The AMIGA Modeling System
Overview

The AMIGA model is a dynamic, computable general equilibrium (CGE) model of the U.S. and world economies. A solution path is computed using a modified Gauss-Seidel algorithm. The model runs to year 2050, with a special capability to extent to 2100 for climate assessment analysis. AMIGA, short for "All Modular Industry Growth Assessment," is a flexible modeling system programmed in C code.

For the U.S. economy the model represents about 200 sectors derived from the 1997 Benchmark Input-Output (I-O) Table. The I-O accounting provides the framework in which all the components of the economy can be represented. Production processes are represented as columns. Supply and demand conditions are represented by rows. Each cell in the Table represents expenditures on an input good, service, labor or capital. These expenditure terms are in some cases disaggregated to take into account differences in physical characteristics. For example, physical flows in oil refineries (which is a single sector in the I-O accounts), is represented by about twenty physical petroleum-related flows in the AMIGA refinery module. Key energy supply and energy-intensive demand processes are represented as independent modules and connected in a consistent framework. For other world regions, the accounting framework is provided by the Global Trade Analysis Project (GTAP) database, housed at Purdue University. Some of the key modules are described below.

Power generation is modeled at the unit level with about 2000 boiler records in the U.S. Generation units are dispatched on a least cost basis. The model provides state, region, and national reports for generation, peak power capacity, fuel use, emissions, operating costs, and investment expenditures. Enhancements are underway to improve the representation of renewable energy (wind, biomass, geothermal, solar) and transmission investment requirements. Technology improvements are represented over time, and advanced technologies such as IGCC with carbon capture and sequestration, are included.

The AMIGA gas and coal supply modules are currently reduced form representations constructed from the NEMS gas supply and coal supply modules. These reduced form gas and coal supply functions are based on multiple runs of the NEMS model for different fuel demands and prices. These reduced form estimates are done by 5-year period to account for the expected rapid technical advances in exploration and production for gas and in coal mine productivity. The world oil price is currently a scenario parameter (or response function to oil import reductions).

The light-duty vehicle module has a flexible design allowing for any number of vehicle types. Currently we model six drive-trains including fuel cell vehicles and electric hybrids. Eight size classes are represented from subcompact cars to large SUVs and delivery trucks. Transportation freight modes are also represented including trucks, air travel and freight, rail transport, and water transport. Technological advance is represented in new vehicles. The on-road stock of vehicles is tracked by the model by

vintage and other characteristics. The vehicle module calculates transportation fuel use, new sales, and expenditures.

Many end-use technologies are represented including combined heat and power (CHP). Investment in these technologies is driven by end-use energy prices and demand for related services such as housing. Capital stocks accumulate over time, with the model tracking vintage, energy intensity, and other characteristics. Long-run price elasticities of electricity and fuel demands are much greater than short-run elasticities.

At the macroeconomic level, the model calculates vectors of final demands for consumers, government, private investment, and foreign trade. The model allocates labor and capital resources to sectors and production processes to satisfy the set of supply and demand conditions. Rising productivity is the most important source of the economy's full-employment growth rate.