Presentation of the Economic Growth Analysis System 5.0 (EGAS 5.0)

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Presentation Outline

- EGAS Overview
- Brief History of EGAS Development
- Improvements and Limitations of EGAS 5.0
- Status and Future Development Plans

EGAS Overview

- EGAS is an economic and activity forecast tool that provides credible growth factors for developing emission inventory projections
- Growth factors are generated through a sequential three-tiered approach:
  1. *National Economic Tier*— U.S. final demand forecasts (e.g., BLS) by sector drive regional economic models.
  2. *Regional Economic Tier*— Economic models (e.g., REMI) translate non-fuel related national economic activity into regional economic activity estimates (i.e., output, value added, employment) by sector; fuel-related combustion/production sectors rely on Census division combustion projections from DOE
  3. *Growth Factor Tier*— Regional economic activity projections are translated into emissions growth factors

Three-tiered Approach to Generating Growth Factors

- EGAS encapsulates the third-tier in the approach to generate emissions growth factors.
  - National- and regional-economic tiers occur outside of the EGAS tool.
  - These first two tiers generate the economic activity datasets used by EGAS in the projection of growth factors.

EGAS 5.0 Growth Factors

- Using EGAS 5.0's default economic activity data, annual growth factors can be generated:
  - for the 50 States plus DC
  - for all two- and three-digit SICs, approximately 8,000 SCCs, and 165 MACT codes
  - annually through the year 2035
- Growth factors for SICs, SCCs, and MACT codes are assigned via crosswalks; actual growth factors are developed for the native codes of economic activity data

EGAS 5.0 Inputs

- Default economic activity datasets in EGAS 5.0 are from:
  - REMI 53-sector 50 state +DC model, Version 5.5;
  - DOE's Annual Energy Outlook (2004);
  - MOBILE 4.1 model (this data source will be replaced in next release)
- Datasets that were included in EGAS 4.0 are also available in new version

REMI Model Variables in EGAS 5.0 (User's Choice)

VARIABLE	SPATIAL	TEMPORAL	SECTORAL
Constant dollar output (sales)	50 States + DC	Annual through 2035	166 non-farm private sectors (disaggregated from the REMI 53- sector model)
Employment	50 States + DC	Annual through 2035	Same as above
Constant dollar value added (GRP)	50 States + DC	Annual through 2035	Same as above
Consumption	50 States + DC	Annual through 2035	13 non-farm private sectors

Annual Energy Outlook (2004) Variables Used for EGU-related Growth Factors

VARIABLE	SPATIAL	TEMPORAL
Residential Fuel Combustion	9 Census divisions	Annual through 2030
Commercial Fuel Combustion	9 Census divisions	Annual through 2030
Electric Utility Fuel Combustion	9 Census divisions and National	Annual through 2030
Industrial Fuel Combustion	9 Census divisions and National	Annual through 2030
Total Energy Combustion	9 Census divisions	Annual through 2030
Agriculture	National	Annual through 2030

Census Divisions Used in AEO

Division Name	Division Acronym	States
New England	NE	CT, ME, MA, NH, RI, VT
Middle Atlantic	MA	NJ, JY, PA
East North Central	ENC	IL, IN, MI, OH, WI
West North Central	WNC	IA, KS, MN, MI, NE, ND, SD
South Atlantic	SA	DE, DC, FL, GA, MD, NC, SC, VA, WV
East South Central	ESC	AL, KY, MS, TN
West South Central	WSC	AK, LA, OK, TX
Mountain	MTN	AZ, CO, ID, MO, NV, NM, UT, WY
Pacific	PAC	AK, CA, HI, OR, WA

MOBILE 4.1 Model Variables

VARIABLE	SPATIAL	TEMPORAL	SECTORAL
Total Vehicle Miles Traveled	National	Annual through 2035	Not applicable

Note: The MOBILE 4.1 data in EGAS 5.0 Beta is serving as a placeholder while updated VMT methodology is being developed for inclusion in the next release of EGAS scheduled for early Spring 2005.

Brief History of EGAS Development

- EGAS was originally developed by Alliance Technologies in 1993; written in C++.
- Pechan and Associates (Pechan) was contracted by EFIG/EMAD to develop version 4.0; completed in 2001.
- Development of EGAS 5.0 carried out by ISEG/AQSSD; Abt Associates (Abt) and Pechan are contractors.
  - Abt responsible for software development and user interface
  - Pechan responsible for methodology and crosswalks

Strategy for EGAS 5.0 Development

- An EGAS improvement workgroup was assembled by ISEG to include interested staff from AQSSD, EMAD, ORD's Global Change Research Program and Atmospheric Modeling Division.
- Suggested improvements to EGAS 4.0 were collected and several have been incorporated in EGAS 5.0 Beta.
- The additional improvements form the basis of the future development plan of EGAS.

Suggested Improvements by EPA Staff

Office/Division	Would like:
OAQPS/AQSSD (Aaiysha Khursheed, Linda Chappell, Ron Evans, Tyler Fox*, Art Rios) *now in EMAD	▪ a consistent economic-based approach for the Agency to develop growth factors for projecting emissions inventories ▪ **to allow for user flexibility in selecting desired inputs within consistency bounds** ▪ **to streamline ability to update and maintain EGAS, i.e., facilitate updates of national and regional economic inputs over time** ▪ **to improve transparency of EGAS operation**
OAQPS/EMAD (Madeleine Strum, Marc Houyoux)	▪ **to add Alaska & Hawaii**, and Puerto Rico & the Virgin Islands ▪ **the ability to maintain an "EPA default mode" to allow for ease and consistency in generating EGAS growth factors** ▪ **the possibility of generating growth factors out to 2030**
ORD/Climate (Anne Gramsch, Dan Loughlin, William Benjey)	▪ **greater user flexibility to choose inputs used by EGAS, i.e., advanced mode operation** ▪ to use EGAS to conduct sensitivity analyses, i.e., multiple future economic scenarios upon which to base growth factors ▪ to be able to generate growth factors out to 2050 ▪ to operate EGAS using a command-line prompt

Improvements Incorporated in EGAS 5.0

- One downloadable executable program file instead of the numerous files required by EGAS 4.0
- Simple graphical user interface; more transparent methodology
- Transition to a flexible approach that allows users to manipulate default datasets or input custom datasets (e.g., EMPAX, AMIGA)
- Added ability to generate growth factors by 3-digit SIC as well as by MACT code; updated SCC crosswalk
- Incorporated regression-based growth factors for certain MACT codes and SCCs
- Allow user to select base year beginning in 2001

Limitations of EGAS 5.0

- Certain SCC and MACT growth factors are based on regressions; users must look at Functions file to determine which ones
- The national VMT projections contained in this version are the same from EGAS 4.0; these are outdated and are being revised
- EGAS 5.0 Beta relies upon a limited set of economic activity data sources; EPA plans to include additional sources and users have the option to input their own
- EPA includes economic activity data in EGAS 5.0 as a default; States and Regions are expected to have a better understanding of influences on their growth factors and therefore are encouraged to update/customize economic activity data

Status and Future Development Plans

- Beta version 5.0 is complete and posted at: http://www.epa.gov/ttn/ecas/egas5.htm
- A brief user's manual (approx. 20 pages) has been written by Abt and is at website too; manual only describes how to operate EGAS 5.0 Version Beta
- Testing of current version begins now through end of February 2005; send comments to khursheed.aaiysha@epa.gov and cc: rios.arturo@epa.gov

Short-Term Development Plans

- Comparison of growth factors generated from different economic activity data sources (to address the strange growth factors based on REMI data for CAIR rule)
- Add command-line prompt to facilitate the incorporation of EGAS into the PHOENIX framework
- Add automatic generation of metafile for each EGAS run and store in database that can be queried (to improve transparency)
- Add economic activity datasets from EMPAX and AMIGA
- Clarify growth factors generated through regressions

Short-Term Development Plans (continued)

- Consider the addition of approximately 1,000 “pseudo” SCCs
  - “pseudo” SCCs are not on official EPA lists
- Update methodology to generate VMT-based growth factors to replace VMT from MOBILE 4.1
- Address limitations to software programming that prevents
  - regressions from being based on previous year’s data
  - regressions to vary by state
- Rewrite user’s manual and documentation
- Add NAICS crosswalk

Long-Term Development Plans

- Programmatic changes to improve the user interface and intensive upgrade to data inputs
- Improve reporting updates especially as they pertain to sensitivity and bounding analyses
- Add visualization capabilities
- Continue to update EGAS documentation