BACKGROUND DOCUMENTS PERTINENT TO THE PRESENTATION

"NEEDS AND PRIORITIES FOR CONSUMPTION INFORMATION IN THE FUTURE"

To be presented by Dwight French at an October 5 breakout session
Of the ASA Committee on Energy Statistics

The attached documents are drafts of two chapters of a larger history of the Energy Consumption Area of EIA being written by Dwight French, Director of the Energy Consumption Division. These chapters discuss the sectoral organization and coverage of the Division's programs, and give an idea of some of the limitations that exist in the Division's programs. The purpose of the session is to consider the limitations inherent in the Division's programs and discuss priorities for the future programs of the Division.

COMPREHENSIVE BACKGROUND ON AND DOCUMENTATION OF THE ENERGY CONSUMPTION DATA PROGRAM IN EIA

Chapter 3: Sectoral Organization and Coverage of Consumption Data Programs

Overview of the Organization of Economic/Social Sectors

As was discussed in Chapter 2, it seems logical that energy consumption statistics would be best covered by data systems that deal with all energy sources at once, but deal separately with different activity groups that use energy in much different ways. The overarching, broad activity categorization used by EIA that relates to energy use is a 5-sector categorization: residential, commercial, industrial, transportation, and utilities. Data from the consumption area of EIA correspond roughly to these sectoral designations, but there are many ways in which they do not coincide, as explained below.

One way to start to approach activity classification is to work with the Office of Management and Budget's standard classification of economic activities, currently called the North American Industry Classification System (NAICS). Although this system, as well as its predecessor, has "industrial" in the title, its aim is to categorize all business and organizational activity, not just that which is commonly thought of as "industrial". The purpose of the classification system is to provide a means of characterizing and organizing activities that occurs at fixed, well-defined individual locations, which are called "establishments". The primary activity carried out within an establishment determines its classification. The classification is hierarchical; that is, very broad sectors encompass groups of individual, narrower industries, which in turn encompass individual products or outputs, or groups of products/outputs.

The early sectors of NAICS do indeed fit into a traditional "industrial" concept; that is, a concept of extraction/construction/transformation/assembly of materials or raw inputs into later-stage or finished goods. These sectors include: Agriculture, forestry, fishing, and hunting; mining; construction; and manufacturing. For its supplier-based statistics, EIA generally accepts a concept of "industrial" that encompasses all these activities, though some data programs treat agriculture and/or mining as separate sectors. This point of view can sometimes be at odds with public perception of "industrial" activity as essentially manufacturing, with the other activities being their own main sectors. The consumption data area is perfectly willing to go along with EIA's general inclusive concept of the industrial sector; however, as with major economic surveys, there is enough variation among the various subclasses of activities with regard to their energy use that EIA customer surveys would have to address these subgroups of activities separately.

The remainder of the NAICS encompasses an enormous variety of activities that can be summarized in a single word as "service" activities. They include wholesale and retail trade; transportation/warehousing; information; finance/insurance; real estate/rental/leasing; professional/scientific/technical services; central management of

enterprises; administrative and support activity; educational services; heath care and social assistance; arts, entertainment and recreation; accommodation and food services; public administration; and all other services, a catch-all category encompassing repairs, religious activities, laundries, personal and death care, and a wide variety of others. EIA generally calls energy use for this entire set of activities "commercial". Here EIA also differs from the common public concept of "commercial", which connotes business activity involving goods and services, but not necessarily organizational/institutional service activities such as schools, prisons, facilities of religious and social organizations, etc. The EIA consumption data area also embraces this comprehensive concept of "commercial" through its data collection activities.

Very little of this economic activity involves personal living. Some activities, such as prisons, colleges, long-stay boarding places, monasteries and convents, etc. can be considered to have personal living quarters as an integral part of the activity or contained within a more general activity, and this can cause classification confusion with the overwhelmingly predominant source of personal living activity, individual housing units. The general public is clear about the concept of personal living as a major societal activity, and EIA also recognizes "residential" as a separate core sector for purposes of classifying energy use. Most living quarters associated with what EIA characterizes as "commercial" activity are not treated as "residential" by either EIA generally or the consumption data area specifically. However, as mentioned in Chapter 2, confusion does arise for some large apartment buildings, which are obviously residential in activity and are covered that way by the consumption area, but which some energy suppliers classify as commercial.

The energy-consuming sector that is perhaps perceived to be clearest in the public's mind's eye, but seems to be the most difficult to categorize and address, is transportation. Other than the "transportation/warehousing" sector in NAICS, which covers establishments whose major activity is providing transportation services (trucking companies, cruise lines, train/bus companies, etc.), the concept of transportation is mentioned virtually nowhere – and yet it is everywhere, in the form of an enormous variety of vehicles – land, sea, and air – that support or complement all other types of activity. And even the transportation services industries have organizational activity such as offices, repair shops, loading docks/piers, etc. and separate activity of the actual vehicles that move the passengers or freight. To the public, and to EIA, transportation is vehicles, and so vehicle activity, including energy use, is addressed in its own separate sector, regardless of how it is associated with residential, commercial, industrial, or utility activities. But even that concept can have some grey areas – for example, does a bulldozer "transport" dirt from one part of a construction site to another or should it be considered part of construction activity, and thus, the industrial sector? Does the captive forklift at a hardware store "transport" goods or merely support the broader commercial activity at the facility?

Utilities as an end user of energy were until recent times considered to be a clearly defined sector. EIA's consumption area did not cover this sector at all, because as energy transformers or distributors, they have been treated as part of the energy supply stream

and have thus been covered by the supply area of EIA. Recently however, with the advent of restructuring in the electricity industry, new types of generating facilities have come into existence that are associated with energy users in various ways, rather than being simply energy transformers for the general public. Some of the activity and energy use in these facilities is inextricably associated with commercial or industrial activity, and therefore, some of this activity is covered in certain of EIA's consumption surveys. EIA is trying to clarify the relationship among its various supplier surveys and between energy supply programs and the energy consumption area as the energy industry continues to evolve.

Overview of Sectoral Coverage by Energy Consumption Data Programs

Consumption data programs cover the sectors mentioned above as follows:

Residential: EIA's Residential Energy Consumption Survey (RECS) covers private housing units, regardless of the type of structure, but does not cover institutional group quarters such as nursing homes, prisons, monasteries and convents, and college dormitories. RECS covers only permanent housing that is occupied at the time of survey fieldwork. Vacant and seasonal housing units are not in scope for the survey, nor are units that are condemned, demolished, or not yet fully constructed and occupied at the time of the survey. All types of housing units are within scope of the RECS: single family detached homes; townhouses; apartments; mobile homes, whether or not they are "permanently" anchored to a foundation; and condominiums.

Commercial: EIA's Commercial Buildings Energy Consumption Survey (CBECS) covers activity across the range of economic activities described above as being within EIA's concept of "commercial". However, EIA covers only the energy use in this sector that occurs within, or is associated with, buildings that are primarily commercial and intended for human occupancy [with a building defined as a structure totally enclosed by walls extending from the foundation to the roofline]. Enclosed buildings such as cooling towers, mausoleums, and road chemical storage domes are not included, nor are non-enclosed structures such as bridges, pumps, light poles, park pavilions and amphitheatres, cell phone towers, open-walled parking garages, or billboards. Vacant buildings are included, but demolished and not-ready-for-occupancy buildings are excluded. Further, buildings with less than 1,000 square feet of floorspace are excluded for ease of survey fieldwork. Research studies have shown that the proportion of commercial energy use represented by the facilities excluded from CBECS is less than 5% and comparisons with EIA supplier-based data programs suggest the same conclusion (though some data comparisons can be obscured by the problem of differing sectoral definitions).

Industrial: EIA's Manufacturing Energy Consumption Survey (MECS) covers in-operation establishments across the entire range of manufacturing industries. Establishments with fewer than 5 employees are excluded from the MECS, for ease of survey operations and to be consistent with the mail survey population for the Census Bureau's quinquennial Census of Manufactures. Census studies based on administrative

records have shown that the non-mail portion of the CM frame represents about 3% of manufacturing product shipments, and likely an equivalent proportion of energy use. EIA has never fielded any consumer-based surveys of any of the other subsectors of the industrial sector as we define it. Scattered energy consumption and/or expenditures information does exist for mining and agriculture. The data for agriculture are scattered and not very useful because the information sources are designed primarily for economic purposes. Fairly complete energy information is available for mining from the Census Bureau's quinquennial Census of Mineral Industries, conducted for data years ending in 2 and 7. There are no known national consumer-based data for construction, a very difficult sector to address because most of its energy consumption takes place at temporary sites. Therefore, over the longer term there are no fixed data collection points to depend on, except possibly for construction company headquarters, which, when they exist, may or may not keep energy records. Comparison of MECS data with EIA supplier-based information suggests that manufacturing accounts for about 75 – 80 percent of broader industrial energy use.

Transportation: EIA currently conducts no consumer-based surveys of transportation energy use. The consumption area used to conduct a survey of household highway vehicles, the Residential Transportation Energy Consumption Survey, as an adjunct survey to the RECS. However, that survey was discontinued after the 1994 cycle for budgetary reasons. EIA has considered, but never implemented, a national survey of nonresidential highway vehicles and vehicles for other modes of transport (buses/aviation/trains/ships/pipelines). The consumption area did do a few special studies in the first half of the 1990's involving nonresidential highway vehicles for purposes of assessing market potential for alternative-fuel vehicles. However, those efforts were discontinued for budgetary reasons as well.

In an attempt to fill the void in transportation energy data, the consumption area has created a derived household vehicle energy database using information from the Department of Transportation's 2001/2002 National Household Travel Survey (NHTS). The results of this effort are of uncertain quality. The NHTS is fielded primarily to collect trip data, and much of the most useful information to estimate energy consumption and expenditures is not collected. The consumption area is currently investigating the feasibility of using the Census Bureau's Vehicle Inventory and Use Survey (VIUS), which covers both residential and nonresidential highway vehicles, to derive an energy database for nonresidential highway vehicles and to check the validity of the NHTS-based data.

Utilities: As mentioned earlier, the Consumption area has never surveyed any utilities in any way other than brief efforts in the early 1990's to survey utility vehicle fleets in order to assess the market potential for alternative-fuel vehicles. We plan no efforts in the utility area in the foreseeable future. The only connection that the consumption survey area has to this sector is that some commercial and manufacturing survey respondents, because they are required to report all energy activity onsite, may include some self-generation activity for electricity, including activity by generation facilities that also sell

to the grid or to other customers. This type of activity can intersect with supply-based information collection, often in unclear ways.

Much more detail about EIA consumption survey programs and their coverage will be given in the sector-specific and special program discussions in later chapters.

COMPREHENSIVE BACKGROUND ON AND DOCUMENTATION OF THE ENERGY CONSUMPTION DATA PROGRAM IN EIA

Chapter 16: The Sectors that the Consumption Survey Program Doesn't Cover

First Draft: August 28, 2006

Chapter 3 of this document ended with a summary of what EIA's Consumption Survey program does and does not cover in the various energy-using sectors of U.S. society. This chapter is intended to give more detail about these "other" sectors and describe activities and investigations in these sectors that have taken place over the years.

Residential: EIA's RECS covers private housing units, regardless of the type of structure, but does not cover institutional group living quarters with 10 or more unrelated residents, such as nursing homes, prisons, monasteries and convents, and college dormitories. These types of institutions are within the scope of the CBECS. It should be noted that RECS covers energy use associated with housing units, which could include facilities other than the housing unit itself (e.g., a detached garage or workshop) on the housing unit property. Because the energy use associated with housing units is captured from billing records that that most often encompass all activities associated with the housing unit and its environs, RECS energy use does include some energy used for commercial and industrial business activity run out of housing units (medical offices, hairdressing and other beauty treatments, pottery-making, etc.). However, RECS does try to get a rough assessment of what proportion of energy use is associated with non-household activity. In scattered instances these activities might be measured separately through their own dedicated meters and accounts. In such cases the objective would be to count only the use associated with household activity.

Vacant and seasonal housing has never been covered in the RECS, and no serious thought has ever been given to doing so, either as part of RECS or as a separate data system. However, there have been attempts over the years to at least guess as to the amount of energy use associated with such living quarters. Usually such attempts have been very informal, and result in the conclusion that total energy use in vacant/seasonal housing is no more than a few percent of household energy use.

The overriding reason for excluding vacant and seasonal housing from RECS is the logistical difficulty in contacting a responsible respondent and obtaining an interview in such units. Of course, that difficulty is due to the fact that RECS accesses housing units by contacting them at their physical location. A possible alternative approach to gathering information about seasonal homes is to try to collect information about them from their owners; that is, ask RECS respondents if anyone in the household owns a second home, and if so, is it used year-round, seasonally, or is it vacant and not in use at the current time. There are statistical and measurement difficulties associated with such an approach, but enough might be able to be circumvented that EIA could provide at least rough estimates of the characteristics and energy use of these units. Such an approach

would not cover vacant and seasonal units owned by commercial entities such as realty companies. Some of these units would be considered commercial (e.g., lodging) units, and be included in CBECS.

Commercial: EIA's CBECS covers a wide range of economic activities considered to be within EIA's concept of "commercial". The scope of activity essentially includes all business, institutional, and organizational entities not classified as residential, utility, or industrial. However, EIA covers only the energy use in this sector that occurs within, or is associated with, buildings. The buildings must have more than half their floorspace devoted to commercial activity and be intended for human occupancy [with a building defined as a structure totally enclosed by walls extending from the foundation to the roofline].

As mentioned earlier, enclosed buildings such as cooling towers, mausoleums, and road chemical storage domes are not included, nor are non-enclosed structures such as bridges, pumps, light poles, park pavilions and amphitheatres, cell phone towers, open-walled parking garages, or billboards. Some early methodological work indicated that these structures all together represent less than 5 percent of total commercial energy use, though the percentage of electricity use might be a bit over 5 percent. Unlike the RECS situation, vacant buildings are included because their owners are commercial entities that can usually be located. However, demolished and not-ready-for-occupancy buildings are excluded. Further, buildings with less than 1,000 square feet of floorspace are excluded for ease of survey fieldwork. From early buildings surveys, these small buildings represent more than 10 percent of commercial buildings, but only a few percent at most of commercial energy use.

The CBECS does have a few annoying (from the point of view of activity purity) building-centered exclusions. The most important is commercial activity in buildings whose primary activity is in some other sector. Examples include commercial establishments located in the lower floors of large city buildings that are mostly residential, and sales operations in the front of manufacturing facilities. The first of these has no clear building-based solution and has never been addressed. The second, while annoying, is not an overall coverage concern within the Consumption program area because that energy is covered in the MECS. Likewise, entire buildings devoted to commercial activity that are located on manufacturing establishments (central administration buildings, warehouses, research laboratories, employee cafeterias, etc.) are excluded from CBECS because of the difficulties in identifying and accessing them, but the energy associated with those activities is captured in MECS, which is establishment-based.

Industrial: EIA's Manufacturing Energy Consumption Survey (MECS) covers in-operation establishments across the entire range of manufacturing industries. Establishments with fewer than 5 employees are excluded from the MECS, for ease of survey operations and to be consistent with the mail survey population for the Census Bureau's quinquennial Census of Manufactures. Census studies based on administrative records have shown that the non-mail portion of the CM frame represents about 3% of

manufacturing product shipments, and likely an equivalent proportion of energy use, even though it accounts for as much as 1/3 of the establishments in the frame.

EIA has never fielded any consumer-based surveys of any of the other subsectors of the industrial sector as we define it. Fairly useful energy information is available for mining from the Census Bureau's quinquennial Census of Mineral Industries, conducted for data years ending in 2 and 7. The characteristics information available for the mining industries is somewhat comparable to what is available for manufacturing from MECS. There are no known national consumer-based data for construction, a very difficult sector to address because most of its energy consumption takes place at temporary sites. Therefore, over the longer term there are no fixed data collection points to depend on, except possibly for construction company headquarters, which, when they exist, may or may not keep energy records.

The agriculture, forestry, and fisheries industries are the most-examined part of the industrial sector that has not been addressed directly by EIA. Agriculture energy use was asked in the distant past as part of the Farm Costs and Returns Survey (FCRS), an annual survey that has been superseded in later years by other farm economic survey systems. It is believed that the last time that the FCRS collected information on expenditures for individual energy sources was 1982, and it is uncertain whether the FCRS ever collected physical quantities of energy sources. The quinquennial Census of Agriculture used to collect expenditures for a relatively detailed breakout of major energy sources, but in response to budget pressures beginning in the 1990's they have collapsed their fuel expenditures into a single category and merged expenditures for electricity with water expenditures, making the expenditure data virtually worthless. Again, the Census of Agriculture has never collected quantities of energy consumed. Therefore, the only way that energy consumption could ever have been provided from Agriculture data sources was to use independent energy price data to apply to expenditures.

Three times over the past 15+ years the Energy Consumption area has approached the Department of Agriculture with the idea of developing an energy consumption/expenditure collection to either run as a separate survey or append to a standing farm economic survey. In each instance, however, the funds have not been available to follow up on this possibility. Because agricultural energy use is fairly substantial and politically sensitive as rising energy costs squeeze the farm economic model, there is a defensible case to be made for continuing to try to develop an agricultural energy collection. Logically, such a collection would be done at about the same time as MECS, so that a more complete, unified picture of industrial energy use could be presented. It is likely that merging energy data collection onto an existing Farm Economic Survey would cost EIA at least $500,000 at this time.

Transportation: Since the RTECS was discontinued after its 1994 cycle, EIA has conducted no consumer-based surveys of transportation energy use. In an attempt to fill the void in household transportation energy data, the consumption area has created a derived household vehicle energy database using information from the Department of Transportation's 2001/2002 National Household Travel Survey (NHTS). The results of

this effort are of uncertain quality. The NHTS is fielded primarily to collect trip data, and much of the most useful information to estimate energy consumption and expenditures is not collected. The consumption area is currently investigating the feasibility of using the Census Bureau's Vehicle Inventory and Use Survey (VIUS), which covers both residential and nonresidential highway vehicles, to derive an energy database for nonresidential highway vehicles and to check the validity of the NHTS-based data.

EIA has considered, but never implemented, a unified national survey of nonresidential highway vehicles and vehicles for other modes of transport (buses/aviation/trains/ships/pipelines). The one significant effort in that regard began in the late 1980's and advanced as far as a Federal Register notice released in 1991 asking for comments and data needs regarding such a survey system. However, money for such an initiative never materialized, and the idea was dropped. The major problem in trying to develop and implement such a system is that nonresidential transport is so varied in mode, types of vehicles, and purposes for which the vehicles are used that any attempt to survey the population would involve many separate lists, samples, and data collection forms. Such an effort would certainly result in a multi-million dollar contract outlay and a large expenditure of Federal FTE to administer all of the collection and dissemination efforts. There is a defensible rationale for such an effort to take place – nonresidential transport energy use exceeds both household and commercial sector energy use – but there has never been significant political or economic impetus to deal with it.

It should be noted that the Center for Transportation Analysis at Oak Ridge National Laboratory compiles transportation statistics for the Department of Energy's Office of Energy Efficiency and Renewable Energy in an annual publication entitled the Transportation Energy Data Book. This extremely comprehensive and useful volume is about the best reference on transportation energy that can be found, but much of its contents deal with data items only marginally related to energy, and much of the energy data is scattered and not as comprehensive and reliable as one would like. Plus, much of the data is displayed in summary accounting form – there is not a lot of associated characteristics information that would be helpful in analyzing nonresidential transportation energy use.

The consumption area did do a few special studies in the first half of the 1990's involving nonresidential highway vehicles as part of a larger initiative for purposes of assessing market potential for alternative-fuel vehicles. However, those efforts were discontinued for budgetary reasons as well. This initiative will be discussed in more detail in the next chapter on special initiatives.

Utilities: The Consumption area has never surveyed any utilities in any way to collect the energy they use internally, other than the previously mentioned efforts to collect information on their vehicle fleets. Surveying utility energy use for their business purposes is the responsibility of other EIA offices. The only connection that the consumption survey area has to this sector is that some commercial and manufacturing survey respondents, because they are required to report all energy activity onsite, may include some self-generation activity for electricity, including activity by generation

facilities that also sell to the grid or to other customers. This type of activity can intersect with supply-based information collection, often in unclear ways.