

Working Paper No. 2

Energy and Transportation Databases

A fundamental underlying need for the U.S. LCI database is a common database for energy and transportation. For transparency it is essential that the various unit process data within the LCI database are linked to common data sets for the production and consumption of fuels used for process and transportation energy. Otherwise, differences between products are clouded by differences in the underlying energy data. This is currently a major problem in comparing results from different LCI sources. For example, the energy and emissions profile for the use of 100 kwh of electricity can vary widely depending on the fuel grid used, the data for the production and consumption of each fuel, and the generating efficiency and transmission losses modeled.

The energy and transportation data sets must include not only the *combustion* energy and emissions for each type of fuel used for process or transportation energy but also the *precombustion* energy and emissions, that is, the energy and emissions to extract, process, and deliver each type of fuel or energy. These types of data are generally developed from publicly available government and industry publications.

Electricity data are available in various levels of detail, from national and regional grids to state- and even power plant-specific data. Because of the interconnectedness of the electricity supply chain, however, we believe that the lowest meaningful level of detail is regional. The electricity grids used in an LCI should match the functional unit and boundaries. Where unit process data are available on a regional basis, regional grids should be used. In cases where unit process data cannot be related to specific regions, the national grid will be used. It is also customary for special cases where electricity is a major issue, such as electro-process industries, that specific industry data are used. (Fuel use for self-generated electricity, however, is generally included in the process energy reported for a unit process.) Both national and regional electricity grids will be included in the fuels and energy database.

The Franklin Associates, Ltd. fuels and energy database (updated and provided to the U.S. EPA in 1998) contains the following data:

Process and Transportation Energy and Process Emissions for:

- Mining and Processing of 1,000 Pounds of Coal
- Production and Processing of 1,000 Cubic Feet of Natural Gas
- Production and Processing of 1,000 Gallons of Residual Fuel Oil
- Production and Processing of 1,000 Gallons of Distillate Fuel Oil
- Production and Processing of 1,000 Gallons of Gasoline
- Production and Processing of 1,000 Gallons of Liquefied Petroleum Gas (LPG)
- Production of 1,000 Pounds of Fuel Grade Uranium

Transportation Fuel Requirements (in fuel units and Btu/ton-mile for various transportation modes; Btu include precombustion and combustion energy)

Energy Consumption for the Generation and Delivery of One Composite Kilowatt-Hour (in fuel units and Btu; precombustion and combustion energy; based on U.S. national grid)

Energy Factors for Various Fuels (in million Btu/1,000 units; pre-combustion and combustion energy)

Total Precombustion Fuel Use and Fuel-related Emissions for:

- Production of 1,000 Pounds of Coal
- Production of 1,000 Cubic Feet of Natural Gas
- Production of 1,000 Gallons of Residual Oil
- Production of 1,000 Gallons of Distillate Oil
- Production of 1,000 Gallons of Gasoline
- Production of 1,000 Gallons of Liquefied Petroleum Gas (LPG)
- Production of 1,000 Pounds of Fuel Grade Uranium

Environmental Emissions (pre-combustion and combustion) per 1,000 fuel units for:

- Combustion of Coal in Utility Boilers
- Combustion of Coal in Industrial Boilers
- Combustion of Residual Oil in Utility Boilers
- Combustion of Residual Oil in Industrial Boilers
- Combustion of Distillate Oil in Utility Boilers
- Combustion of Distillate Oil in Industrial Boilers
- Combustion of Natural Gas in Utility Boilers
- Combustion of Natural Gas in Industrial Boilers
- Combustion of Natural Gas in Industrial Equipment
- Diesel Powered Industrial Equipment
- Gasoline Powered Industrial Equipment
- Combustion of Liquefied Petroleum Gas in Industrial Boilers
- Combustion of Fuel Grade Uranium
- Combustion of Wood in Industrial Boilers
- Tractor-Trailer Gasoline Powered Trucks
- Tractor-Trailer Diesel Powered Trucks
- Single Unit Gasoline Powered Trucks
- Single Unit Diesel Powered Trucks
- Diesel Powered Locomotives
- Barges
- Ocean Freighters

Franklin Associates' energy and transportation data (along with other LCI unit process data) have been subjected to critical reviews of Franklin Associates LCI studies conducted in 1998 and 2001. The energy and transportation data will need to be updated for use in the national LCI database. Current regional electricity data will also be developed. In addition, it has been suggested that data for air transport be developed and added to the database. Other additions to the fuels and energy database may be suggested by the technical advisory group.