A Regulatory Burden:

The Compliance Dimension of Regulating CO_2 as a Pollutant

For the U.S. Chamber of Commerce

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Executive Summary

Estimates of the costs of restricting carbon dioxide (CO_2) emissions have generally focused on the penalties arising from the associated direct or indirect increases in the cost of energy. Since hydrocarbons provide 85 percent of all U.S. energy, such fuel-cost penalties could be substantial and widespread. But generally missing from economic analyses to date is inclusion of the regulatory and bureaucratic costs from complying with and enforcing federal pollution laws should the U.S. Environmental Protection Agency regulate CO_2 and other greenhouse gases under the Clean Air Act (CAA).

Classifying CO_2 as a pollutant and regulating it under the CAA, or similar, domains would bring to force all the necessary related tracking, reporting and enforcement authorities. Many large enterprises (notably electric utilities, chemical plants, etc.) already accommodate the costs, and risks, of federal regulatory compliance. However, establishing operations and procedures to comply with federal Clean Air Act regulations would be a new experience for most small and mid-sized businesses, especially those that do not have infrastructure for such regulatory regimes, the staff time, consulting support and legal services. There is as well an associated potential risk for penalties arising from errors in compliance, recording, documenting or reporting. For many to-be-regulated businesses, it is possible that compliance costs could exceed the direct fuel price increase anticipated in a CO_2-constrained world.

Under proposed modifications to the CAA, a business would become a regulated "stationary source" if it emits over 250 tons per year (TPY) of CO_2.[1] On average, this emissions threshold is reached when a business uses about $70,000[2] of oil or natural gas per year in "stationary" equipment (i.e., not cars, trucks and similar). How many commercial businesses, manufacturers and farms exceed this threshold?

By analyzing U.S. Census and Energy Information Administration data for energy consumption in manufacturing, commercial buildings, and farming, this report finds that **at 250 TPY for CO_2, a total of over one million businesses[3] involved in manufacturing, operating buildings and services, and farming could become subject to new EPA regulations, monitoring, controls and enforcement.**

- At least **one million mid-sized to large commercial buildings** emit enough CO_2 per year to become EPA regulated stationary sources. The threshold would be reached, for example, by one-fifth of all food service businesses, one-third of those in health care, half of those in the lodging industry, even 10 percent of buildings used for religious worship.

- Nearly **200,000 manufacturing operations** would become regulated CO_2 sources. For the majority of industries, the average sized operation is big enough (in terms of emissions) to trigger the 250 TPY emissions threshold. At the top of the list are chemicals, metal fabrication, food processing, minerals, plastics, paper, and electrical equipment.

- About **20,000 large farms** emit enough CO_2 per year to become regulated stationary emissions sources. At the top of the list are greenhouses and nurseries, poultry and egg production, vegetable and melon farms, pig and dairy farms. (Limitations in primary data do not permit a complete analysis, and the number is likely an underestimate.)

1 Note that a small number of specifically designated industrial enterprises (e.g. oil refineries) would trigger this provision at a 100 ton-per-year level. This analysis incorporates those exceptions as indicated in relevant tables in this document.

2 Calculating 250 TPY in terms of dollars: assume $10 per 1000 cubic feet natural gas, or $3 per gallon oil yields ~ 7 lbs CO2/$

3 These estimates likely underestimate the impact because of limitations in the primary data.

Executive Summary Tables

The number and types of businesses potentially subject to proposed CO_2 regulation

Table 1: Industrial Sector Summary

Business type	Estimated # establishments regulated @ 250 TPY	Total Site CO_2 emissions subject to reg
		million tons
Fabricated Metal Products	26,000	9
Food	15,000	50
Machinery	12,000	3
Nonmetallic Mineral Products	11,000	60
Printing and Related Support	9,300	1
Plastics and Rubber Products	9,200	7
Chemicals	8,900	200
Wood Products	8,400	3
Transportation Equipment	7,300	10
Computer and Electronic Products	7,200	3
Miscellaneous	5,100	1
Paper	4,200	60
Primary Metals	4,200	100
Furniture and Related Products	3,600	0
Apparel	3,600	1
Electrical Equip., Appliances	3,500	3
Textile Product Mills	2,900	1
Textile Mills	2,200	7
Petroleum and Coal Products	1,900	50
Beverage and Tobacco Products	1,600	5
Iron and Steel Mills*	770	100
Semiconductors, Related Devices	550	1
Leather and Allied Products	360	0
Petroleum Refineries*	210	50
Cements*	190	30
Lime*	65	7
Primary Aluminum*	41	1
Pulp Mills*	34	2
Total**	**190,000**	**600**
Total CO_2 including kWh		1,000

** Calculated for 100 TPY* *** Total different from column due to rounding*

Executive Summary Tables

The number and types of businesses potentially subject to proposed CO_2 regulation

Table 2: Commercial Sector Summary

Business type	Estimated # establishments regulated @ 250 TPY	Total Site CO_2 emissions subject to reg
		million tons
Office	260,000	30
Warehouse and Storage	150,000	10
Mercantile	140,000	30
Education	100,000	30
Health Care	92,000	30
Lodging	71,000	20
Service	67,000	3
Food Service	58,000	10
Religious Worship	37,000	1
Public Assembly	26,000	8
Food Sales	23,000	4
Other	7,900	5
Public Order and Safety	7,100	2
Total*	1,000,000	200

** Total different from column due to rounding*

Table 3: Agricultural Sector Summary

Business type	Estimated # establishments regulated @ 250 TPY	Total Site CO_2 emissions subject to reg
		million tons
Oil seed, grain	3,400	9
Other Crop Farming Total	2,600	5
Poultry and egg	1,100	2
Vegetable, melon	1,500	2
Greenhouse, nursery, floriculture	1,400	2
Beef cattle ranching	920	5
Dairy cattle, milk production	910	2
Fruit and tree nut	880	1
Cattle feedlots	630	1
Hog and pig	560	1
Animal aquaculture, other	420	1
Sheep and goat	50	0
Total	1,000,000	40

Methodology

This study is intended to provide a reasonable estimate of the universe of stationary sources potentially exposed to Prevention of Significant Deterioration (PSD) permitting requirements should greenhouse gases become regulated pollutants under the Clean Air Act. Under the CAA, should CO_2 be deemed "regulated" in any way, no new or existing "major" stationary source of CO2 can be built or modified (if the modification increases net emissions) without first obtaining a PSD permit. Major sources are defined as either a source in one of 28 listed categories (mostly industrial manufacturers and energy producers) with the potential to emit at least 100 tons per year of an air pollutant, or any other source with the potential to emit 250 tons per year (TPY) of an air pollutant. EPA defines "potential to emit" (PTE) as "the maximum capacity of a stationary source to emit a pollutant under its physical and operational design, including certain legal limitations, for example, on emissions or hours of operation."

The results in this report emerge from an analysis of macro-economic and energy data, by sector, from the Energy Information Administration (EIA), U.S. Census and similar. The (calculated) CO_2 emissions are based on reported total on-site fuel consumption by relevant sector categories (types of buildings, factories, or farms). While aggregate energy data are deemed to be reasonably accurate, EIA and Census data become weaker (leading to under-reporting) the more finely the data are disaggregated and more specific the source. Nonetheless, the actual aggregate energy use (and thus actual CO_2 emissions) provide a reasonable starting point to estimate the number of buildings, factories, or farms that appear to emit enough CO_2 to cross the 250 TPY threshold (or 100 TPY threshold). The results of the analysis provide an estimate of the total universe of buildings likely exposed to potential PSD permitting should new construction or modifications be undertaken.

EPA has conducted its own analysis of the potential number of permits required by PSD.[4] However, rather than using reported sector energy data, EPA instead chose to calculate and estimate emissions from the 'bottom' up. In doing so, EPA employed a "capacity factor" based on what EPA assumes to be the level of operations of reported energy-using equipment. For instance, EPA assumes the restaurant and food service sector only uses its equipment to ten percent of capacity, so it applies a ten percent capacity factor to that sector. Capacity factors are notoriously difficult to know, or obtain. (Capacity factors applicable to industrial boilers range from 25 to 66 percent.) By reducing the number of PTE-exposed sectors by anywhere from 40 to 90 percent, EPA's analysis results in a sample size much smaller than the one used here. EPA also lists a series of "uncertainties" that differ from this study, including: no estimates for the agricultural sector (Note: EPA incorrectly asserts that there are no on-site CO_2 emissions from combustion in agriculture); no estimates of PSD permits required for modifications; and no consideration of existing major sources for other pollutants that will be exposed to PSD for CO_2. However, the basic methodology EPA used to determine the number of buildings exposed to PSD—setting aside EPA's "capacity factor" de-rating, stated uncertainties, variables—is similar to that used here, and EPA's initial estimates of sources meeting PTE thresholds for CO_2 are in the same order-of-magnitude as that found in this analysis.

4 "Estimates of Facilities that Emit CO_2 in Excess of 100 and 250 tpy thresholds," prepared by EPA staff, May 2008.

Industrial-Manufacturing Sector

The majority of establishments in the industrial-manufacturing sector emit over 250 TPY. For some of these businesses, an operation as small as 1,000 square feet is sufficient to emit 250 TPY – e.g. chemicals and metals where the average sized operation is over 100,000 square feet.[5] On-site emissions intensity in industrial operations varies widely, from several thousand pounds CO_2 per square foot in heavy material and mineral industries, to 10 to 30 lbs per square foot for furniture, printing, computer and semiconductor industries. (See Table 5.)

Even dominantly electricity-intensive businesses, like semiconductor and related tech industries, are large enough users of hydrocarbons to become regulated entities. A semiconductor manufacturer larger than 20,000 square feet, and computer maker larger than 45,000 square feet, would exceed the 250 TPY regulated threshold. The *average* semiconductor operation is over 175,000 square feet, and computer makers average almost 100,000 square feet. Thus nearly every semiconductor business, and about half the computer and electronics industry would be subject to CO_2 regulatory compliance. At the other end of the tech spectrum are food processing businesses, where the average facility is over 100,000 square feet. Food processors hit the 250 TPY threshold with only 3,500 square feet of operations.

For many industries, the more CO_2 is emitted indirectly from their use of electricity, and thus the associated utility emissions, than from site combustion; e.g.; textiles, computers, wood products. Using the computer and semiconductor industry examples again, where on-site fuel use leads to 12 and 26 pounds of CO_2 per square foot respectively – their electricity use equals 75 and 176 pounds, respectively, of CO_2 per square foot because of average utility fuel use to make the kilowatt-hours. (See Table 6.) Consequently, of the approximately 600 millions TPY of total industrial CO_2 emissions subject to on-site regulation identified in this report, at least as much again is emitted by electric utilities to serve those industries.[6]

Many businesses may find it desirable to increase electric intensity (use more electric, instead of fuel-burning technologies – a long-standing trend) to attempt to drop below the regulatory threshold, and shift the CO_2 regulatory burden to electric utilities. The industrial sector, overall, is the least electrified part of the stationary energy economy, with less than 25 percent of total energy needs supplied from electric utilities. Many new and emerging electric technologies have inherent productivity benefits over combustion-based equipment (e.g., faster, more uniform drying times for electric infrared heaters vs gas heaters). A CO_2 regulatory regime could have the effect of accelerating turn-over in, or biasing new purchases towards, electric-based capital equipment. This would create the unintended consequence of increasing growth in electric demand – a "dash to electricity" – and increase CO_2 emissions from utilities.

A "dash to electricity" by facilities trying to avoid triggering CO_2 permit requirements would not only further strain the electric supply system, but would likely exacerbate the emerging problem associated with the utility industry's "dash to gas" as the primary means to generate electricity. A recent

5 EPA proposes a small number of specifically designated industrial enterprises would trigger this provision at a 100 ton-per-year level. This analysis incorporates those exceptions as indicated by an *.

6 Total CO_2 emissions calculated from the available data yields ~ 600 million TPY, which is significantly lower than the > 1,000 tons of total aggregate CO_2 emissions identified by DOE/EIA for the overall industrial sector. This difference results from the limitations of the primary data as disaggregated by sector: many companies do not report (for proprietary or competitive reasons) specific uses of fuels. Thus the data available under-counts total industrial fuel use – and thus CO_2 emissions for specific industrial sectors.

Industrial-Manufacturing Sector continued

Department of Energy report highlights the challenges with the U.S. natural gas system meeting *current* needs, and the attendant expected rapid growth in the need for LNG imports from many of the same regions where the U.S. is currently dependent on oil imports.[7]

Table 4: Summary of Typical Industrial-Manufacturing Categories

- Food and Kindred Products
- Meat Packing Plants
- Canned Fruit and Vegetables
- Frozen Fruits and Vegetables
- Wet Corn Milling
- Bread, Cake, and Related Products
- Cane Sugar Refining
- Beet Sugar
- Soybean Oil Mills
- Malt Beverages
- Textile Mill Products
- Apparel and Other Textile Products
- Lumber and Wood Products
- Furniture and Fixtures
- Wood Furniture, Except Upholstered
- Paper and Allied Products
- Paper Mills
- Paperboard Mills
- Printing and Publishing
- Chemicals and Allied Products
- Alkalis and Chlorine
- Industrial Glass
- Inorganic Pigments
- Industrial Inorganic Chemicals
- Plastic Materials and Resins
- Synthetic Rubber
- Cellulosic Manmade Fibers
- Organic Fibers, Noncellulosic
- Gum and Wood Chemicals
- Cyclic Crudes and Intermediates
- Industrial Organic Chemicals
- Nitrogenous Fertilizers
- Phosphatic Fertilizers
- Petroleum and Coal Products
- Petroleum Refining
- Rubber and Miscellaneous Plastic Products
- Tires and Inner Tubes
- Miscellaneous Plastics Products
- Stone, Clay, and Glass Products
- Fret Glass
- Glass Containers
- Pressed and Blown Glass
- Cement, Hydraulic
- Lime
- Mineral Wool
- Primary Metal Industries
- Blast Furnace and Basic Steel Products
- Blast Furnaces and Steel Mills
- Electrometallurgical Products
- Gray and Ductile Iron Foundries
- Primary Copper
- Primary Aluminum
- Primary Nonferrous Metals
- Aluminum Sheet, Plate, and Foil
- Fabricated Metal Products
- Industrial Machinery and Equipment
- Computer and Office Equipment
- Electronic and Other Electric Equipment
- Transportation Equipment
- Motor Vehicles and Car Bodies
- Motor Vehicle Parts and Accessories
- Instruments and Related Products
- Surgical and Medical Instruments

7 *Natural Gas and Electricity Impacts on Industry: White Paper on Expected Near Term Cost Increases*, DOE National Energy Technologies Laboratory, April 28, 2008, DoE/NETL-2008/1320: "The decline in EIA's AEO2008 forecast for natural gas supply from the AEO2001 forecast for year 2020 alone, excluding LNG, is roughly 13Tcf, or nearly equivalent to the expected annual supply from ten Alaskan pipelines. Domestic production is projected to decline steadily, falling below 20 Tcf by 2030. Disappointing U.S. production, declining Canadian imports, minimal LNG imports to date, and the continued rise in the price of oil have caused natural gas prices to more than triple between 2002 and today." "In the event of climate change legislation, running existing natural gas combined cycle units at higher capacity factors can displace 20- 35% of current coal kilowatt-hours. Such substitution requires another 5.4 TCF per year. Clearly, the existing natural gas fleet cannot meet the growth in peak demand expected before 2016 and also substitute for coal to meet carbon caps."

Industrial-Manufacturing Sector continued

Table 5: Summary of Industrial-Manufacturing Sector CO_2 Emissions: Ranked by Minimum Size of Establishment to Reach 250 TPY CO_2

Business type	Size to emit 250 TPY	Average floor space per establishment	Site CO_2 emissions	Estimated # establishments regulated @ 250 TPY	Total # establishments
	sq ft	sq ft	lbs/sq ft		
Lime*	14	31,000	15,000	65	65
Cements*	41	110,000	4,900	190	200
Petroleum Refineries*	80	590,000	2,500	210	220
Iron and Steel Mills*	160	330,000	1,200	770	770
Pulp Mills*	330	490,000	610	34	34
Petroleum and Coal Products	360	58,000	1,400	1,900	1,900
Chemicals	940	110,000	530	8,900	8,900
Primary Metals	1,100	170,000	440	4,200	4,200
Nonmetallic Mineral Products	2,100	75,000	240	11,000	12,000
Paper	2,300	180,000	220	4,200	4,300
Primary Aluminum*	2,500	900,000	80	41	41
Food	3,400	100,000	150	15,000	15,000
Textile Mills	8,800	200,000	60	2,200	2,200
Beverage and Tobacco Products	9,000	160,000	60	1,600	1,600
Semiconductors, Related Devices	19,000	180,000	30	550	580
Transportation Equipment	22,000	220,000	20	7,300	7,700
Plastics and Rubber Products	24,000	94,000	20	9,200	11,000
Electrical Equip., Appliances	25,000	120,000	20	3,500	3,900
Fabricated Metal Products	25,000	48,000	20	26,000	35,000
Wood Products	26,000	65,000	20	8,400	10,000
Apparel	29,000	43,000	20	3,600	5,500
Textile Product Mills	33,000	100,000	10	2,900	3,500
Leather and Allied Products	35,000	38,000	10	360	690
Printing and Related Support	40,000	37,000	10	9,300	20,000
Machinery	43,000	72,000	10	12,000	17,000
Computer and Electronic Products	43,000	96,000	10	7,200	9,200
Miscellaneous	54,000	40,000	9	5,100	16,000
Furniture and Related Products	82,000	61,000	6	3,600	11,000
Total**				190,000	

** Calculations are for 100 TPY*

***Total different from column due to rounding*

Industrial-Manufacturing Sector continued

Table 6:
Summary of Industrial-Manufacturing Sector CO_2 Emissions Arising from Electricity Use (Emissions from Electric Utilities Allocated by Industrial Site Use)

Business type	Electricity CO_2 emissions allocated to site	Site CO_2 emissions	Electricity as Share Total Energy	Floor space to reach 250 TPY from electric use	Average floor space per establishment
	lbs/sq ft	lbs/sq ft	%	sq ft	sq ft
Lime*	1,800	15,000	10	280	31,000
Cements*	1,500	4,900	20	340	110,000
Petroleum Refineries*	1,200	2,500	5	430	590,000
Petroleum and Coal Products	620	1,400	5	810	58,000
Iron and Steel Mills*	440	1,200	20	1,100	330,000
Pulp Mills*	340	610	6	1,500	490,000
Primary Metals	340	440	30	1,500	170,000
Chemicals	300	530	20	1,700	110,000
Semiconductors	180	30	50	2,800	180,000
Paper	150	220	20	3,400	180,000
Textile Mills	130	60	40	3,900	200,000
Food	120	150	30	4,300	100,000
Nonmetallic Mineral Products	110	240	20	4,700	75,000
Plastics and Rubber Products	90	20	40	5,500	94,000
Computer and Electronic Products	75	10	50	6,700	96,000
Wood Products	60	20	30	8,200	65,000
Transportation Equipment	60	20	40	8,500	220,000
Electrical Equip., Appliances	60	20	30	8,500	120,000
Beverage and Tobacco Products	50	60	30	9,100	160,000
Fabricated Metal Products	50	20	40	10,000	48,000
Printing and Related Support	40	10	40	11,000	37,000
Apparel	40	20	40	12,000	43,000
Machinery	40	10	40	13,000	72,000
Miscellaneous	30	9	40	15,000	40,000
Textile Product Mills	30	10	30	18,000	100,000
Leather and Allied Products	30	10	40	18,000	38,000
Furniture and Related Products	20	6	40	26,000	61,000
Primary Aluminum*	N/A	80	N/A	N/A	900,000

** Calculations are for 100 TPY*

Commercial Sector

Like the industrial sector, the commercial sector uses lots of fuel. Unlike the industrial sector, fuel purchases are heavily weighted towards electricity; 80 percent of total commercial energy is supplied by electric utilities. Thus, given the importance of coal for the electric supply system (>50 percent of national generation), the effect of directly, or indirectly, taxing carbon will have an inordinately large effect on the commercial sector's cost of energy.

Nonetheless, many of the commercial sector's buildings use enough carbon-based fuels to face the same kinds of regulatory costs, controls, and enforcement from EPA that the industrial sector would in a regulated CO_2 regime.

Energy use varies by building type – but within a far narrower range than industrial operations. Commercial buildings emit from a few pounds of CO_2 per square foot (e.g., office buildings) to 10 to 15 pounds CO_2 per square foot in health care and food services. On average, a building with over 40,000 square feet uses enough hydrocarbons to become a regulated source.

Using data for each type of commercial building, energy use and size, we estimate that a total of over 1,000,000 commercial buildings would become classified as new regulated stationary emissions sources. This would include over one-fourth of all school buildings, over two-thirds of health care facilities, one-third of office buildings, half of those in lodging, and one-fifth of food services. (See Table 8.) Hotels and resorts emit a relatively low 6 pounds CO_2 per square foot, but need only be over 80,000 square feet in size to hit the regulatory threshold (80,000 square feet is only two to three times the size of many hotel ballrooms alone). Food services (restaurants, etc.) are heavily electrified and emit on average only 14 pounds of CO_2 per square foot, but that's enough to be subject to regulation with a 30,000 square foot operation.

For every class of commercial building, emissions per square foot associated with electricity (not on site, but at the utility) exceed the on-site emissions from combustion. Office buildings emit 23, hotels about 18, and food services about 50 pounds of CO_2 per square foot associated with their electricity use – each respectively eight times, three times and almost four times more than on-site emissions. Still, because many commercial buildings are large enough fuel users to trigger the CO_2 regulatory threshold, here as with the industrial sector, many building owners may seek increased use of electric technologies as a means to fall below thresholds for CO_2 regulations. (See Table 9.)

Commercial Sector continued

Table 7: Examples of Commercial Sector Categories

- Accessory Stores
- Amusement, Theme Parks
- Amusement Parks
- Art Dealers
- Art Drama and Music Schools
- Auto and Home Supply Stores
- Automotive Repair Shops
- Bakes Goods Stores
- Bakeries
- Botanical and Zoological Gardens
- Cafeterias
- Carpet and Upholstery Cleaning
- Casino Hotels
- Catalog and Mail-Order Houses
- Caterers
- Children's Hospitals
- Colleges Universities and Professional Schools
- Continuing Care Retirement Communities
- Department Stores
- Diaper Service
- Dinner Theaters
- Dry-Cleaning Plants
- Eating and Drinking Places
- Family Planning Centers
- Fish and Seafood Markets
- Fitness and Recreational Sports Centers (pt)
- Full Service Restaurants
- General Medical and Surgical Hospitals
- Golf Clubs
- Grocery Stores
- Historical Sites
- HMO Medical Centers
- Hotels and Motels (except Casino Hotels)
- Industrial Launderers
- Libraries
- Linen Supply
- Medical Supply
- Medical Laboratories
- Men's Accessory Stores
- Men's Clothing Stores
- Mental Health Facilities
- Museums
- Offices of Lawyers
- Offices of Physicians
- Operators of Apartment Buildings
- Personal Appliance Stores
- Pet and Pet Supply Stores
- Psychiatric Hospitals
- Recreation Clubs and Facilities
- Stadium Operators
- Supermarket and Grocery Stores
- Warehouse Clubs and General Merchandise Stores
- Zoos and Botanical Gardens

Table 8: Summary of Commercial Sector CO_2 Emissions: Ranked by Minimum Size of Establishment to Reach 250 TPY CO_2

Business type	Size to emit 250 TPY	Mean building size	Site CO_2 emissions	Estimated # buildings regulated @ 250 TPY	Total # buildings
	sq ft	sq ft	lbs/sq ft		
Food Service	34,000	5,600	15	58,000	297,000
Health Care	51,000	25,000	10	92,000	129,000
Lodging	81,000	36,000	6	71,000	142,000
Other	83,000	22,000	6	7,900	79,000
Public Order and Safety	110,000	16,000	4	7,100	71,000
Public Assembly	120,000	14,000	4	26,000	277,000
Service	120,000	6,500	4	67,000	622,000
Education	120,000	26,000	4	100,000	386,000
Food Sales	130,000	5,600	4	23,000	226,000
Religious Worship	150,000	10,000	3	37,000	370,000
Mercantile	160,000	17,000	3	140,000	657,000
Office	170,000	15,000	3	260,000	824,000
Warehouse and Storage	290,000	17,000	2	150,000	597,000
Total				1,000,000	4,859,000

Commercial Sector continued

Table 9:
Summary of Commercial Sector CO_2 Emissions Arising from Electricity Use (Emissions from Electric Utilities Allocated by Commercial Site Use)

Business type	Electricity CO_2 emissions allocated to site	Site CO_2 emissions	Electricity as Share Total Energy	Floor space to reach 250 TPY from electric use	Mean floor space per establishment
	lbs/sq ft	lbs/sq ft	%	sq ft	sq ft
Food Sales	70	4	90	7,700	5,600
Food Service	50	15	80	9,700	5,600
Health Care	30	10	70	16,000	25,000
Other	30	6	80	17,000	22,000
Mercantile	30	3	90	19,000	17,000
Office	20	3	90	22,000	15,000
Public Order and Safety	20	4	80	24,000	16,000
Lodging	20	6	70	28,000	36,000
Public Assembly	20	4	80	30,000	14,000
Education	10	4	80	34,000	26,000
Service	10	4	80	35,000	6,500
Warehouse and Storage	10	2	80	53,000	17,000
Religious Worship	6	3	70	77,000	10,000

** Calculations are for 100 TPY*

Agricultural Sector

Farmers don't get off the hook. The agricultural sector's dependence on low-cost energy is widely recognized. In addition to the obvious economic penalty associated with increased fuel costs for wheeled farm machinery, there are significant additional costs increases in fertilizer and chemical supplies directly tied to fuel prices in the agricultural sector.[8]

Just as in the commercial and industrial sectors, however, significant cost for many farming businesses may arise not just from fuel price increases but also from all of the activities associated with becoming a regulated stationary source of emissions of CO_2 as a new pollutant.

In counting only non-vehicular use of fossil fuels – oil, liquid petroleum gas and natural gas – nearly 20,000 farms would become regulated stationary emissions sources. (See Table 10.)

The highest impacted sectors in farming, based on the use of fossil fuels for purposes other than tractors and similar farm machinery, include poultry, grains, general crops, horticulture, vegetables and melons, fruits and livestock.

Note that Census data are very limited with regard to specific assignment of farm energy uses by either type (oil, gas, etc.), or use (stationary, or vehicles). Census farm energy use data are provided in dollars and aggregated for all purposes -- which would include vehicles, not subject to stationary source regulations analyzed here. Table 14 was used in this analysis to develop an estimated approximate average pounds of CO_2 emitted per dollar of farm energy expenditures associated only with stationary equipment.

8 See for example: American Farm Bureau Federation Commends Doane Advisory Services' Analysis of Lieberman-Warner Bill, The Fertilizer Institute, June 2, 2008: "Due to increasing energy prices, operating costs for corn are forecast to rise by an additional $60.14 per acre by 2020. Potential climate change legislation will add up to $78.80 in operating costs per acre of corn, resulting in a total increase of well over $100 per acre by 2020."

Agricultural Sector continued

Table 10: Summary of Agricultural Sector CO_2 Emissions: Ranked by Minimum Size of Farm to Reach 250 TPY CO_2

Farm type	Size to emit 250 TPY	Average farm size	Site CO_2 emissions	Estimated # farms regulated @ 250 TPY	Total # Farms
	Acres	Acres	lbs/acre		
Greenhouse, nursery, floriculture	640	75	780	1,400	64,000
Poultry and egg	780	140	640	1,100	44,000
Vegetable, melon	1,600	320	310	1,500	35,000
Fruit and tree nut	2,000	120	250	880	96,000
Hog and pig	2,000	250	250	560	34,000
Dairy cattle, milk production	2,900	380	170	910	73,000
Cattle feedlots	5,800	470	90	630	55,000
Other Crop Farming Total	6,300	270	80	2,600	440,000
Oil seed, grain	6,400	690	80	3,400	350,000
Animal aquaculture, other	8,700	200	60	420	230,000
Beef cattle ranching	21,000	630	20	920	660,000
Sheep and goat	23,000	410	20	50	44,000
Total				17,000	2,100,000

Appendices

Data sources, detailed data tables, summary/calculation overview

Industrial-Manufacturing Sector Data:

- Subsector Energy Expenditures: Energy Information Administration
  - 2002 Energy Consumption by Manufacturers--Data Tables
  - Link: **http://www.eia.doe.gov/emeu/mecs/mecs2002/data02/shelltables.html**
  - Pertinent Tables 1.1, 9.1
- Emissions Factors: Energy Information Administration
  - Voluntary Reporting of Greenhouse Gases Program
  - link: **http://www.eia.doe.gov/oiaf/1605/coefficients.html**

Commercial Sector Data:

- Subsector Energy Expenditures: Energy Information Administration
  - 2003 CBECS Detailed Tables
  - **http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.html#consumexpen03**
  - Pertinent Tables: A1, C1A, A6
- EIA Commercial Data Contacts:
  - Joelle Michaels, CBECS Manager
    - Phone: (202) 586-8952
  - Alan Swenson
    - Phone: (202) 586-1129

Agricultural Sector Data:

- **Summary by North American Industry Classification System 2002: USDA**
  - 2002 Census Publications, U.S. National Level Data
  - **http://www.agcensus.usda.gov/Publications/2002/Volume_1,_Chapter_1_US/index.asp**
  - Pertinent Tables: 59 - Summary by North American Industry Classification System: 2002
- Contacts:
  - 202 694 5059 - ERS: Donnell Royster
  - 18007279540 - NASS
  - 2024010523 - Jim Duffield
- Agriculture Energy Information
  - "On-Farm Energy Use Characterizations," Brown, Elliott, American Council for an Energy-Efficient Economy, March 2005

General Energy Information

- **gasoline**: (dec) - **http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/weekly_petroleum_status_report/historical/2003/2003_08_27/txt/table17.txt**
- **diesel**: (dec) - **http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/weekly_petroleum_status_report/historical/2003/2003_08_27/txt/table17.txt**
- **natural gas**: (commercial) - **http://tonto.eia.doe.gov/dnav/ng/ng_sum_lsum_dcu_nus_a.htm**
- **electricity**: (commercial) - **http://www.eia.doe.gov/cneaf/electricity/epa/epat7p4.html**
- **petroleum: http://usasearch.gov**

Appendices continued

Table 11: Industrial-Manufacturing Sector Data

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Business type	Total # establishments	Average floorspace per establishment	Approximate Enclosed Floorspace of all buildings onsite	Net Electricity	Natural Gas	Total Oil	Total coal	Total site CO_2 emissions in sector	Site CO_2 emissions	Size to emit 250 TPY	250 TPY Reg Hurdle hit compared to avg size estab	Estimated # establishments regulated @ 250TPY	Total Site CO_2 emissions subject to reg	CO_2 Emissions from kWh @1.3lb/kWh	Electricity CO_2 emissions allocated to site	Floorspace to reach 250 TPY from electric use
	counts	sq ft	million sq ft	million KWh	billion cu ft	million bbl	million short tons	Million tons	lbs/ sq ft	sq ft	%	Count	million tons	million tons	lbs/sq ft	sq ft
Food	15,089	102,589	751	67521	567	5	8	55	146	3425	3.3	14837	54	44	117	4278
Beverage, Tobacco	1,595	163,082	181	7639	45	0	1	5	55	9032	5.5	1551	5	5	55	9113
Textile Mills	2,247	201,870	253	25271	73	1	1	7	57	8841	4.4	2198	7	16	130	3851
Textile Product Mills	3,457	100,863	225	4875	28	0	0	2	15	33482	33.3	2882	1	3	28	17751
Apparel	5,500	42,905	111	3588	16	0	0	1	17	28906	67.4	3647	1	2	42	11899
Leather and Allied Products	685	37,749	34	716	4	0	0	0	14	35417	93.8	364	0	0	27	18264
Wood Products	10,486	64,501	445	20985	56	2	0	4	19	25944	40.2	8377	3	14	61	8156
Paper	4,257	179,562	580	65503	490	18	11	63	218	2296	1.3	4230	63	43	147	3406
Pulp Mills*	34	490,005	6	1579	23	1	0	2	615	325	0.2	34	2	1	342	1461
Printing and Related	20,220	36,999	433	14714	45	0	0	3	12	40093	108.4	9265	1	10	44	11318
Petroleum, Coal products	1,916	58,241	78	37186	854	7	0	54	1397	358	0.6	1910	54	24	620	807
Petroleum Refineries*	215	592,841	40	35478	799	4	0	50	2490	80	0.0	215	50	23	1153	434
Chemicals	8,909	111,909	672	153104	2,246	16	16	179	533	938	0.8	8872	178	100	296	1688
Plastics, Rubber Products	10,538	94,074	767	53181	125	1	0	8	21	24077	25.6	9189	7	35	90	5547
Nonmetallic Mineral	11,593	75,319	501	41393	411	6	14	60	239	2095	2.8	11432	59	27	107	4655
Cements*	195	114,618	11	12471	21	1	11	27	4933	41	0.1	195	27	8	1474	339
Lime*	65	31,060	1	1353	7	0	3	7	14700	14	0.1	65	7	1	1759	284
Primary Metals	4,166	174,794	550	144502	686	3	34	121	440	1136	0.6	4152	121	94	342	1464
Iron and Steel Mills*	771	325,341	159	53915	406	2	32	99	1248	160	0.1	771	99	35	441	1134
Primary Aluminum*	41	901,645	28	0	19	0	0	1	81	2456	0.7	41	1	0	0	N/A
Fabricated Metal	35,349	48,426	1,277	47123	204	1	0	13	20	25130	51.9	26177	9	31	48	10423
Machinery	17,381	72,187	825	24563	80	0	0	5	12	42969	59.5	12208	3	16	39	12918
Computer, Electronic	9,238	96,297	665	38352	64	0	0	4	12	43294	45.0	7161	3	25	75	6669
Semiconductors	578	176,153	96	13001	21	0	0	1	26	19048	10.8	547	1	8	176	2840
Electrical, Appliances	3,886	122,535	309	13901	52	0	0	3	20	24760	20.2	3493	3	9	58	8549
Transportation Equipment	7,653	223,706	1,111	50508	198	2	0	13	23	21686	9.7	7282	12	33	59	8460
Furniture and Related Products	10,941	60,782	473	7062	24	0	0	1	6	82118	135.1	3550	0	5	19	25761
Miscellaneous	15,605	39,779	400	10374	31	0	0	2	9	53763	135.2	5059	1	7	34	14930
Total**	200,710	80,268	10,643	832061	6,298	67	100	640	120	4158	5.2	190314	627	541		

** Calculations are for 100 TPY*

Appendices continued

Industrial-Manufacturing Sector Data: Explanation of data/calculations for Table 11

Columns 1 – 8: primary data from **http://www.eia.doe.gov/emeu/mecs/mecs2002/data02/shelltables.html**

Columns 9 – 17: calculated values/estimates as follows.

9. CO_2 emissions from combustion of natural gas (6), oil (7), coal (8) are a added to yield total tons CO_2 for sector business.

10. Total emissions (9) divided by that sector's total square footage of all business in that sector (4) yields avg CO_2 lbs/sq ft

11. Divide 250 tons (500,000 lbs) by emissions per square foot (10) to yield size of operation that triggers 250 TPY

12. Divide the average 250 TPY trigger size (11) by the average size of facilities in that sector (3).

13. Rough estimate of number of establishments above 250 TPY by assuming: a) if size to trigger 250 TPY (11) is less than average size of establishment in that sector (3), then start with 50% of all establishments get regulated, then b) calculate how many more than 50% (i.e., "average") get regulated by using the ratio of trigger/overage (12) as the % additional that are smaller than average that are regulated. Thus if the 250 TPY trigger occurs at 30% of the average size of an operation, and assume for this example the sector has 15,000 establishments, then a) 7,500 establishments are regulated (the 50%, or "average), plus b) 70% (100 – 30%) of the remaining 7,500 establishments would be subject to regulation since only 30% of the average size is required to reach 250 TPY. (This calculation is done in reverse if the 250 TPY trigger is larger than the average size.) While this method is crude, at the broad statistical abstraction level, it yields a reasonable ballpark. There is no other means to estimate the distribution since the primary Census data does not provide granular information on energy use, but just overall totals, and overall averages. This method could both over, or under estimate. But it is notable regarding any potential overestimate of regulated establishments – such is likely, on average, to be more than offset by the entire data set's general underestimate of regulated establishments because the Census data is incomplete (i.e., undercounts by roughly 50%) total industrial energy use – Census/DOE does not have complete data for all companies which do not report all disaggregated data (for competitive reasons, or because of Census collection issues).

14. Total sector CO_2 emissions (10) are multiplied by ratio of number of regulated establishments (13) compared to total establishments (2).

15. Electric utility emissions of CO_2 associated with sector electric use (5) based on national average fuel use (and thus CO_2 emissions) for utility sector.

16. Sector electric-related emissions (15) divided by total square footage of that sector (4) to yield indirect CO_2 emissions per square foot from kWh use.

17. kWh-related CO_2 emissions (16) divided in to 250 TPY to yield number of square feet of operations that lead to 250 TPY trigger occurring at utilities for that specific industrial sector's average.

Appendices continued

Table 12: Commercial Sector Data

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	Business type	Total # bldgs	Mean floor space per building	1,001 to 5, 000 sq ft	5,001 to 10,000 sq ft	10,000 to 25,000 sq ft	25,001 to 50,000 sq ft	50,001 to 100,000 sq ft	100,001 to 200,000 sq ft	200,001 to 500,000 sq ft	Over 500,000 sq ft	Floor space	total annual electricity consumption	total annual gas consumption	total annual fuel oil consumption	Avg gas used	Avg oil used	Site CO_2 emissions	Size to emit 250 TPY	# sq ft regulated (*Notes)	Estimated # buildings regulated @ 250 TPY	Total Site CO_2 emissions subject to reg	Total CO_2 emitted (incl from kWh)	Electric CO_2	Electricity CO_2 emissions allocated to site	Floorspace to reach 250 TPY from electric use	Electricity as share total energy
		x1000	x1000	Total floor space – millions sq ft								million sq ft	trillion Btu	trillion Btu	trillion Btu	1000 Btu/sq ft	1000 Btu/sq ft	lbs/sq ft	(1000 sq ft)	millions	1000	million tons	million tons	million tons	lbs/sq ft	1000 sq ft	%
	Education	386	26	409	399	931	1,756	2,680	2,167	1,420	Q	9,874	1,121	268	47	27	5	4	124	2606	102	28	113	73	15	34	78
	Food Sales	226	6	409	356	Q	Q	Q	Q	N	N	1,255	629	39	0	31	0	4	134	126	23	4	46	41	65	8	94
	Food Service	297	6	544	442	345	Q	Q	N	Q	N	1,654	654	203	0	123	0	15	34	323	58	10	67	43	52	10	76
	Health Care	129	25	165	280	313	157	364	385	514	973	3,163	748	243	11	77	3	10	51	2246	92	25	80	49	31	16	75
	Lodging	142	36	99	160	631	803	841	930	1,185	Q	5,096	709	215	35	42	7	6	81	2562	71	23	78	46	18	28	74
	Mercantile	657	17	771	1,173	2,409	1,291	1,505	1,677	462	1,905	11,192	2,214	264	21	24	2	3	160	2367	139	25	179	144	26	19	89
	Office	824	15	1,382	938	1,887	1,506	1,209	1,428	1,493	2,365	12,208	2,170	269	18	22	1	3	174	3858	260	26	176	141	23	22	88
	Public Assembly	277	14	336	518	1,077	301	474	868	Q	Q	3,939	506	102	29	26	7	4	117	365	26	8	50	33	17	30	79
	Public Order and Safety	71	16	122	Q	Q	Q	Q	Q	Q	Q	1,090	172	29	8	27	7	4	114	109	7	2	16	11	21	24	82
	Religious Worship	370	10	416	744	1,235	930	Q	Q	Q	N	3,754	188	82	18	22	5	3	148	375	37	1	25	12	6	77	65
	Service	622	7	1,034	722	1,021	560	Q	Q	Q	Q	4,050	451	139	0	34	0	4	121	433	67	3	46	29	14	35	76
	Warehouse, Storage	597	17	895	868	2,064	1,043	1,494	1,162	Q	Q	10,078	738	132	9	13	1	2	292	2552	151	11	65	48	10	53	84
	Other	79	22	Q	Q	Q	Q	Q	Q	Q	Q	1,738	401	87	0	50	0	6	83	174	8	5	37	26	30	17	82
	Vacant	182	14	239	Q	Q	471	Q	Q	Q	Q	2,567	46	28	0	11	0	1	382	0	0	0	6	3	2	218	62
	Total	4,859	15	6,922	7,033	12,659	9,362	10,291	10,217	7,494	7,660	71,658	10,746	2,100	228	29	3	4	124	20263	1374	181	987	699	20	26	82

Appendices continued

Commercial Sector Data: Explanation of data/calculations for Table 12

Columns 1 – 15: primary data from
http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.html#consumexpen03

Columns 16 – 27: calculated values/estimates as follows.

16. Divide total sector gas use (13) by total square footage (12) to yield avg gas used per sq ft

17. Ditto re oil

18. Calculate site CO_2 emissions by adding avg emissions per sq foot from gas, and oil – by first converting gas or oil use to CO_2 emissions.

19. Divide 250 tons (as pounds) by avg pounds emitted per square foot (18) to yield avg size space that hits 250 TPY

20. To estimate how many square feet are subject to regulation, add up the number of square feet less than the trigger (19) from the disaggregated data in columns (4) – (11). Pro-rate the number of square feet in the relevant column where the average (19) falls in the relevant range in columns (4) – (11).

21. Estimate, roughly, number of buildings regulated by assuming share of total square footage regulated is approx the same as share of total buildings in that sector regulated. Share of square footage calcu lated by dividing (20) by (12) – multiply this ratio by total buildings in the sector (2).

22. Multiply same ratio in (21) by total sector emissions – latter calculated by multiplying emissions per sq ft (18) by total square footage in sector (12).

23. Multiply sector total electric use (13) by national average utility CO_2 emissions per kWh – add to total site CO_2 emissions (18).

24. As above without site CO_2 emissions.

25. Calculate utility emissions associated with kWh by dividing sector kWh CO_2 (24) by total square footage (12)

26. Calculate same way as (19).

27. Divide primary energy to make electricity (13) by total sector energy use.

Appendices continued

Table 13: Agricultural Sector Data

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Farm type	Total # Farms	Land in farms	Average farm size	Average size of farm	total annual purchases - gasoline, fuels, oils	Farms with gas, fuel, oil expenses of				64% Share All Energy purchases not for vehicles	TOTAL Site CO_2 emissions subject to reg	Site CO_2 emissions	Size to emit 250 TPY	Estimated # farms regulated @ 250 TPY	Total CO_2 emission incl on-site vehicles
	count	acres	Acres	$US	1000 $US	$1 - 4,999	$5,000 - $24,999	$25,000 - $49,999	$50,000+	$million	million tons	lbs/ acre	Acres	count	lbs/ sq ft
TOTAL	2,128,982	938,279,056	441	97,320	6,675,419	1,738,679	242,029	29,049	14,382	4,272	32	68	7,321	14,382	50
Oil seed, grain	349,023	242,218,224	694	115,964	1,962,572	231,615	95,273	9,816	3,447	1,256	9	78	6,428	3,447	15
Vegetable, melon	34,624	11,215,546	324	382,581	358,743	24,765	4,711	1,467	1,499	230	2	307	1,628	1,499	3
Fruit and tree nut	95,680	11,525,130	120	141,680	301,769	83,938	8,016	1,264	882	193	1	251	1,989	882	2
Greenhouse, nursery, floriculture	64,366	4,819,149	75	234,219	393,875	50,194	7,502	1,472	1,433	252	2	785	637	1,433	3
Other Crop Farming Total	442,932	118,327,994	267	36,372	977,535	377,832	27,038	4,971	2,576	626	5	79	6,305	2,576	7
Beef cattle ranching	664,431	419,821,930	632	30,902	1,028,713	606,388	39,440	2,470	920	658	5	24	21,255	920	8
Cattle feedlots	55,472	25,984,434	468	415,480	231,441	44,677	6,735	970	633	148	1	86	5,848	633	2
Dairy cattle, milk production	72,537	27,351,777	377	323,182	488,176	44,487	23,524	2,129	909	312	2	171	2,918	909	4
Hog and pig	33,655	8,317,127	247	369,531	214,618	22,437	7,727	1,112	555	137	1	248	2,018	555	2
Poultry and egg	44,219	6,153,409	139	552,989	411,022	25,184	14,015	2,478	1,062	263	2	641	780	1,062	3
Sheep and goat	43,891	17,910,791	408	10,815	39,759	40,363	978	72	50	25	0	21	23,463	50	0
Animal aquaculture, other	228,152	44,633,545	196	19,034	267,197	186,763	7,070	828	416	171	1	57	8,700	416	2
TOTAL from calculations											37			16,958	57

Appendices continued

Agricultural Data: Explanation of data/calculations for Table 13

Columns 1 – 10: primary data from
http://www.agcensus.usda.gov/Publications/2002/Volume_1,_Chapter_1_US/index.asp

Columns 11 – 16: calculated values/estimates as follows.

11. Share of total energy purchases used for stationary equipment (non-vehicle) derived from Table 14. Data set in Table 13 and 14 both for year 2002 – permitting consistent transfer of derived value.

12. Conversion factor (16 lbs CO_2/$) for average CO_2 emissions per energy $ spent derived from Table 14. Multiply (16) by 16 lbs/$ and convert to tons.

13. Divide (12) by total acres per category (3)

14. Divide 250 TPY by (13)

15. 250 TPY in 2002 ~ $50,000 of fuel expenditures – thus only farms in (10) subject to regulation.

16. Multiply total fuel spending for all purposes (6) by average emissions per $ (16 lbs per Table 14).

Agricultural Data: Explanation of data/calculations for Table 14

Columns 1 – 7: data from "On-Farm Energy Use Characterizations," American Council for an Energy-Efficient Economy, March 2005.

Columns 11 – 16: calculated values/estimates as follows.

8. Convert BTU data from (2) to (7) to relevant units (gallons oil, cubic feet n gas, kWh electricity).

9. Fuel units

10. Cost per unit of relevant fuel in 2002 (DOE/EIA national average data)

11. Expenditures for each fuel type: total at bottom of column – all non-electric spending of $8,415 million.

12. Calculate CO_2 emissions; multiply BTU in (7) by CO2/BTU for each fuel type

13. Divide (12) by (11) to yield lbs CO_2/$ spent on each fuel type: bottom of column derive straight statistical avg of 16 lbs CO_2/$ of fuel purchases.

14. Estimate share of each fuel type associated with stationary source equipment (non-vehicle) from statistical avg of (18) through (22)

15. Multiply (14) by (11) for total spending on non-vehicle energy: total column $5,348 million – divide by total for all non-electric energy spending (11) to yield 64% share of energy spending for stationary uses.

16. Multiply (15) by 16 lbs/$ for total CO_2 emissions from non-vehicle

17. Same categories as (1)

18 – 22. Estimate share of fuel used for non-vehicle purposes based on category of use (e.g., 0% of "onsite transportation" energy is for stationary; but estimate 75% of all "machinery" is stationary.

Appendices continued

Table 13: Agricultural Energy End-Uses

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	total motors	total lighting	onsite transport	machinery	other not categorized	total	Energy Units (b)		Cost/Unit (c)	Total Expenditures	Total CO_2	CO_2	Estimated share stationary sources (d)	Total Expenditures for non-mobile energy use	Total Emissions CO_2 non-mobile	ESTIMATED SHARE STATIONARY	total motors	total lighting	onsite transport	machinery	other not categorized
							million		US (cents)	million $	million tons	lbs/$	%	million $	million tons	total - all farm-types	%	%	%	%	%
total - all farm-types																					
gasoline	134	-	2	1	5	142	1,235	gallons	142	1753	11	13	51	886	6	gasoline	50	-	0	75	70
diesel	7	-	28	77	249	361	2,777	gallons	142	3943	29	15	73	2868	21	diesel	80	-	0	75	80
natural gas	2	-	-	-	94	98	98,000	cubic feet	600	588	6	20	90	529	5	natural gas	100	-	-	-	90
other (a)	15	2	-	2	169	195	1,500	gallons	142	2130	16	15	50	1065	8	other (a)	75	0	-	75	80
electricity	9	3	-	-	136	153	44,842	kWh	8	3538	29	16	0	0	29	*(kWh not counted in total below)*					
total petroleum	158	2	30	80	517	796			73.7/gallon												
total energy	167	5	30	80	653	949				11953	62	**16**	***Avg lbs***	5348	69						
										8415	*excludes kWh*										
ACEE pg. 7																					
(a) treated as diesel											*Note: compare "Total Purchases" of energy (excluding kWh) result here with Table 59 Census total of ~$*										

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