS) Output Capability
- Review of Tier 3 Growth Factor Algorithms