

**U.S. Lighting Market Characterization  
Volume I: National Lighting Inventory and  
Energy Consumption Estimate**

Prepared for:  
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This Microsoft Excel  
Workbook contains  
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the tables presented in  
the National Lighting  
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Consumption Estimate  
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report available at: <http://www.eren.doe.gov/buildings/documents/pdfs/>

**Table ES-1 U.S. National Energy Use for Lighting Disaggregated by Sector**

Sector	Electricity Use per Building (kWh/yr)	Number of Buildings	Site Energy (TWh/yr)	Primary Energy (quads)	Percent of Total
Residential	1,946	106,989,000	208	2.2	27%
Commercial	83,933	4,657,000	391	4.2	51%
Industrial	475,063	227,000	108	1.2	14%
Outdoor stationary	n/a	n/a	58	0.6	8%
Totals			765	8.2	100%

**Table ES-2. Average Number of Lamps per Building and Total Lamps, 2001**

<b>Technologies</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Total Lamps in US</b>	<b>Percent of Lamps</b>
Incandescent	39	91	33	4,397,000,000	63%
Fluorescent	6	324	1,340	2,473,000,000	35%
HID	0.04	7	67	105,357,000	2%
Solid State	-	0.4	0.3	1,840,000	0.03%
Total	45	422	1,440	6,977,197,000	100%
Number of Buildings	106,989,000	4,657,000	227,000	n/a	n/a

**Table ES-3. Average Operating Hours per Day by Light Source, 2001**

Lamp Type	Residential (hours/day)	Commercial (hours/day)	Industrial (hours/day)	Outdoor (hours/day)	National Avg. (hours/day)
Incandescent	1.9	10.2	16.7	7.9	2.8
Fluorescent	2.2	9.7	13.4	10.8	8.2
HID	2.8	10.1	13.9	11.3	11
Solid State	-	23	23.4	7	22.2
Total	2	9.9	13.5	10.5	4.8

**Table 2-1: Sector and Subsector Classification**

<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Outdoor Stationary</b>
Manufactured	Vacant	Food and Kindred Products	Traffic Signals
Single Family – attached	Office/Professional	Tobacco Products	Roadway
Single Family – detached	Laboratory	Textile Mill Products	Parking
Multifamily – less than 4 units	Warehouse (non-refrigerated.)	Apparel and other Textile Products	Billboards
Multifamily – 4 or more units	Food sales	Lumber and Wood Products	Aviation
	Public order/safety	Furniture and Fixtures	
	Health care (outpatient)	Paper and Allied Products	
	Warehouse (refrigerated)	Printing and Publishing	
	Religious worship	Chemicals and Allied Products	
	Public assembly	Petroleum and Coal Products	
	Education	Rubber and Miscellaneous Plastics Products	
	Food service	Leather and Leather Products	
	Health care (inpatient)	Stone, Clay, and Glass Products	
	Skilled nursing	Primary Metal Industries	
	Hotel/Motel/Dorm	Fabricated Metal Products	
	Strip shopping	Industrial Machinery and Equipment	
	Enclosed shopping center/mall	Electronic and Other Electric Equipment	
	Retail (excluding mall)	Transportation Equipment	
	Service (excluding food)	Instruments and Related Products	
	Other	Miscellaneous Manufacturing Industries	

**Table 2-2: Space Functions in XenCAP database**

Architectural	<i>Exterior architectural features</i>
Assembly	<i>Gathering places</i>
Bathroom	<i>Lavatories</i>
Classroom	<i>Educational meeting rooms, lecture halls</i>
Dining	<i>Eating areas</i>
Exit sign	<i>Exit signs</i>
Food preparation	<i>Kitchens</i>
Hallway	<i>Connecting corridors</i>
Healthcare	<i>Examination and operating rooms</i>
Landscape	<i>Exterior landscaping features</i>
Lodging	<i>Sleeping and living areas</i>
Merchandise display	<i>Retail display areas</i>
Office	<i>General offices</i>
Parking	<i>Parking spaces and areas</i>
Roadway	<i>Streets and highways</i>
Shipping/receiving	<i>Loading docks and staging areas</i>
Shop	<i>Manufacturing, assembly areas</i>
Signage	<i>Luminous and illuminated signs</i>
Signal	<i>Traffic and unspecified signals</i>
Sports and Recreation	<i>Gymnasiums, racquet sports courts, ball fields</i>
Storage	<i>Warehouses, closets, storage facilities</i>
Task	<i>Individual task lighting</i>
Unknown	<i>Data records with insufficient description</i>
Utility	<i>Mechanical or electrical rooms, building services</i>

**Table 2-3: Lamp and Ballast Classification**

<b>Lamps</b>	
<b>Fluorescent</b>	<b>Incandescent</b>
T5	Standard – general service
T8 – less than 4’	Standard – integral reflector
T8 – 4’	Halogen – general service
T8 – greater than 4’	Quartz Halogen
T8 – U-bent	Halogen – integral reflector – low voltage
T12 – less than 4’	Low wattage (less than 25W)
T12 – 4’	Miscellaneous incandescent <sup>2</sup>
T12 – greater than 4’	<b>High Intensity Discharge</b>
T12 – U-bent	Mercury vapor
Compact – Pin-base	Metal halide
Compact – Screw base	High pressure sodium
Compact – Pin-base – integral reflector	Low pressure sodium <sup>1</sup>
Compact – Screw base – integral reflector	Xenon <sup>1</sup>
Circline	Electrodeless (e.g. mercury) <sup>1</sup>
Induction discharge	<b>Solid State</b>
Miscellaneous fluorescent <sup>2</sup>	LED
	Electroluminescent

<sup>1</sup> Low pressure sodium, xenon, and electrodeless lamps are discharge lamps, but are not high intensity. They are included in this category for convenience of presentation. Electrodeless lamps consist primarily of mercury vapor lamps excited by radio frequencies, but this category also includes the sulfur lamp.

<sup>2</sup> “Miscellaneous” means that the light source cannot be categorized elsewhere either because it is of a different type (e.g. T4 fluorescent) or because it is undesignated in the database.

**Table 3-1: Data Sources used in Preparing the Inventory.**

Residential	Tacoma Public Utilities Energy Information Administration – Residential Energy Consumption Survey (2001) American Housing Survey (1999)
Commercial	XenCAP™ Energy Information Administration – Commercial Buildings Energy Consumption Survey (1999)
Industrial	XenCAP™ Energy Information Administration – Manufacturing Energy Consumption Survey (1998)
Outdoor Stationary	Federal Aviation Administration Federal Highway Administration Outdoor Advertising Association of America International Parking Institute Lawrence Berkeley National Laboratory Energy Information Administration Airport Lighting Systems



**Table 3-2: Characteristics of EIA Building Energy Use Surveys**

<b>Survey</b>	<b>Year</b>	<b>Number of Completed Surveys</b>	<b>Number of Buildings</b>	<b>National Floorspace (million sq. ft.)</b>
Residential Energy Consumption Survey (RECS)	2001	4,822	106,989,000	2,233,091
Commercial Building Energy Consumption Survey (CBECS)	1999	5,430	4,657,000	67,300
Manufacturing Energy Consumption Survey (MECS)	1998	17,877	227,000	12,836

<sup>1</sup> The RECS floor space estimate is from RECS 1997, as the estimate for RECS 2001 was not available when this report went to print.

**Table 3-3: XenCAP™ Databases**

<b>Utility Name</b>	<b>States</b>	<b>Data Collected</b>	<b>No. of Audits</b>	<b>Motivation</b>
Georgia Power Company	Georgia	1993-94	167	Program
Anaheim Public Utilities Dept.	California	1993-94	22	Program
Kansas City Power and Light	Missouri	1991-93	461	Program
Northern States Power	Minnesota	1987-89	1,016	Research
Orange and Rockland Utilities	New York, New Jersey	1986, 1989-93	1,813	Both
Ohio Edison	Ohio	1993-96	208	Program
Omaha Public Power District	Nebraska	1992-95	402	Program
Missouri Public Service	Missouri	1992	43	Research
Pasadena Water & Power Dept.	California	1991-95	51	Program
Central Maine Power	Maine	1992-93	171	Program
Public Service Electric and Gas	New Jersey	1990-94	251	Both
Long Island Lighting Co.	New York	1986-98	13,637	Program
Cincinnati Gas & Electric	Ohio	1991-96	998	Program
Central Illinois Lighting Co.	Illinois	1983-96	213	Program
Central States Power Co.	Ohio	1994, 96	109	Program
Ohio Power	Ohio	1994-96	126	Program
Consolidated Edison	New York	-	5,078	Both
Rockland Electric	New York	-	54	Program
ABCS			26	Program

**Table 3-4: Relationship between XenCAP™ and the Population of Commercial Buildings**

<b>XenCAP™ Code</b>	<b>XenCAP™ Description</b>	<b>XenCAP™ Samples</b>	<b>Samples per 10,000 Population (approx.)</b>
1	Office building	5,232	64
2	Retail	3,658	52
3	Food Store	1,510	110
4	Service	1,438	25
5	Restaurant	2,116	74
6	Lodging	1,018	80
7	Warehouse	1,999	34
8	Religious	1,432	24
9	Education	2,161	70
10	Hospital	320	145
11	Nursing Home	409	132
	<b>Total:</b>	21,293	47

**Table 3-5: Mapping of CBECS Floorspace to XenCAP™ Building Types**

CBECS		XenCAP™	
Code	Description	Code	Description
1	Vacant	1	Office (33%)
		2	Retail (27%)
		3	Food Sales (1%)
		4	Service (16%)
		6	Lodging (13%)
		9	Education (4%)
		10	Hospital (2%)
11	Nursing Home (2%)		
2	Office/Professional	1	Office (100%)
4	Laboratory	1	Office (89%)
		2	Retail (1%)
		4	Service (1%)
		7	Warehouse (4%)
9	Education (5%)		
5	Warehouse (nonrefrig.)	10	Warehouse (100%)
6	Food sales	3	Food Store (100%)
7	Public order/safety	1	Office (40%)
		6	Lodging (42%)
		9	Education (18%)
8	Health care (outpatient)	1	Office (100%)
11	Warehouse (refrig.)	7	Warehouse (100%)
12	Religious worship	8	Religious (100%)
13	Public assembly	1	Office (32%)
		2	Retail (8%)
		3	Food sales (6%)
		4	Service (24%)
		6	Lodging (1%)
		8	Religious (3%)
		9	Education (25%)
14	Education	9	Education (100%)
15	Food service	6	Restaurant (100%)
16	Health care (inpatient)	10	Hospital (100%)
17	Skilled nursing	11	Nursing Home (100%)
18	Hotel/Motel/Dorm	7	Lodging (100%)
23	Strip shopping	2	Retail Store (100%)
24	Enclosed shopping ctr/mall	2	Retail Store (100%)
		2	Retail Store (100%)
25	Retail (excl mall)	2	Retail Store (100%)
26	Service (excl food)	4	Service
91	Other	1	Office (77%)
		2	Retail (7%)
		3	Food sales (6%)
		4	Service (2%)
		6	Lodging (3%)
		9	Education (3%)
		10	Hospital (2%)

**Table 3-6: Mapping XenCAP™ Industrial Buildings to CBECS based on SIC**

<b>CBECS Building Type</b>	<b>SIC Codes</b>
Office/Professional	60-67, 81, 83, 87, 91, 93-96
Retail (excluding mall)	52, 53, 56, 57, 59
Warehouse (non-refrigerated)	50, 51
Service (excluding food)	43, 55, 72-76
Food sales	54
Food service	58
Health care (inpatient)	80
Hotel/Motel/Dorm	70
Education	82
Other	40-42, 44-49, 78, 79, 84-86, 89, 92, 97

**Table 3-7: Relationship between XenCAP™ and the Population of Industrial Buildings**

<b>SIC code</b>	<b>Description</b>	<b>Number of XenCAP™</b>	<b>Samples per 10,000</b>
20	Food and Kindred Products	73	44
21	Tobacco Products	1	83
22	Textile Mill Products	22	23
23	Apparel and Other Textile Products	24	13
24	Lumber and Wood Products	38	12
25	Furniture and Fixtures	29	27
26	Paper and Allied Products	90	102
27	Printing and Publishing	150	30
28	Chemicals and Allied Products	77	49
29	Petroleum and Coal Products	8	25
30	Rubber and Miscellaneous Plastics Products	109	62
31	Leather and Leather Products	3	15
32	Stone, Clay, and Glass Products	38	27
33	Primary Metal Industries	59	73
34	Fabricated Metal Products	175	53
35	Industrial Machinery and Equipment	130	24
36	Electronic and Other Electric Equipment	174	99
37	Transportation Equipment	76	57
38	Instruments and Related Products	61	37
39	Miscellaneous Manufacturing Industries	45	28
<b>Total</b>		<b>1382</b>	<b>38</b>

**Table 3-8: XenCAP™ Lamp Types**

<b>Lighting Source</b>	<b>Number of Fixture Types</b>
Mercury Vapor	10
Low Pressure Sodium	7
High Pressure Sodium	12
Metal Halide	12
Quartz Halogen	13
Incandescent	22
Incandescent, Elliptical Reflector	6
Incandescent, Spotlight	16
Other, (Capsylite, Miniature)	16
High pressure Sodium, color Improved	5
Fluorescent (including compact)	104

**Table 4-1: Illuminance Levels Assigned to Each Space Type**

IES Illuminance		
Space Type	Category	Footcandles (lumens / sq. ft.)
assembly	B-C	7.5
athletic	F	100
bathroom	B	5
boarding	C	10
class	E	50
dining	C	10
display	E	50
food prep	E	50
hall	B	5
healthcare	E	50
office	D-E	40
shop/rec	D	30
shop	E	50
storage	C	10
task	E	50
unknown	D-E	40
utility	B	5



**Table 5-1: Average Lamp Wattage by Building Sector (W), 2001**

<b>Technologies</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Outdoor Stationary</b>	<b>All</b>
<b>Incandescent</b>	<b>67</b>	<b>83</b>	<b>64</b>	<b>138</b>	<b>69</b>
Standard - General Service	63	83	126	138	65
Standard – Reflector	102	104	102	103	102
Halogen - General Service	200	64	-		195
Quartz Halogen	205	226	452	167	215
Halogen - refl. - low volt	-	48	58		48
Low wattage (less than 25W)	-	15	19		15
Misc incandescent	-	-	-		-
<b>Fluorescent</b>	<b>38</b>	<b>41</b>	<b>48</b>	<b>150</b>	<b>41</b>
T5	-	8	10		8
T8 – less than 4’	-	23	23		23
T8 – 4’	-	33	31		32
T8 – More than 4’	-	50	53	105	52
T8 – U-bent	-	34	32		33
T12 – less than 4’	-	29	32		29
T12 – 4’	-	45	44		45
T12 – More than 4’	-	93	95	190	93
T12 – U-bent	-	46	46		46
Compact – Pin-base	-	17	31		17
Compact – Screw-in	18	16	14		17
Compact – Pin-base – reflr	-	16	-		-
Compact – Screw-in – reflr	11	16	14		16
Circline	-	30	35		31
Induction discharge	-	-	-		-
Miscellaneous fluorescent	41	18	34	150	41
<b>HID</b>	<b>151</b>	<b>404</b>	<b>425</b>	<b>227</b>	<b>304</b>
Mercury vapor	179	331	409	239	266
Metal halide	-	472	438	311	440
High pressure sodium	79	260	394	216	229
Low pressure sodium	-	104	90	180	172
Xenon	-	-	-		-
Electrodeless (e.g. mercury)	-	-	-		-
<b>Solid State</b>	<b>-</b>	<b>5</b>	<b>5</b>	<b>15</b>	<b>6</b>
LED	-	6	6	15	7
Electroluminescent	-	2	2		2
<b>Total</b>	<b>63</b>	<b>56</b>	<b>65</b>	<b>205</b>	<b>62</b>

**Table 5-2: Average Number of Lamps per Building, 2001**

<b>Technologies</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>
<b>Incandescent</b>	<b>37</b>	<b>91</b>	<b>33</b>
Standard - General Service	34	53	7
Standard – Reflector	2	17	6
Halogen - General Service	0.2	0.2	-
Quartz Halogen	0.1	4	1
Halogen - refl. - low volt	-	9	0
Low wattage (less than 25W)	-	9	20
Misc incandescent	-	-	-
<b>Fluorescent</b>	<b>6</b>	<b>324</b>	<b>1,340</b>
T5	-	1	0.1
T8 – less than 4’	-	7	28
T8 – 4’	-	83	631
T8 – More than 4’	-	0.4	0.1
T8 – U-bent	-	2	12
T12 – less than 4’	-	6	5
T12 – 4’	-	152	354
T12 – More than 4’	-	25	281
T12 – U-bent	-	7	7
Compact – Pin-base	-	21	6
Compact – Screw base	1	10	6
Compact – Pin-base – reflector	-	-	-
Compact – Screw base – reflector	0	1	1
Circline	-	5	8
Induction discharge	-	-	-
Miscellaneous fluorescent	5	1	2
<b>HID</b>	<b>0</b>	<b>7</b>	<b>67</b>
Mercury vapor	0	1	8
Metal halide	-	4	47
High pressure sodium	0	1	12
Low pressure sodium	-	0.1	0.3
Xenon	-	-	-
Electrodeless (e.g. mercury)	-	-	-
<b>Solid State</b>	<b>-</b>	<b>0.4</b>	<b>0.3</b>
LED	-	0.3	0.2
Electroluminescent	-	0.1	0.1
<b>Total</b>	<b>43</b>	<b>422</b>	<b>1,440</b>

**Table 5-3: Distribution of Lamps in each Building Sector (%)**

<b>Technologies</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Outdoor Stationary</b>	<b>All</b>
<b>Incandescent</b>	<b>86%</b>	<b>22%</b>	<b>2%</b>	<b>22%</b>	<b>63%</b>
Standard - General Service	79%	12%	-	17%	56%
Standard – Reflector	6%	4%	-	2%	5%
Halogen - General Service	-	-	-	-	-
Quartz Halogen	-	1%	-	3%	-
Halogen - refl. - low volt	-	2%	-	-	1%
Low wattage (less than 25W)	-	2%	1%	-	1%
Misc incandescent	-	-	-	-	-
<b>Fluorescent</b>	<b>14%</b>	<b>77%</b>	<b>93%</b>	<b>3%</b>	<b>35%</b>
T5	-	-	-	-	-
T8 – less than 4’	-	2%	2%	-	1%
T8 – 4’	-	20%	44%	-	8%
T8 – More than 4’	-	-	-	-	-
T8 – U-bent	-	1%	1%	-	-
T12 – less than 4’	-	1%	-	-	-
T12 – 4’	-	36%	25%	-	11%
T12 – More than 4’	-	6%	20%	-	3%
T12 – U-bent	-	2%	-	-	-
Compact – Pin-base	-	5%	-	-	1%
Compact – Screw-in	2%	2%	-	-	2%
Compact – Pin-base – reflr	-	-	-	-	-
Compact – Screw-in – reflr	-	-	-	-	-
Circline	-	1%	1%	-	-
Induction discharge	-	-	-	-	-
Miscellaneous fluorescent	13%	-	-	2%	9%
<b>HID</b>	<b>-</b>	<b>2%</b>	<b>5%</b>	<b>75%</b>	<b>2%</b>
Mercury vapor	-	-	1%	17%	-
Metal halide	-	1%	3%	6%	-
High pressure sodium	-	-	1%	47%	1%
Low pressure sodium	-	-	-	5%	-
Xenon	-	-	-	-	-
Electrodeless (e.g. mercury)	-	-	-	-	-
<b>Solid State</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
LED	-	-	-	-	-
Electroluminescent	-	-	-	-	-
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

**Table 5-4. Estimated Inventory of Lamps in the U.S. by End-use Sector**

<b>Technologies</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Outdoor Stationary</b>	<b>All</b>
<b>Incandescent</b>	<b>3,948,115,000</b>	<b>425,864,000</b>	<b>7,402,000</b>	<b>16,024,000</b>	<b>4,397,406,000</b>
Standard - General Service	3,653,336,000	244,924,000	1,501,000	12,343,000	3,912,104,000
Standard – Reflector	262,471,000	81,229,000	1,251,000	1,500,000	346,451,000
Halogen - General Service	18,089,000	757,000	-	-	18,845,000
Quartz Halogen	14,219,000	17,496,000	167,000	2,181,000	34,063,000
Halogen - refl. - low volt	-	39,733,000	2,000	-	39,736,000
Low wattage (less than 25W)	-	41,725,000	4,481,000	-	46,207,000
Misc incandescent	-	-	-	-	-
<b>Fluorescent</b>	<b>659,077,000</b>	<b>1,507,796,000</b>	<b>304,380,000</b>	<b>1,894,000</b>	<b>2,473,146,000</b>
T5	-	6,601,000	20,000	-	6,621,000
T8 – less than 4’	-	30,889,000	6,262,000	-	37,150,000
T8 – 4’	-	388,685,000	143,284,000	-	531,969,000
T8 – More than 4’	-	2,017,000	14,000	50,000	2,080,000
T8 – U-bent	-	11,151,000	2,827,000	-	13,978,000
T12 – less than 4’	-	29,258,000	1,059,000	-	30,317,000
T12 – 4’	-	709,485,000	80,320,000	-	789,805,000
T12 – More than 4’	-	115,824,000	63,847,000	50,000	179,720,000
T12 – U-bent	-	33,202,000	1,518,000	-	34,721,000
Compact – Pin-base	-	96,973,000	1,371,000	-	98,344,000
Compact – Screw-in	73,473,000	47,437,000	1,442,000	-	122,352,000
Compact – Pin-base – reflr	-	-	-	-	-
Compact – Screw-in – reflr	559,000	5,563,000	189,000	-	6,311,000
Circline	-	24,569,000	1,824,000	-	26,393,000
Induction discharge	-	-	-	-	-
Miscellaneous fluorescent	585,045,000	6,142,000	403,000	1,794,000	593,385,000
<b>HID</b>	<b>4,307,000</b>	<b>30,912,000</b>	<b>15,223,000</b>	<b>54,915,000</b>	<b>105,356,000</b>
Mercury vapor	3,103,000	5,401,000	1,750,000	12,146,000	22,400,000
Metal halide	-	19,378,000	10,706,000	4,726,000	34,809,000
High pressure sodium	1,204,000	5,814,000	2,694,000	34,347,000	44,058,000
Low pressure sodium	-	319,000	73,000	3,696,000	4,089,000
Xenon	-	-	-	-	-
Electrodeless (e.g. mercury)	-	-	-	-	-
<b>Solid State</b>	<b>-</b>	<b>1,683,000</b>	<b>60,000</b>	<b>96,000</b>	<b>1,840,000</b>
LED	-	1,433,000	42,000	96,000	1,571,000
Electroluminescent	-	250,000	18,000	-	269,000
<b>Total</b>	<b>4,611,499,000</b>	<b>1,966,255,000</b>	<b>327,066,000</b>	<b>72,929,000</b>	<b>6,977,748,000</b>

**Table 5-5: Distribution of Installed Wattage per Building by Lamp Type (%)**

<b>Technologies</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Outdoor Stationary</b>	<b>All</b>
<b>Incandescent</b>	<b>91%</b>	<b>32%</b>	<b>2%</b>	<b>15%</b>	<b>69%</b>
Standard – General Service	80%	18%	1%	11%	58%
Standard – Reflector	9%	8%	1%	1%	8%
Halogen – General Service	1%	-	-	-	1%
Quartz Halogen	1%	4%	-	2%	2%
Halogen - refl. – low volt	-	2%	-	-	-
Low wattage (less than 25W)	-	1%	-	-	-
Misc incandescent	-	-	-	-	-
<b>Fluorescent</b>	<b>9%</b>	<b>57%</b>	<b>68%</b>	<b>2%</b>	<b>23%</b>
T5	-	-	-	-	-
T8 – less than 4’	-	1%	1%	-	-
T8 – 4’	-	12%	20%	-	4%
T8 – More than 4’	-	-	-	-	-
T8 – U-bent	-	-	-	-	-
T12 – less than 4’	-	1%	-	-	-
T12 – 4’	-	29%	17%	-	8%
T12 – More than 4’	-	10%	28%	-	4%
T12 – U-bent	-	1%	-	-	-
Compact – Pin-base	-	2%	-	-	-
Compact – Screw-in	-	1%	-	-	-
Compact – Pin-base – reflr	-	-	-	-	-
Compact – Screw-in – reflr	-	-	-	-	-
Circline	-	1%	-	-	-
Induction discharge	-	-	-	-	-
Miscellaneous fluorescent	8%	-	-	2%	6%
<b>HID</b>	<b>-</b>	<b>11%</b>	<b>30%</b>	<b>83%</b>	<b>7%</b>
Mercury vapor	-	2%	3%	19%	1%
Metal halide	-	8%	22%	10%	4%
High pressure sodium	-	1%	5%	50%	2%
Low pressure sodium	-	-	-	4%	-
Xenon	-	-	-	-	-
Electrodeless (e.g. mercury)	-	-	-	-	-
<b>Solid State</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
LED	-	-	-	-	-
Electroluminescent	-	-	-	-	-
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

**Table 5-6: Operating Hours per Day by Light Source**

<b>Technologies</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Outdoor Stationary</b>	<b>All</b>
<b>Incandescent</b>	<b>1.9</b>	<b>10.2</b>	<b>16.7</b>	<b>7.9</b>	<b>2.8</b>
Standard - General Service	1.9	9.4	14.2	8	2.4
Standard - Reflector	2.4	9.7	13.4	7.2	4.2
Halogen - General Service	2.3	9.5	-	-	2.5
Quartz Halogen	2.5	9.6	13.6	8.1	6.5
Halogen - refl. - low volt	-	10.3	12.4	-	10.3
Low wattage (less than 25W)	-	16.5	18.6	-	16.7
Misc incandescent	-	-	-	-	-
<b>Fluorescent</b>	<b>2.2</b>	<b>9.7</b>	<b>13.4</b>	<b>10.8</b>	<b>8.2</b>
T5	-	12.8	18.2	-	12.8
T8 – less than 4’	-	9.4	12.7	-	9.9
T8 – 4’	-	9.7	13.5	-	10.8
T8 – More than 4’	-	8.9	14.7	7.3	8.9
T8 – U-bent	-	10.5	13.1	-	11
T12 – less than 4’	-	10.2	11.2	-	10.3
T12 – 4’	-	9.4	12.6	-	9.7
T12 – More than 4’	-	9.9	14.6	7.3	11.6
T12 – U-bent	-	10.5	11.2	-	10.5
Compact – Pin-base	-	10.7	14.9	-	10.8
Compact – Screw-in	2.3	10.6	14.4	-	5.7
Compact – Pin-base – reflr	-	-	-	-	-
Compact – Screw-in – reflr	1.7	10.3	9.6	-	9.5
Circline	-	10.4	11.1	-	10.5
Induction discharge	-	-	-	-	-
Miscellaneous fluorescent	2.2	9.7	11.2	11	2.3
<b>HID</b>	<b>2.8</b>	<b>10.1</b>	<b>13.9</b>	<b>11.3</b>	<b>11</b>
Mercury vapor	2.8	10	12.4	11.2	9.9
Metal halide	-	10.1	14.4	10.5	11.5
High pressure sodium	2.8	10.2	13	11.3	11
Low pressure sodium	-	10.4	11.9	12	11.9
Xenon	-	-	-	-	-
Electrodeless (e.g. mercury)	-	-	-	-	-
<b>Solid State</b>	<b>0</b>	<b>23</b>	<b>23.4</b>	<b>7</b>	<b>22.2</b>
LED	-	22.9	23.3	7	21.9
Electroluminescent	-	23.4	23.7	-	23.4
<b>Total</b>	<b>2</b>	<b>9.9</b>	<b>13.5</b>	<b>10.5</b>	<b>4.8</b>

**Table 5-7: Distribution of Lighting Electricity Consumed per Sector by Lamp Type (%)**

<b>Technologies</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Outdoor Stationary</b>	<b>All</b>
<b>Incandescent</b>	<b>90%</b>	<b>32%</b>	<b>2%</b>	<b>11%</b>	<b>42%</b>
Standard - General Service	76%	18%	1%	9%	31%
Standard - Reflector	11%	8%	1%	1%	7%
Halogen - General Service	1%	-	-	-	-
Quartz Halogen	1%	4%	-	2%	2%
Halogen - refl. - low volt	-	2%	-	-	1%
Low wattage (less than 25W)	-	1%	1%	-	1%
Misc incandescent	-	-	-	-	-
<b>Fluorescent</b>	<b>10%</b>	<b>56%</b>	<b>67%</b>	<b>2%</b>	<b>41%</b>
T5	-	-	-	-	-
T8 – less than 4’	-	1%	1%	-	-
T8 – 4’	-	12%	20%	-	9%
T8 – More than 4’	-	-	-	-	-
T8 – U-bent	-	-	-	-	-
T12 – less than 4’	-	1%	-	-	-
T12 – 4’	-	28%	15%	-	16%
T12 – More than 4’	-	10%	30%	-	9%
T12 – U-bent	-	1%	-	-	1%
Compact – Pin-base	-	2%	-	-	1%
Compact – Screw-in	1%	1%	-	-	1%
Compact – Pin-base – reflr	-	-	-	-	-
Compact – Screw-in – reflr	-	-	-	-	-
Circline	-	1%	-	-	-
Induction discharge	-	-	-	-	-
Miscellaneous fluorescent	9%	-	-	2%	3%
<b>HID</b>	<b>0.30%</b>	<b>12%</b>	<b>31%</b>	<b>87%</b>	<b>17%</b>
Mercury vapor	0.27%	2%	3%	20%	3%
Metal halide	-	9%	23%	9%	8%
High pressure sodium	0.05%	1%	5%	52%	5%
Low pressure sodium	-	-	-	5%	-
Xenon	-	-	-	-	-
Electrodeless (e.g. mercury)	-	-	-	-	-
<b>Solid State</b>	<b>-</b>	<b>0.02%</b>	<b>0.00%</b>	<b>0.01%-</b>	<b>0.01%</b>
LED	-	0.02%	0.00%	0.01%	0.01%
Electroluminescent	-	-	-	-	-
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

**Table 5-8: Distribution of Lamp Output (Tlm-hr) per Year by Lamp Type**

<b>Technologies</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Outdoor Stationary</b>	<b>All</b>
<b>Incandescent</b>	<b>2,693</b>	<b>1,777</b>	<b>36</b>	<b>111</b>	<b>4,614</b>
Standard - General Service	2,376	1,114	17	84	3,590
Standard - Reflector	212	270	6	4	491
Halogen - General Service	54	3	-	-	56
Quartz Halogen	51	276	8	23	358
Halogen - refl. - low volt	-	80	-	-	80
Low wattage (less than 25W)	-	34	5	-	39
Misc incandescent	-	-	-	-	-
<b>Fluorescent</b>	<b>1,188</b>	<b>16,733</b>	<b>5,744</b>	<b>68</b>	<b>23,732</b>
T5	-	13	-	-	13
T8 – less than 4’	-	196	55	-	251
T8 – 4’	-	3,876	1,837	-	5,713
T8 – More than 4’	-	29	-	1	31
T8 – U-bent	-	107	32	-	139
T12 – less than 4’	-	202	9	-	211
T12 – 4’	-	8,073	1,206	-	9,279
T12 – More than 4’	-	3,076	2,546	2	5,624
T12 – U-bent	-	402	20	-	421
Compact – Pin-base	-	391	14	-	405
Compact – Screw-in	59	161	6	-	225
Compact – Pin-base – reflr	-	-	-	-	-
Compact – Screw-in – reflr	-	19	1	-	20
Circline	-	164	15	-	179
Induction discharge	-	-	-	-	-
Miscellaneous fluorescent	1,129	24	3	65	1,221
<b>HID</b>	<b>31</b>	<b>3,068</b>	<b>2,320</b>	<b>4,677</b>	<b>10,097</b>
Mercury vapor	23	261	149	532	965
Metal halide	-	2,202	1,605	356	4,163
High pressure sodium	8	587	562	3,381	4,539
Low pressure sodium	-	18	4	408	430
Xenon	-	-	-	-	-
Electrodeless (e.g. mercury)	-	-	-	-	-
<b>Solid State</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>2</b>
LED	-	1	-	-	2
Electroluminescent	-	-	-	-	-
<b>Total</b>	<b>3,912</b>	<b>21,579</b>	<b>8,100</b>	<b>4,856</b>	<b>38,445</b>



**Table 5-9: Lighting Electricity Usage -- Typical Residential Unit**

Room Type	Operation(Hours per day per room)	Room Type Electricity Use (kWh/yr)	Rank by kWh/yr
Bathroom	1.8	251	3
Bedroom	1.1	215	5
Closet	1.1	19	13
Dining Room	2.5	55	10
Family Room	1.8	74	8
Garage	1.5	103	7
Hall	1.5	171	6
Kitchen	3	322	2
Living Room	2.5	352	1
Office	1.7	37	11
Outdoor	2.1	248	4
Utility Room	2	67	9
Other	0.8	32	12
Total		1,946	

**Table 5-10: Lighting Electricity Usage -- Typical Residential Buildings**

<b>XenCAP™</b>	<b>Average</b>	<b>Installed</b>	<b>Operation</b>	<b>Electricity Use per</b>	<b>Intensity</b>	<b>Rank</b>
<b>Subsector</b>	<b>Floorspace</b>	<b>Wattage</b>	<b>(hrs/day)</b>	<b>Building</b>	<b>(kWh/yr/ ft<sup>2</sup>)</b>	<b>(intensity)</b>
	<b>(sq ft)<sup>1</sup></b>	<b>(W/sq ft)</b>		<b>(kWh/yr)</b>		
Manufactured	949	2.6	1.8	1,690	1.8	1
Single Family – detached	1,648	1.9	2	2,328	1.4	3
Single Family – attached	1,648	1.6	1.9	1,876	1.1	5
Multifamily – <4 units	778	2.2	1.9	1,204	1.5	2
Multifamily – >=4 units	801	2	1.9	1,088	1.4	4
Mean	1,425	2	1.9	1,946	1.4	

**Table 5-11: Lighting Electricity Usage -- Typical Commercial Buildings**

XenCAP™ Subsector	Average Floorspace (sq ft)	Installed Wattage (W/sq ft)	Operation (Hrs/day)	Electricity Use per (kWh/yr)	Intensity (kWh/yr/ ft <sup>2</sup> )	Rank (intensity)
01 Vacant	7,554	2.1	9.8	56,300	7.5	6
02 Office/ Professional	16,303	1.8	10.3	109,212	6.7	9
04 Laboratory	15,767	1.7	13.9	130,157	8.3	3
05 Warehouse (non- refrigerated)	16,284	1.4	9.7	78,565	4.8	16
06 Food sales	5,714	1.9	14.4	56,161	9.8	1
07 Public order/safety	16,191	1.3	9.6	73,030	4.5	18
08 Health Care (outpatient)	9,067	1.7	9.3	52,541	5.8	11
11 Warehouse (refrigerated)	63,850	1.4	10.6	340,119	5.3	14
12 Religious Worship	11,084	1.4	5	27,468	2.5	20
13 Public Assembly	14,397	1.4	7.3	52,238	3.6	19
14 Education	26,430	1.8	7.6	130,236	4.9	15
15 Food Service	5,305	1.6	12.6	37,221	7	7
16 Health Care (inpatient)	168,174	1.7	16	1,605,030	9.5	2
17 Skilled Nursing	26,875	1.3	12	144,229	5.4	13
18 Hotel/Motel/Dorm	30,069	1.3	10.1	142,669	4.7	17
23 Strip Shopping	30,229	1.9	11.1	226,343	7.5	5
24 Enclosed Retail	606,771	1.7	13.7	4,872,139	8	4
25 Retail (excluding enclosed)	8,933	1.9	10.2	62,286	7	8
26 Service (excluding food)	7,085	1.7	9.4	40,736	5.7	12
91 Other	10,651	1.7	10.2	65,040	6.1	10

**Table 5-12: Lighting Electricity Use in Commercial Buildings -- Estimate by Subsector**

XenCAP™ Subsector	Number of Buildings	Lighting Electricity	Fraction of Use	Rank (fraction)
01 Vacant	253,000	14.2	4%	10
02 Office/Professional	739,000	80.7	21%	1
03 Laboratory	27,000	3.5	1%	20
05 Warehouse (non-refrigerated)	590,000	46.3	12%	2
06 Food sales	174,000	9.8	3%	13
07 Public orders/safety	72,000	5.3	1%	16
08 Health care (outpatient)	116,000	6.1	2%	15
11 Warehouse (refrigerated)	14,000	4.7	1%	18
12 Religious worship	307,000	8.4	2%	14
13 Public assembly	305,000	15.9	4%	9
14 Education	327,000	42.6	11%	3
15 Food service	349,000	13	3%	12
16 Health care	11,000	17.8	5%	8
17 Skilled nursing	25,000	3.7	1%	19
18 Hotel/motel/dorm	128,000	18.2	5%	7
23 Strip shopping	131,000	29.6	8%	5
24 Enclosed shopping	3,000	13.5	3%	11
25 Retail (excluding mall)	534,000	33.2	9%	4
26 Service (excluding food)	478,000	19.5	5%	6
91 Other	75,000	4.9	1%	17
Total	4,657,000	391	100%	

**Table 5-13: Lighting Electricity Use in Commercial Buildings by Lamp Technology**

XenCAP™ Subsector	Incandescent	Fluorescent	HID
01 Vacant	38%	59%	4%
02 Office/Professional	33%	56%	11%
03 Laboratory	33%	58%	10%
05 Warehouse (non-refrigerated)	25%	58%	17%
06 Food sales	29%	63%	8%
07 Public orders/safety	38%	47%	15%
08 Health care (outpatient)	32%	56%	12%
11 Warehouse (refrigerated)	27%	58%	15%
12 Religious worship	30%	54%	16%
13 Public assembly	34%	53%	13%
14 Education	28%	58%	14%
15 Food service	46%	45%	8%
16 Health care	34%	57%	9%
17 Skilled nursing	36%	51%	13%
18 Hotel/motel/dorm	39%	47%	15%
23 Strip shopping	31%	59%	10%
24 Enclosed shopping	32%	58%	9%
25 Retail (excluding mall)	31%	60%	10%
26 Service (excluding food)	30%	58%	13%
91 Other	32%	56%	12%

**Table 5-14: Lighting Electricity Usage -- Typical Industrial Buildings**

SIC	Description	Average Floorspace (sq ft)	Installed (W/sq ft)	Operation (Hrs/day)	Electricity Use (kWh/yr)	Intensity (kWh/yr/ft <sup>2</sup> )	Rank (intensity)
20	Food and Kindred Products	72,205	1.1	16.2	490,062	6.8	6
21	Tobacco Products	146,622	1.2	13.7	941,181	6.4	9
22	Textile Mill Products	201,018	1.3	13.5	1,241,737	6.2	13
23	Apparel and Other Textile Products	34,501	1.3	10.1	161,043	4.7	17
24	Lumber and Wood Products	45,796	1.5	15.7	413,835	9	2
25	Furniture and Fixtures	53,683	1.2	10.8	260,721	4.9	16
26	Paper and Allied Products	156,346	1.1	16.2	984,205	6.3	11
27	Printing and Publishing	20,606	1.2	14.6	132,004	6.4	10
28	Chemicals and Allied Products	182,403	1.3	14.5	1,245,133	6.8	5
29	Petroleum and Coal Products	77,339	0.8	14.5	312,579	4	19
30	Rubber and Miscellaneous Plastics	84,717	1.2	15.1	569,539	6.7	7
31	Leather and Leather Products	43,829	1.8	12.1	333,042	7.6	4
32	Stone, Clay, and Glass Products	57,946	1.2	14.8	372,954	6.4	8
33	Primary Metal Industries	201,817	1.4	15.7	1,618,790	8	3
34	Fabricated Metal Products	37,674	1.2	11.3	200,189	5.3	15
35	Industrial Machinery and Equipment	60,583	1.3	14.2	379,325	6.3	12
36	Electronic and Other Electric Equipment	79,488	1.3	12.4	465,191	5.9	14
37	Transportation Equipment	161,367	1.5	16.6	1,604,236	9.9	1
38	Instruments and Related Products	356,695	1.3	10	1,643,373	4.6	18
39	Miscellaneous Manufacturing Industries	36,771	1.2	8	125,423	3.4	20

**Table 5-15: Lighting Electricity Use in Industrial Buildings -- Estimate by Subsector**

SIC	Description	National Population of Buildings	Industrial Lighting Electricity Use (TWh/yr)	Share of Industrial Lighting Electricity Use	Rank
20	Food and Kindred Products	18,100	8.9	8%	4
21	Tobacco Products	300	0.3	0%	20
22	Textile Mill Products	7,200	8.9	8%	3
23	Apparel and Other Textile Products	12,600	2	2%	16
24	Lumber and Wood Products	11,700	4.8	4%	10
25	Furniture and Fixtures	11,300	2.9	3%	15
26	Paper and Allied Products	4,700	4.6	4%	12
27	Printing and Publishing	25,800	3.4	3%	14
28	Chemicals and Allied Products	9,000	11.2	10%	2
29	Petroleum and Coal Products	1,800	0.5	1%	18
30	Rubber and Miscellaneous Plastics	11,900	6.8	6%	8
31	Leather and Leather Products	1,000	0.3	0%	19
32	Stone, Clay, and Glass Products	11,300	4.2	4%	13
33	Primary Metal Industries	3,800	6.2	6%	9
34	Fabricated Metal Products	40,700	8.2	8%	5
35	Industrial Machinery and Equipment	19,600	7.4	7%	7
36	Electronic and Other Electric Equipment	9,900	4.6	4%	11
37	Transportation Equipment	8,400	13.4	12%	1
38	Instruments and Related Products	4,500	7.4	7%	6
39	Miscellaneous Manufacturing Industries	13,600	1.7	2%	17
<b>Total</b>		<b>227,000</b>	<b>107.9</b>	<b>100%</b>	

**Table 5-16: Share of Lighting Electricity Use in Industrial Buildings by Lamp**

<b>SIC</b>	<b>XenCAP™ Subsector</b>	<b>Incandescent</b>	<b>Fluorescent</b>	<b>HID</b>
20	Food and Kindred Products	2%	65%	33%
21	Tobacco Products	1%	62%	37%
22	Textile Mill Products	2%	69%	28%
23	Apparel and Other Textile Products	3%	67%	31%
24	Lumber and Wood Products	2%	62%	36%
25	Furniture and Fixtures	3%	68%	29%
26	Paper and Allied Products	2%	66%	32%
27	Printing and Publishing	3%	72%	25%
28	Chemicals and Allied Products	2%	75%	23%
29	Petroleum and Coal Products	3%	80%	17%
30	Rubber and Miscellaneous Plastics	2%	63%	34%
31	Leather and Leather Products	1%	64%	35%
32	Stone, Clay, and Glass Products	2%	65%	33%
33	Primary Metal Industries	2%	65%	33%
34	Fabricated Metal Products	2%	64%	34%
35	Industrial Machinery and Equipment	2%	69%	28%
36	Electronic and Other Electric Equip.	2%	67%	31%
37	Transportation Equipment	2%	61%	38%
38	Instruments and Related Products	5%	74%	20%
39	Miscellaneous Manufacturing Industries	3%	64%	33%



**Table 5-17: Lamps per Outdoor Stationary Installation**

Technology	Billboard – lamps per installation			Traffic signals per intersection			Aviation per airport				Roadway - national proportion lamps	Parking - national proportion lamps
	8 panel	30 panel	Bulletin	Ball	Turn	Pedestrian	Approach	Touch-down	Center-line	Edge		
<b>Incandescent</b>				<b>24</b>	<b>2</b>	<b>8</b>	<b>96</b>	<b>180</b>	<b>120</b>	<b>70</b>		
Standard - GS				23.8	2	7.9					4%	6%
Standard - Refl							48	90	60	35		2%
Halogen - Refl							48	90	60	35		5%
Low Wattage												
<b>Fluorescent</b>	<b>0.14</b>	<b>0.28</b>	<b>0.42</b>								<b>2%</b>	<b>4%</b>
T8 - >4'	0.07	0.14	0.21									
T12 - < 4'												
T12 - 4'												
T12 - > 4'	0.07	0.14	0.21									
Other											2%	4%
<b>HID</b>	<b>0.86</b>	<b>1.72</b>	<b>2.58</b>								<b>94%</b>	<b>83%</b>
Mercury vapor	0.06	0.12	0.18								20%	20%
Metal halide	0.8	1.6	2.4								5%	10%
HPS											59%	53%
LPS											10%	
<b>Solid State</b>				<b>0.24</b>	<b>0.02</b>	<b>0.08</b>						
LED				0.24	0.02	0.08						
<b>Total</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>24</b>	<b>2</b>	<b>8</b>	<b>96</b>	<b>180</b>	<b>120</b>	<b>70</b>	<b>100%</b>	<b>100%</b>

**Table 5-18: Lamp Wattage Assumed for Outdoor Stationary Installations**

Technology	Billboard – lamps per installation			Traffic signals per intersection			Aviation per Airport				Roadway – lamps	Parking – lamps
	8 panel	30 panel	Bulletin	Ball	Turn	Pedestrian	Approach	Touch-down	Center-line	Edge		
<b>Incandescent</b>												
Standard - GS				150	125	125					150	83
Standard - Refl							375	60	120	120		104
Halogen - Refl							375	60	120	120		226
Low Wattage												
<b>Fluorescent</b>												
T8 - >4'	105	105	105									
T12 - < 4'												
T12 – 4'												
T12 - > 4'	190	190	190									
Other											150	150
<b>HID</b>												
Mercury vapor	300	300	300								182	331
Metal halide	300	300	300								200	407
HPS											192	260
LPS											180	
<b>Solid State</b>												
LED				15	10	15						

**Table 5-19: Fraction of Outdoor Stationary Lighting Energy by Lamp Technology (%)**

Technology	Row Sum of Percentages	Billboard – all installations			Traffic - all intersections			Aviation – all airports				Roadway – all installations	Parking – all installations
		8 panel	30 panel	Bulletin	Ball	Turn	Pedestrian	Approach	Touch-down	Center-line	Edge		
Incandescent	11.20%	-	-	-	5.00%	0.10%	1.10%	0.10%	0.20%	0.30%	0.20%	1.70%	2.60%
Standard - GS	8.50%				5.00%	0.10%	1.10%					1.70%	0.70%
Standard - Refl	0.70%							0.00%	0.10%	0.10%	0.10%		0.30%
Halogen - Refl	2.00%							0.00%	0.10%	0.10%	0.10%		1.60%
Low Wattage	-												
Fluorescent	1.90%	0.00%	0.00%	0.00%	-	-	-	-	-	-	-	1.00%	0.90%
T8 - >4'	0.02%	0.00%	0.00%	0.00%									
T12 - < 4'	-												
T12 – 4'	-												
T12 - > 4'	0.04%	0.00%	0.00%	0.00%									
Other	1.90%											1.00%	0.90%
HID	86.80%	0.20%	0.50%	0.20%	-	-	-	-	-	-	-	51%	35%
Mercury vapor	20.00%	0.00%	0.00%	0.00%								10%	9.50%
Metal halide	9.50%	0.20%	0.40%	0.20%								2.90%	5.80%
HPS	52.30%											32%	20%
LPS	5.00%											5.00%	
Solid State	0.01%	-	-	-	0.00%	0.00%	0.00%	-	-	-	-	-	-
LED	0.00%				0.00%	0.00%	0.00%						
<b>Total</b>	<b>100%</b>	<b>0.20%</b>	<b>0.50%</b>	<b>0.20%</b>	<b>5.00%</b>	<b>0.10%</b>	<b>1.10%</b>	<b>0.10%</b>	<b>0.20%</b>	<b>0.30%</b>	<b>0.20%</b>	<b>54%</b>	<b>39%</b>

**Table 5-20: Lighting Energy Use in Outdoor Stationary Sources**

	Number of Installations	Installed Wattage per Installation (W)	Operating hours per Installation (h/day)	Lighting Energy Use per Installation (kWh/yr)	Total Lighting Energy Use (TWh/yr)
<b>Billboard</b>	<b>Displays</b>				<b>0.5</b>
8 Sheet	140,000	279	7.3	747	0.1
30 Sheet	200,000	557	7.3	1,493	0.3
Bulletin	56,000	836	7.3	2,240	0.1
<b>Traffic Signal</b>	<b>Intersections</b>				<b>3.6</b>
Ball Signal	300,000	3,568	7.3	9,549	2.9
Turn Arrow	300,000	248	2.2	201	0.1
Pedestrian	225,000	991	7.5	2,713	0.6
<b>Aviation</b>	<b>Lit runways</b>				<b>0.5</b>
Approach	720	36,000	6	78,840	0.1
Touchdown	5,000	10,800	6	23,652	0.1
Centerline	5,000	14,400	6	31,536	0.2
Taxiway/Runway	7,500	8,400	6	18,396	0.1
Roadway	37,850,000	187	12	818	31
Parking	22,670,000	269	10	983	22.3
<b>Total</b>					<b>57.8</b>

**Table 5-21: National Lighting Energy Use Summary**

Sector	Lighting Energy use per Building (kWh/yr)	Number of Buildings	Site Energy		Primary Energy (quad/yr)	Percent of Total
			(TWh/yr)	(quad/ yr)		
Residential	1,946	106,989,000	208	0.7	2.2	27%
Commercial	83,933	4,657,000	391	1.3	4.2	51%
Industrial	475,063	227,000	108	0.4	1.2	14%
Outdoor Stationary	n/a	n/a	58	0.2	0.6	8%
Total			765	2.6	8.2	100%

**Table 5-22: National Lighting Energy Use by Sector and Source**

Sector	Incandescent		Fluorescent		HID		Solid State		Total	
	TWh/yr	Quads	TWh/yr	Quads	TWh/yr	Quads	TWh/yr	Quads	TWh/yr	Quads
Residential	187.6	2.02	19.9	0.21	0.7	0.01	0	0	208.2	2.2
Commercial	124.5	1.34	220.1	2.37	46.2	0.5	0.1	0.001	390.9	4.2
Industrial	2.6	0.03	72.3	0.78	33	0.36	0	0	107.9	1.2
Outdoor	6.5	0.07	1.1	0.01	50.2	0.54	0	0	57.8	0.6
Stationary										
Total	321.2	3.5	313.4	3.4	130	1.4	0.1	0	764.7	8.2

**Table 5-23: Lighting Use on a Floorspace Basis**

<b>Sector</b>	<b>Installed Wattage (W/sq ft)</b>	<b>Mean Efficacy (lm/W)</b>	<b>Illuminance (fc)(CU=0.5)</b>	<b>Operating Hours (hr/day)</b>	<b>Energy Intensity (kWh/yr/ft<sup>2</sup>)</b>
Residential	2	18	18	2	1.4
Commercial	1.7	55	45	9.9	5.8
Industrial	1.3	75	48	13.5	6.4

**Table 6-1: Description of Space Functions**

Space Function	Description
Assembly	Public gathering places such as auditoriums, churches, and museums
Bathroom	Bathrooms
Classroom	Spaces where classes are taught
Dining	Places where food is served and eaten
Exit sign	“Exit” signs
Food prep	Places where food is prepared
Hallway	Pass-through areas such as stairs and lobbies
Healthcare	Medical, nursing, and lab areas
Landscape	Exterior lit spaces including hardscape and softscape and pedestrian walks
Living space	Occupied living spaces not including kitchens and bathrooms
Merchandise	Retail display areas
Office	Spaces where non-manufacturing work is conducted
Parking	Parking areas
Roadway	Streets and highways
Shipping/Receiving	Areas where materials are staged, shipped, and received
Shop	Manufacturing assembly and fabrication areas
Storage	Places where items are stored including food
Signage	Illuminated signs
Signal	Installations such as traffic and aviation signals not intended to illuminate
Sports/Recreation	Athletic and recreational areas
Structure	Exterior illumination of buildings
Task	Illumination focused on specific tasks
Unknown	Unidentifiable areas typically including phrases such as “First Floor” that change with the building function
Utility	Boiler rooms, electrical closets, and other areas dedicated to equipment



**Table 6-2: Lighting Energy Consumed in Each Sector by Space Function (TWh/yr)**

	Res	Com	Ind	Out	All	
Assembly	-	12	-	-	12	2%
Bathroom	27	5	1	-	32	4%
Classroom	-	21	1	-	22	3%
Dining	6	16	1	-	23	3%
Exit sign	-	4	1	-	5	1%
Food prep	34	7	-	-	42	5%
Hallway	18	31	2	-	51	7%
Healthcare	-	10	4	-	14	2%
Landscape	27	14	-	-	41	5%
Living space	69	8	-	-	77	10%
Merchandise	-	48	-	-	48	6%
Office	4	73	11	-	88	11%
Parking	-	11	1	22	34	4%
Roadway	-	-	-	31	31	4%
Shipping/Receiving	-	1	2	-	3	0%
Shop	-	17	50	-	66	9%
Storage	13	27	9	-	49	6%
Signage	-	19	2	1	22	3%
Signal	-	-	-	4	4	1%
Sports/Recreation	-	8	1	-	9	1%
Structure	-	10	2	-	12	2%
Task	-	6	1	-	7	1%
Unknown	3	36	15	-	54	7%
Utility	7	8	4	-	19	2%
Total						

**Table 7-1: Annual Lighting Electricity Consumption Estimates**

<b>Residential</b>	<b>Annual Household Lighting Electricity Consumption</b>
EIA (1996)	940 kWh
Hanford (1994) <sup>1</sup>	1,313 kWh
Hwang et. al., LBNL (1994b)	1,469 kWh
Heschong Mahone Group (1997) <sup>2</sup>	1,704 kWh
Tribwell and Lerman (1996) <sup>3</sup>	1,818 kWh
<b>Lighting Market Characterization (2001)</b>	<b>1,946 kWh</b>
Manclark et al. (1992) and Nelson (1992) <sup>4</sup>	2,517 kWh
<b>Commercial</b>	<b>Annual National Lighting Electricity Consumption</b>
Vorsatz and Koomey (1997) <sup>5</sup>	240 TWh
EIA (1996a)	340 TWh
<b>Lighting Market Characterization (2001)</b>	<b>391 TWh</b>
<b>Industrial</b>	<b>Annual National Lighting Electricity Consumption</b>
Niefer (1997) <sup>6</sup>	50 TWh
<b>Lighting Market Characterization (2001)</b>	<b>108 TWh</b>

Table notes:

1. PG&E metered data scaled by national average floorspace. Incandescent only. Our
2. California only based on 697 homes and adjustments based on TPU data.
3. Tacoma, Washington service area only based on the TPU dataset.
4. Yakima, Washington only. Surveys and metering of 53 homes for 3 months.
5. Results of COMMEND model forecast. Cited in Vorsatz (1997)
6. Based on 1991 MECS

**Table 7-2: Comparison of AHS and TPU Rooms per Housing Unit**

<b>Room Type</b>	<b>AHS Occurrence</b>	<b>TPU Occurrence</b>
Bathroom	<b>1.56</b>	1.7
Bedroom	<b>2.61</b>	2.67
Closet	5.21	<b>0.47</b>
Dining Room	<b>0.38</b>	0.77
Family Room	<b>0.35</b>	0.6
Garage	n/a	<b>0.57</b>
Hall	n/a	<b>2.19</b>
Kitchen	<b>1</b>	1.01
Living Room	<b>0.96</b>	0.99
Office	<b>0.05</b>	0.24
Outdoor	n/a	<b>1.37</b>
Utility Room	<b>0.41</b>	0.76
Other	0.08	<b>0.33</b>
<b>Total</b>	<b>12.61</b>	<b>13.67</b>

Note: Shaded values indicate those selected for use in this study.

n/a: AHS did not provide data

**Table 8-1. U.S. National Lighting Energy Use Estimates for 2001**

	Electricity Use per Building	Number of Buildings	Site Energy (TWh/yr)	Energy (quads)	Percent of Total
Residential	1,946	106,989,000	208	2.2	27%
Commercial	83,933	4,657,000	391	4.2	51%
Industrial	475,063	227,000	108	1.2	14%
Outdoor stationary	n/a	n/a	58	0.6	8%
Totals			765	8.2	100%

**Table 8-2: National Lighting Energy Use by Sector and Source**

Sector	Incandescent		Fluorescent		HID		Solid State		Total	
	TWh/yr	Quads	TWh/yr	Quads	TWh/yr	Quads	TWh/yr	Quads	TWh/yr	Quads
Residential	187.6	2.02	19.9	0.21	0.7	0.01	0	0	208.2	2.2
Commercial	124.5	1.34	220.1	2.37	46.2	0.5	0.1	0.001	390.9	4.2
Industrial	2.6	0.03	72.3	0.78	33	0.36	0	0	107.9	1.2
Outdoor	6.5	0.07	1.1	0.01	50.2	0.54	0	0	57.8	0.6
Stationary										
Total	321.2	3.5	313.4	3.4	130	1.4	0.1	0	764.7	8.2

**Table 8-3. Average Installed Wattages by Sector and Lamp Type, 2001**

Incandescent	67	83	64	138	69
Fluorescent	38	41	48	150	41
HID	151	404	425	227	304
Solid State	-	5	5	15	6

**Table 8-4. Percentage of Installed Lamps in Average Buildings by Sector, 2001**

	Residential (% lamps)	Commercial (% lamps)	Industrial (% lamps)	Outdoor (% lamps)	National Avg. (% lamps)
Incandescent	86%	22%	2%	22%	63%
Fluorescent	14%	77%	93%	3%	35%
HID	0%	2%	5%	75%	2%
Solid State	0%	0%	0%	0%	0%
Totals	100%	100%	100%	100%	100%

**Table 8-5. Percentage of Installed Wattages in Average Buildings by Sector, 2001**

Incandescent	91%	32%	2%	15%	69%
Fluorescent	9%	57%	68%	2%	23%
HID	0%	11%	30%	83%	7%
Solid State	0%	0%	0%	0%	0%
Totals	100%	100%	100%	100%	100%



**Table 8-6. Average Operating Hours per Day by Sector and Source, 2001**

	Residential (hours/day)	Commercial (hours/day)	Industrial (hours/day)	Outdoor (hours/day)	National Avg. (hours/day)
Incandescent	1.9	10.2	16.7	7.9	2.8
Fluorescent	2.2	9.7	13.4	10.8	8.2
HID	2.8	10.1	13.9	11.3	11
Solid State	0	23	23.4	7	22.2
Sectoral Average	2	9.9	13.5	10.5	4.8

**Table 8-7. Percentage of Electricity Consumption by Sector and Source, 2001**

	Residential (% electricity)	Commercial (% electricity)	Industrial (% electricity)	Outdoor (% electricity)	National Avg. (% electricity)
Incandescent	90%	32%	2%	11%	42%
Fluorescent	10%	56%	67%	2%	41%
HID	0.30%	12%	31%	87%	17%
Solid State	0%	0.02%	0.00%	0.01%	0.01%
Totals	100%	100%	100%	100%	100%

**Table 8-8. Percentage of Source Lumen Output by Sector and Source, 2001**

	Residential (% lmhr/yr)	Commercial (% lmhr/yr)	Industrial (% lmhr/yr)	Outdoor (% lmhr/yr)	National Avg. (% lmhr/yr)
Incandescent	69%	8%	0%	2%	12%
Fluorescent	30%	78%	71%	1%	62%
HID	1%	14%	29%	96%	26%
Solid State	0%	0%	0%	0%	0%
Totals	100%	100%	100%	100%	100%

**Table A-1. Approximate Properties of Lighting Technologies Considered**

Lamp Type	Available Wattage	Efficacy (lm/W)	CRI	CCT (K)	Life (1000 hrs)
<b>Incandescent</b>					
Standard - General Service	15-250	10-19	97	2,500-3,000	0.75 - 2.5
Standard - Reflector	30-120	8-12	97	2,500-3,000	2
Halogen - General Service	42-150	14-20	99	3,000	2 - 3.5
Quartz Halogen	35-150	11-17	99	2,800-3,000	2 - 5
Halogen - refl. - low volt	15-73	7-10	99		4
Low wattage (less than 25W)	3-25	3-17	99		0.2 - 9
Misc incandescent	0.5 - 37.5		99		0 - 3
<b>Fluorescent</b>					
T5	4-13	25-55	52-75	3,000-6,500	6 - 7.5
T8 – less than 4’	17-30	35-82	60-90	3,000-6,500	15 - 20
T8 – 4’	32	78-87	70-90	3,000-5,000	15 - 20
T8 – More than 4’	35-86	78-87	52-84	3,000-4,100	7.5 - 20
T8 – U-bent	32	80-82	75-84	3,000-4,100	20
T12 – less than 4’	14-55	35-75	52-90	3,000-6,500	7.5 - 18
T12 – 4’	32, 34, 40	60-75	50-90	3,000-7,500	20
T12 – More than 4’	50-220	45-92	60-92	3,000-6,500	9-20
T12 – U-bent	34-40	48-74	52-82	3,000-6,500	10-20
Compact – Pin-base	5-50	42-77	82	2,700-6,500	10-20
Compact – Screw-in	5-55	40-70	82	2,700-5,000	10
Compact – Pin-base – reflector					
Compact – Screw-in – reflector					
Circline	20-40	29-50	60-85	3,000-6,500	10-12
Induction discharge	55-85	50-56	80+	3,000-4,000	100
Miscellaneous fluorescent					
<b>HID</b>					
Mercury vapor	40-1000	25-50	15-50	4,000-7,000	29
Metal halide	36-1650	50-115	65-70	3,000-4,400	3-20
High pressure sodium	35-1000	50-124	22	1,900-2,200	29
Low pressure sodium	18-180	75-150	0	1,700-1,800	18
Xenon					
Electrodeless (e.g. mercury)					
<b>Solid State</b>					
LED	2-25	3-30	0		
Electroluminescent					
<b>Total</b>					

**Table A-2. Ballast Prevalence in Fluorescent Lamps in XenCAP™**

	Magnetic			Hybrid	Electronic		
	Standard	High Eff.	T8		Standard	T8 Full Output	T8 Reduced Output
T8	8%	1%	29%	0%	0%	62%	1%
T12	91%	7%	0%	0%	1%	0%	0%
Both	89%	7%	1%	0%	1%	2%	0%

**Table A-3. Efficacy Assumptions Used to Calculate National Lumen Production**

Lighting Technology	Residential		Commercial		Industrial	
	Wattage	efficacy	Wattage	efficacy	Wattage	efficacy
Standard - General Service	63	15	83	16	126	17
Standard - Reflector	102	9	104	9	102	9
Halogen - General Service	200	18	64	15	-	15
Halogen – Double Ended	205	19	226	20	452	20
Halogen - refl. - low volt	-	-	48	11	58	11
Low wattage (<25W)	-	-	15	9	19	9
Misc incandescent	-	-	-	13	-	13
T5	-	-	8	50	10	50
T8 – less than 4'	-	-	23	82	23	82
T8 – 4'	-	-	33	85	31	85
T8 – More than 4'	-	-	50	88	53	88
T8 – U-bent	-	-	34	74	32	74
T12 – less than 4'	-	-	29	63	32	63
T12 – 4'	-	-	45	74	44	74
T12 – More than 4'	-	-	93	79	95	79
T12 – U-bent	-	-	46	69	46	69
Compact Plug-in	-	60	17	60	31	60
Compact Screw base	18	55	16	55	14	55
Compact Plug-in – reflector	-	55	16	55	-	55
Compact Screw base – reflector	11	55	16	55	14	55
Circline	-	58	30	58	35	58
Induction discharge	-	53	-	53	-	53
Miscellaneous fluorescent	41	60	18	60	34	60
Mercury vapor	179	40	331	40	409	46
Metal halide	-	65	472	65	438	65
High pressure sodium	79	80	260	104	394	112
Low pressure sodium	-	-	104	140	90	140
Xenon	-	-	-	40	-	40
Electrodeless (e.g. mercury)	-	-	-	150	-	150
LED	-	-	6	20	6	20
Electroluminescent	-	-	2	10	2	10

**Table C-1 Example of a Facility Table from XenCAP™ Database**

AudNo	Address	Zip	SICCode	FacilTyp	FloorArea	DateVisit	OpHrs	NoEmpl	Utility
15372S	Staten Island, NY	10305	0	6	5300	27-Aug-96	79	8	6
15373M	New York, NY	10010	0	1	9700	28-Aug-96	60	25	6
15374M	New York, NY	10001	0	4	5200	28-Aug-96	80	15	6
15375Q	Ozone Park, NY	11416	0	1	9000	27-Aug-96	78	30	6
15376M	New York, NY	10029	0	16	2268	4-Sep-96	15	10	6
15378W	Pleasantville	10570	0	6	3000	5-Sep-96	90	7	6
15379M	New York, NY	10014	0	4	1800	4-Sep-96	84	3	6
15380B	Brooklyn, NY	11237	0	10	30540	22-Aug-96	58	10	6
15381B	Brooklyn, NY	11211	0	11	6620	16-Sep-96	144	20	6
15382Q	Long Island City, NY	11101	0	10	27000	11-Sep-96	60	80	6
15384W	Elmsford, NY	10523	0	10	70400	5-Sep-96	111	205	6
15385M	New York, NY	10024	0	6	6600	13-Sep-96	126	30	6
15386X	Bronx, NY	10464	0	6	5000	10-Sep-96	130	20	6
15387Q	Maspeth, NY	11378	0	6	1800	13-Sep-96	81	4	6
15388M	New York, NY	10035	0	11	2420	13-Sep-96	61	25	6
15389Q	Flushing, NY	11354	0	10	6000	13-Sep-96	84	6	6
15390W	Mount Vernon, NY	10550	0	6	3200	10-Jul-96	100	10	6
15391Q	Woodside, NY	11377	0	11	15000	13-Sep-96	40	30	6
15392W	Bronxville, NY	10708	0	7	7000	11-Sep-96	168	2	6
15393W	Scarsdale, NY	10583	0	16	3600	11-Sep-96	25	30	6
15394X	Bronx, NY	10454	0	10	80000	20-Sep-96	80	3	6
15395X	Bronx, NY	10473	0	10	40000	20-Sep-96	61	5	6
15396X	Bronx, NY	10457	0	10	10000	20-Sep-96	53	1	6
15397W	New Rochelle, NY	10801	0	10	20000	20-Sep-96	61	3	6
15398W	Mount Vernon, NY	10550	0	10	20000	20-Sep-96	66	3	6
15399B	Brooklyn, NY	11201	0	1	15000	4-Sep-96	60	20	6

**Table C-2 Example of a Lighting Group Table from the XenCAP™ Database**

<b>AudNo</b>	<b>Light Group</b>	<b>Desc</b>	<b>OpHrs</b>	<b>Utility</b>
15372S	1	Bar	80	6
15372S	2	Entrance	80	6
15372S	3	Mens room	80	6
15372S	4	Ladies room	80	6
15372S	5	Restroom hallwy	80	6
15372S	6	Main room	35	6
15372S	7	Service counter	80	6
15372S	8	Kitchen	80	6
15372S	9	Kitchen prea.a.	80	6
15372S	10	Stairway	80	6
15372S	11	Basement	80	6
15372S	12	Bsmt laundry rm	80	6
15372S	13	Bsmt. restroom	40	6
15372S	14	Outside lights	40	6
15372S	15	Exit signs	168	6
15373M	1	Exit	168	6
15373M	2	Halls	168	6
15373M	3	Halls	65	6
15373M	4	Conference room	40	6
15373M	5	Storage	65	6
15373M	6	Restrooms	50	6
15373M	7	Suite 1015	65	6
15373M	8	Other suites	60	6
15374M	1	Exit	168	6
15374M	2	Reception	80	6
15374M	3	Halls	80	6
15374M	4	Offices	60	6
15374M	5	Storage	30	6
15374M	6	Conference room	40	6
15374M	7	Production area	80	6
15374M	8	Color production	80	6



**Table C-3 Example of a Lighting Technology Table from the XenCAP™ Database**

AudNo	Light Group	Lighting Type	Lamps per Fixture	Lamp code	Qty	Pct High Efficiency Lamps	Present Ballast Type	Utility
15372S	1	I	3	15	8			6
15372S	2	I	1	40	2			6
15372S	2	I	1	40	6			6
15372S	3	I	1	60	3			6
15372S	4	I	1	60	6			6
15372S	5	F	1	17	1			6
15372S	5	F	1	19	1			6
15372S	6	I	1	40	16			6
15372S	6	I	6	40	4			6
15372S	7	I	1	25	2			6
15372S	7	I	1	60	1			6
15372S	7	F	1	12	1			6
15372S	8	F	4	3	1	100	1	6
15372S	9	F	4	1	2		1	6
15372S	9	F	2	1	1		1	6
15372S	10	F	1	13	1		1	6
15372S	11	I	1	60	3			6
15372S	12	F	2	1	2		1	6
15372S	13	I	1	60	1			6
15372S	14	MH	1	100	2			6
15372S	14	I	1	100	1			6
15372S	14	I	1	60	4			6
15372S	14	IS	2	150	1			6
15372S	15	I	2	15	3			6
15373M	1	I	2	20	4			6
15373M	2	F	4	1	3		1	6
15373M	3	F	4	1	3		1	6
15373M	3	F	2	1	1		1	6
15373M	3	F	4	3	2		1	6
15373M	3	I	1	60	2			6
15373M	3	MH	1	150	2			6
15373M	3	Q	1	4	4			6

**Table D-1. Number of Households for the Residential Sector**

	<b>Mobile Home</b>	<b>Single Family Detached</b>	<b>Single Family Attached</b>	<b>Multifamily 2-4 Units</b>	<b>Multifamily &gt;4 Units</b>
<b>Number</b>	6,806,000	63,099,000	10,591,000	9,490,000	17,003,000

Source: RECS, 2001

**Table D-2. Average lamps per household for the Residential Sector**

<b>Building Type</b>	<b>Mobile Home</b>	<b>Single Family Detached</b>	<b>Single Family Attached</b>	<b>Multifamily 2-4 Units</b>	<b>Multifamily &gt;4 Units</b>
Bathroom	5.38	6.88	6.06	4.05	4.31
Bedroom	7.74	9.94	7.43	5.74	4.69
Closet	0.65	0.77	0.68	0.58	0.59
Dining Room	0.5	1.23	0.95	0.67	0.43
Family Room	0.61	2.38	0.96	0.36	0.13
Garage	1.3	4.23	2.42	0	0
Hall	4.42	5.12	4.7	3.72	3.83
Kitchen	5.14	5.11	5.14	4.91	4.87
Living Room	6.01	5.97	5.94	6.02	6
Office	0.46	1.16	0.75	0.54	0.43
Other	1.88	2.05	1.88	0	0
Outdoor	3.57	4.06	3.73	0	0
Utility Room	1.65	1.81	1.4	0.88	0.52
<b>Total per hhld</b>	<b>39.3</b>	<b>50.7</b>	<b>42.04</b>	<b>27.49</b>	<b>25.79</b>

**Table D-3. Number of Lamps by Room-type for the Residential Sector**

	Mobile Home	Single Family Detached	Single Family Attached	Multifamily 2-4 Units	Multifamily >4 Units	Total
Bathroom	36,617,857	434,002,906	64,227,443	38,464,990	73,305,796	646,618,991
Bedroom	52,669,576	627,177,520	78,644,774	54,473,798	79,759,677	892,725,346
Closet	4,439,432	48,302,109	7,171,999	5,551,639	9,959,537	75,424,716
Dining Room	3,425,922	77,578,827	10,108,244	6,316,809	7,309,296	104,739,098
Family Room	4,160,922	150,137,826	10,183,334	3,404,712	2,236,188	170,122,982
Garage	8,814,762	267,035,734	25,666,515	-	-	301,517,010
Hall	30,053,656	322,909,621	49,803,292	35,346,727	65,083,481	503,196,778
Kitchen	34,977,887	322,473,072	54,404,859	46,615,142	82,738,315	541,209,275
Living Room	40,915,618	376,648,436	62,942,144	57,137,190	101,986,948	639,630,335
Office	3,099,757	73,489,159	7,920,932	5,165,261	7,310,996	96,986,105
Other	12,786,713	129,053,064	19,928,003	-	-	161,767,781
Outdoor	24,314,406	256,117,677	39,481,650	-	-	319,913,733
Utility Room	11,204,308	114,389,898	14,800,665	8,397,664	8,854,307	157,646,842
<b>Total</b>	<b>267,480,814</b>	<b>3,199,315,848</b>	<b>445,283,855</b>	<b>260,873,933</b>	<b>438,544,540</b>	<b>4,611,498,991</b>

**Table D-4. Annual hours of operation by room-type by home for the Residential Sector**

	<b>Mobile Home</b>	<b>Single Family Detached</b>	<b>Single Family Attached</b>	<b>Multifamily 2-4 Units</b>	<b>Multifamily &gt;4 Units</b>
Bathroom	603	669	617	647	577
Bedroom	403	406	408	442	423
Closet	314	513	382	264	183
Dining Room	888	829	885	1,088	1,080
Family Room	626	772	676	441	453
Garage	667	720	665	0	0
Hall	519	616	542	462	414
Kitchen	994	1,210	1,089	921	888
Living Room	948	864	921	1,040	1,015
Office	385	708	676	435	401
Other	267	435	299	0	0
Outdoor	981	1,027	989	0	0
Utility Room	487	888	673	448	370



<b>Table D-6. Lamp Hours by home and light source for the Residential Sector</b>					
	<b>Mobile Home</b>	<b>Single Family Detached</b>	<b>Single Family Attached</b>	<b>Multifamily 2-4 Units</b>	<b>Multifamily &gt;4 Units</b>
Standard-General Service	137,790,185,955	1,746,138,835,677	236,669,078,569	149,881,336,050	241,447,053,446
Standard-Reflector	14,512,940,394	170,076,184,170	24,488,984,093	8,733,324,473	14,543,951,700
Halogen-General Service	918,344,198	10,194,038,322	1,499,556,114	842,481,367	1,405,830,929
Halogen-Quartz	848,671,887	10,085,669,325	1,428,008,521	258,592,236	429,611,276
Halogen-refl.-low volt	-	-	-	-	-
Low wattage (lessthan25W)	-	-	-	-	-
Misc incandescent	-	-	-	-	-
T5	-	-	-	-	-
T8-less than 4'	-	-	-	-	-
T8-4'	-	-	-	-	-
T8-More than 4'	-	-	-	-	-
T8-U-bent	-	-	-	-	-
T12-less than 4'	-	-	-	-	-
T12-4'	-	-	-	-	-
T12-More than 4'	-	-	-	-	-
T12-U-bent	-	-	-	-	-
Compact-Plug-in	-	-	-	-	-
Compact-Screwbase	3,478,406,499	40,889,520,700	5,811,446,689	4,102,814,297	6,783,020,316
Compact-Plug-in-reflector	-	-	-	-	-
Compact-Screwbase-reflector	17,103,705	243,772,767	33,291,605	21,598,984	32,193,733
Circline	-	-	-	-	-
Induction discharge	-	-	-	-	-
Miscellaneous fluorescent	21,444,936,584	348,344,764,730	41,460,514,807	19,582,663,435	32,249,326,283
Mercury vapor	231,320,419	2,552,222,456	378,937,132	-	-
Metal halide	-	-	-	-	-
High pressure sodium	89,727,283	989,986,050	146,986,589	-	-
Low pressure sodium	-	-	-	-	-
Xenon	-	-	-	-	-
Electrodeless (e.g.sulfur)	-	-	-	-	-
LED	-	-	-	-	-
Electroluminescent	-	-	-	-	-
<b>Total</b>	<b>179,331,636,924</b>	<b>2,329,514,994,198</b>	<b>311,916,804,118</b>	<b>183,422,810,843</b>	<b>296,890,987,683</b>

<b>Table D-7. Average Wattage and Efficacy for the Residential Sector</b>			
	<b>Average Wattage</b>	<b>Estimated Efficacy</b>	
Standard - General Service	63	15	
Standard - Reflector	102	9	
Halogen - General Service	200	18	
Halogen - Quartz	205	19	
Halogen - refl. - low volt	-	-	
Low wattage (less than 25W)	-	-	
Misc incandescent	-	-	
T5	-	-	
T8 - less than 4'	-	-	
T8 - 4'	-	-	
T8 - More than 4'	-	-	
T8 - U-bent	-	-	
T12 - less than 4'	-	-	
T12 - 4'	-	-	
T12 - More than 4'	-	-	
T12 - U-bent	-	-	
Compact - Plug-in	-	60	
Compact - Screw base	18	55	
Compact - Plug-in - reflector	-	55	
Compact - Screw base - reflector	11	55	
Circline	-	58	
Induction discharge	-	53	
Miscellaneous fluorescent	41	60	
Mercury vapor	179	40	
Metal halide	-	65	
High pressure sodium	79	80	
Low pressure sodium	-	-	
Xenon	-	-	
Electrodeless (e.g. mercury)	-	-	
LED	-	-	
Electroluminescent	-	-	



<b>Table D-8. Energy Consumption Estimate for the Residential Sector</b>			
	<b>Energy Use by Building Type (Watt-hour)</b>	<b>Number of Buildings</b>	<b>Average per Building (kWh/yr)</b>
Mobile Home	11,499,983,694,082	6,806,164	1,690
Single Family Detached	146,878,349,179,373	63,098,716	2,328
Single Family Attached	19,867,559,000,049	10,591,051	1,876
Multifamily 2-4 Units	11,426,105,726,929	9,490,463	1,204
Multifamily >4 Units	18,498,812,857,877	17,002,880	1,088
<b>Total</b>	<b>208,170,810,458,309</b>	<b>106,989,274</b>	<b>1,946</b>

<b>Table E-1. Commercial building types and Area</b>			
	Average Square Feet	Number of Buildings	Total Square Feet
01 Vacant	7,554	252,577	1,908,045,611
02 Office/Professional	16,303	738,743	12,044,031,679
04 Laboratory	15,767	26,842	423,211,050
05 Warehouse (non-refrigerated.)	16,284	589,601	9,600,989,844
06 Food sales	5,714	174,029	994,453,090
07 Public order/safety	16,191	72,163	1,168,414,664
08 Health care (outpatient)	9,067	116,085	1,052,504,333
11 Warehouse (refrigerated.)	63,850	13,713	875,547,324
12 Religious worship	11,084	307,216	3,405,192,189
13 Public assembly	14,397	305,152	4,393,215,580
14 Education	26,430	327,314	8,650,756,940
15 Food service	5,305	349,025	1,851,474,623
16 Health care (inpatient)	168,174	11,090	1,865,116,689
17 Skilled nursing	26,875	25,398	682,577,129
18 Hotel/Motel/Dorm	30,069	127,640	3,838,066,239
23 Strip shopping	30,229	130,659	3,949,747,948
24 Enclosed shopping center/mall	606,771	2,771	1,681,392,533
25 Retail (excluding mall)	8,933	533,588	4,766,495,475
26 Service (excluding food)	7,085	478,210	3,388,247,305
91 Other	10,651	74,955	798,321,375
<b>Row Sum</b>		<b>4,656,772</b>	<b>67,337,801,619</b>

**Table E-2. Application Area by Building Type (sq. ft.) for the Commercial Sector**

	Assembly	Athletic	Bathroom	Boarding	Class	Dining	Display	Exit	Ext-Archi	Ext-Park	Ext-Sign	Exterior	Food Prep	Hall	Healthcare	Office	Ship / Rec	Shop	Storage	Task	Unknown	Utility
01 Vacant	83	49	87	33	105	78	118	34	159	103	10	363	32	569	129	3917	18	207	346	30	852	233
02 Office/ Professional	317	45	848	133	144	359	194	16303	16303	16303	16303	16303	44	4011	163	5431	35	379	1556	36	1086	1521
04 Laboratory	447	53	524	480	285	393	114	15767	15767	15767	15767	15767	95	5510	2396	1158	16	231	1464	52	1403	1146
05 Warehouse non-refrigerated	346	111	540	51	85	449	227	16284	16284	16284	16284	16284	35	1584	25	1347	178	1070	8325	46	979	884
06 Food sales	278	2	127	21	17	134	1853	5714	5714	5714	5714	5714	319	748	3	131	28	170	1516	10	145	214
07 Public order/safety	693	82	1972	5392	236	641	22	16191	16191	16191	16191	16191	220	4226	18	392	1	225	781	96	432	761
08 Health care (outpatient)	215	33	539	74	107	233	157	9067	9067	9067	9067	9067	29	2386	101	2669	17	224	1004	21	462	794
11 Warehouse (refrigerated.)	811	248	1376	162	175	1504	1628	63850	63850	63850	63850	63850	140	5777	132	4485	904	2412	33086	71	6509	4430
12 Religious worship	4194	36	681	351	930	406	12	11084	11084	11084	11084	11084	150	2365	47	412	1	24	927	10	270	265
13 Public assembly	8214	137	682	276	769	380	251	14397	14397	14397	14397	14397	142	1767	53	441	7	73	557	21	284	344
14 Education	2005	581	1619	387	6304	2003	85	26430	26430	26430	26430	26430	162	8942	238	1072	5	241	716	164	697	1210
15 Food service	181	13	715	24	10	1932	54	5305	5305	5305	5305	5305	608	685	4	87	2	30	717	8	129	106
16 Health care (inpatient)	3726	285	3078	5197	890	4150	685	168174	168174	168174	168174	168174	1047	55085	25615	9793	126	1448	9586	215	23192	24056
17 Skilled nursing	1534	15	2022	3846	129	2120	50	26875	26875	26875	26875	26875	397	10879	1265	1050	2	164	1323	18	619	1440
18 Hotel/ Motel/Dorm	1437	139	3506	10141	426	1119	47	30069	30069	30069	30069	30069	373	7978	35	799	4	341	1213	134	927	1452
23 Strip shopping	1194	52	995	130	422	814	8165	30229	30229	30229	30229	30229	68	5275	64	1464	156	2052	6040	240	1503	1595
24 Enclosed shopping center/mall	8718	188	29262	979	2274	37071	117772	606771	606771	606771	606771	606771	311	146966	1128	16312	1037	49749	72332	2157	46372	74143
25 Retail (excluding mall)	350	17	290	34	114	210	2494	8933	8933	8933	8933	8933	23	1463	19	468	27	807	1857	62	298	401
26 Service (excl. food)	360	108	455	90	93	370	585	7085	7085	7085	7085	7085	50	1339	91	601	51	1000	1107	12	341	435
91 Other	613	70	584	383	496	528	574	10651	10651	10651	10651	10651	115	2380	139	1401	34	361	1689	31	559	694
Total	35715	2262	49901	28184	14011	54893	135087	1089213	1089337	1089281	1089188	1089541	4360	269936	31667	53432	2650	61208	146140	3433	87059	116126

<b>Table E-3. Annual Operating Hours by Building Type and Application for the Commercial Sector</b>																							
	Assembly	Athletic	Bathroom	Boarding	Class	Dining	Display	Exit	Ext-Archi	Ext-Park	Ext-Sign	Exterior	Food Prep	Hall	Healthcare	Office	Ship / Rec	Shop	Storage	Task	Unknown	Utility	
01 Vacant	2,692	3,868	3,280	3,054	2,621	3,251	3,829	8,619	3,883	3,827	3,907	3,674	2,956	4,492	3,584	3,522	4,538	3,455	3,265	3,304	3,773	4,449	
02 Office/Professional	2,468	3,860	3,432	3,296	2,824	3,379	3,611	8,649	4,003	3,933	4,295	3,921	2,758	4,814	3,435	3,580	4,364	3,743	3,123	2,908	3,828	4,442	
04 Laboratory	4,018	3,747	3,620	3,061	3,349	5,320	4,061	8,700	3,648	4,352	4,604	4,371	4,503	6,268	5,822	3,360	4,852	5,624	4,233	3,519	5,363	5,264	
05 Warehouse (non-refrigerated.)	3,186	3,698	3,206	2,503	2,792	3,276	3,373	8,612	3,639	3,823	3,782	3,855	3,270	3,602	2,995	3,054	4,113	3,318	3,627	3,193	3,466	4,013	
06 Food sales	6,319	4,585	3,455	4,980	3,640	4,569	5,472	8,633	3,208	3,802	3,432	3,809	5,074	5,539	5,032	3,345	5,544	5,334	5,090	6,754	5,032	6,403	
07 Public order/safety	2,911	3,421	2,262	2,443	2,523	3,524	2,925	8,651	3,792	3,978	4,611	3,988	3,612	6,872	2,587	3,510	6,492	4,352	2,954	1,732	3,419	3,744	
08 Health care (outpatient)	2,303	3,816	2,973	2,745	2,723	3,220	3,536	8,633	3,736	3,810	3,885	3,874	2,592	4,344	3,015	3,196	3,482	3,320	2,864	2,704	3,354	4,003	
11 Warehouse (refrigerated.)	3,285	3,697	3,492	2,836	3,081	3,130	3,337	8,645	3,608	3,462	3,680	3,773	4,692	4,007	2,120	3,755	3,842	3,500	4,073	3,242	3,751	4,428	
12 Religious worship	1,123	1,955	1,401	1,696	1,767	1,654	878	8,492	3,113	2,983	2,688	2,895	1,513	2,106	1,282	1,998	827	1,301	1,337	2,088	1,742	1,886	
13 Public assembly	2,119	3,735	2,474	2,493	1,893	2,553	5,071	8,558	2,704	3,125	2,965	3,557	2,558	3,234	2,081	2,524	5,294	2,742	2,681	5,817	2,812	2,891	
14 Education	1,989	2,778	2,726	2,970	2,311	2,384	2,593	8,666	4,130	3,764	3,653	2,882	2,196	3,768	2,541	2,870	3,421	2,569	2,283	4,228	2,901	2,848	
15 Food service	2,745	4,541	4,268	2,532	3,196	4,639	4,932	8,609	3,463	3,432	3,544	3,515	5,163	4,368	3,144	3,638	4,168	3,924	4,382	4,898	4,206	4,254	
16 Health care (inpatient)	4,892	4,018	4,605	3,630	3,569	5,778	4,751	8,667	5,025	4,993	5,010	5,708	5,661	7,437	6,029	3,644	6,165	5,005	4,807	3,622	6,190	7,003	
17 Skilled nursing	3,248	3,954	2,882	2,913	3,147	3,958	1,763	8,662	4,665	4,117	3,860	4,606	4,351	6,862	3,838	3,176	5,078	3,460	3,469	1,933	5,297	5,824	
18 Hotel/Motel/Dorm	3,258	3,612	2,414	2,605	2,612	3,729	3,236	8,653	4,090	4,136	4,611	3,970	4,065	7,204	2,644	3,349	6,926	4,830	3,348	1,677	3,618	4,250	
23 Strip shopping	3,804	4,754	3,776	3,805	3,505	3,530	4,177	8,529	3,127	3,784	3,475	3,208	3,745	4,580	3,663	3,397	5,059	3,514	3,949	3,780	4,196	4,808	
24 Enclosed shopping center/mall	3,226	4,464	6,669	4,404	3,163	2,253	5,223	8,435	3,483	4,514	3,606	3,980	3,891	6,291	6,744	3,767	4,788	4,224	4,950	4,590	5,679	4,570	
25 Retail (excl. mall)	3,727	4,375	3,016	3,321	3,272	3,338	3,872	8,551	3,296	3,594	3,300	3,189	3,513	4,016	3,511	3,255	4,150	3,276	3,433	3,524	3,830	4,818	
26 Service (excl. food)	2,785	4,500	3,218	2,193	2,790	3,229	3,562	8,569	4,395	3,690	3,407	3,556	2,958	3,452	3,307	2,890	5,115	3,424	3,284	2,644	3,219	4,201	
91 Other	2,214	3,397	3,154	2,784	2,333	3,530	4,278	8,627	3,907	3,870	3,999	3,783	4,249	4,754	4,491	3,525	4,361	3,554	3,602	3,423	3,970	4,571	
Average	2,133	3,426	3,033	2,611	2,339	3,380	4,130	8,606	3,745	3,804	3,739	3,603	3,726	4,542	4,246	3,344	4,417	3,474	3,506	3,457	3,812	4,305	



<b>Table E-5. Commercial Building Lamp Characteristics</b>		
<b>Type</b>	<b>Wattage</b>	<b>Efficacy</b>
Standard - General Service	83	16
Standard - Reflector	104	9
Halogen - General Service	64	15
Halogen – Quartz	226	20
Halogen - refl. - low volt	48	11
Low wattage (less than 25W)	15	9
Misc incandescent	0	13
T5	8	50
T8 – less than 4’	23	82
T8 – 4’	33	85
T8 – More than 4’	50	88
T8 – U-bent	34	74
T12 – less than 4’	29	63
T12 – 4’	45	74
T12 – More than 4’	93	79
T12 – U-bent	46	69
Compact – Plug-in	17	60
Compact – Screw base	16	55
Compact – Plug-in – reflector	16	55
Compact – Screw base – reflector	16	55
Circline	30	58
Induction discharge	0	53
Miscellaneous fluorescent	18	60
Mercury vapor	331	40
Metal halide	472	65
High pressure sodium	260	104
Low pressure sodium	104	140
Xenon	0	40
Electrodeless (e.g. mercury)	0	150
LED	6	20
Electroluminescent	2	10

<b>Table E-6. Commercial Building Energy Consumption</b>			
	<b>Energy Consumption by Building Type (kWh)</b>	<b>Number of Facilities</b>	<b>Total Consumption (TWh)</b>
01 Vacant	56,300,094	252,577	14.22
02 Office/Professional	109,211,533	738,743	80.68
04 Laboratory	130,157,354	26,842	3.49
05 Warehouse (non-refrigerated.)	78,564,789	589,601	46.32
06 Food sales	56,161,313	174,029	9.77
07 Public order/safety	73,030,177	72,163	5.27
08 Health care (outpatient)	52,541,097	116,085	6.1
11 Warehouse (refrigerated.)	340,119,145	13,713	4.66
12 Religious worship	27,468,033	307,216	8.44
13 Public assembly	52,237,833	305,152	15.94
14 Education	130,236,394	327,314	42.63
15 Food service	37,220,861	349,025	12.99
16 Health care (inpatient)	1,605,030,201	11,090	17.8
17 Skilled nursing	144,228,615	25,398	3.66
18 Hotel/Motel/Dorm	142,668,617	127,640	18.21
23 Strip shopping	226,343,225	130,659	29.57
24 Enclosed shopping center/mall	4,872,138,817	2,771	13.5
25 Retail (excluding mall)	62,286,175	533,588	33.24
26 Service (excluding food)	40,735,581	478,210	19.48
91 Other	65,039,617	74,955	4.88
<b>Total</b>		<b>4,656,772</b>	<b>390.9</b>

<b>Table F-1. Industrial Building Types</b>			
<b>Establishment</b>	<b>Average Square Feet</b>	<b>Number of Buildings</b>	<b>Total Square Feet</b>
20 Food and Kindred Products	72,205	18,074	1,305,040,151
21 Tobacco Products	146,622	316	46,368,740
22 Textile Mill Products	201,018	7,151	1,437,477,573
23 Apparel and Other Textile Products	34,501	12,566	433,543,336
24 Lumber and Wood Products	45,796	11,663	534,112,917
25 Furniture and Fixtures	53,683	11,274	605,217,632
26 Paper and Allied Products	156,346	4,676	731,075,766
27 Printing and Publishing	20,606	25,782	531,256,157
28 Chemicals and Allied Products	182,403	8,962	1,634,694,790
29 Petroleum and Coal Products	77,339	1,756	135,806,406
30 Rubber and Miscellaneous Plastics Products	84,717	11,944	1,011,864,626
31 Leather and Leather Products	43,829	995	43,609,358
32 Stone, Clay, and Glass Products	57,946	11,333	656,698,618
33 Primary Metal Industries	201,817	3,830	772,960,259
34 Fabricated Metal Products	37,674	40,743	1,534,939,559
35 Industrial Machinery and Equipment	60,583	19,577	1,186,033,391
36 Electronic and Other Electric Equipment	79,488	9,925	788,917,408
37 Transportation Equipment	161,367	8,380	1,352,255,460
38 Instruments and Related Products	356,695	4,526	1,614,400,665
39 Miscellaneous Manufacturing Industries	36,771	13,630	501,181,915
<b>Total</b>		<b>227,103</b>	<b>16,857,454,725</b>



Table F-2. Industrial Total Square Footage by Application Area and Building Type (sq. ft.)																				
Type Building	20 Food and Kindred Products	21 Tobacco Products	22 Textile Mill Products	23 Apparel and Other Textile Products	24 Lumber and Wood Products	25 Furniture and Fixtures	26 Paper and Allied Products	27 Printing and Publishing	28 Chemicals and Allied Products	29 Petroleum and Coal Products	30 Rubber and Miscellaneous Plastics Products	31 Leather and Leather Products	32 Stone, Clay, and Glass Products	33 Primary Metal Industries	34 Fabricated Metal Products	35 Industrial Machinery and Equipment	36 Electronic and Other Electric Equipment	37 Transportation Equipment	38 Instruments and Related Products	39 Miscellaneous Manufacturing Industries
assembly	131	0	0	63	12	0	288	349	83	0	157	0	95	5	25	266	370	234	2815	23
athletic	48	0	13	11	3	43	150	44	115	396	56	0	117	497	13	40	20	423	88	11
bathroom	972	0	4504	1680	570	1583	2589	566	4156	3266	1806	0	562	6475	717	1567	1465	7040	6868	1501
boarding	248	0	0	0	472	86	117	13	0	0	63	135	4	0	10	3	92	626	163	103
class	43	0	1645	0	13	47	295	52	78	1906	90	0	165	5185	111	122	369	408	4405	64
dining	3125	0	2441	786	297	2376	3072	380	3393	2662	2735	16	897	3290	847	1663	2523	4547	8343	1609
display	99	0	2373	348	59	167	121	48	371	8	322	0	80	42	132	143	178	53	1299	75
exit	72205	146622	201018	34501	45796	53683	156346	20606	182403	77339	84717	43829	57946	201817	37674	60583	79488	161367	356695	36771
ext-archi	72205	146622	201018	34501	45796	53683	156346	20606	182403	77339	84717	43829	57946	201817	37674	60583	79488	161367	356695	36771
ext-park	72205	146622	201018	34501	45796	53683	156346	20606	182403	77339	84717	43829	57946	201817	37674	60583	79488	161367	356695	36771
ext-sign	72205	146622	201018	34501	45796	53683	156346	20606	182403	77339	84717	43829	57946	201817	37674	60583	79488	161367	356695	36771
exterior	72205	146622	201018	34501	45796	53683	156346	20606	182403	77339	84717	43829	57946	201817	37674	60583	79488	161367	356695	36771
food prep	577	0	10	22	6	27	110	46	19	301	9	11	12	29	38	17	69	247	845	14
hall	2064	0	7047	1759	1050	5295	11287	2615	14948	15856	2311	13	1255	7913	3046	3914	4407	9636	36943	3008
healthcare	492	11580	954	12	78	17	198	69	16428	2073	489	546	758	1537	197	381	1691	1493	7865	39
office	4594	0	15857	3204	2698	4782	14788	4494	23796	3652	8580	5661	6187	21837	4888	6910	13497	9095	58139	3648
ship/rec	1338	0	4438	238	212	1359	3033	293	5162	893	2159	0	1389	2213	384	374	858	559	6324	427
shop	20171	48184	60053	11682	28075	15169	40413	3695	30637	3895	23944	34528	16644	80005	12565	18838	23234	100933	56592	10230
storage	20975	86858	38900	9464	2965	8702	43208	2582	37200	4022	28483	0	15458	25215	8412	10660	12183	4394	44742	10192
task	0	0	262	17	73	212	58	3	0	0	45	0	0	395	69	61	98	402	12234	55
unknown	5442	0	29111	4126	4769	7540	8527	2367	25756	4971	4979	1923	2866	20338	1980	7323	4730	7759	44628	3243
utility	11886	0	33409	1090	4443	6278	28094	2989	20263	33438	8488	996	11457	26841	4239	8303	13705	13519	64400	2528
Total	433232	879731	1206106	207008	274773	322096	938078	123634	1094417	464031	508304	262971	347674	1210904	226042	363498	476927	968202	2140169	220623

Table F-3. Industrial Total Operating Hours by Application Area and Building Type (hrs.)																				
Type Building	20 Food and Kindred Products	21 Tobacco Products	22 Textile Mill Products	23 Apparel and Other Textile Products	24 Lumber and Wood Products	25 Furniture and Fixtures	26 Paper and Allied Products	27 Printing and Publishing	28 Chemicals and Allied Products	29 Petroleum and Coal Products	30 Rubber and Miscellaneous Plastics Products	31 Leather and Leather Products	32 Stone, Clay, and Glass Products	33 Primary Metal Industries	34 Fabricated Metal Products	35 Industrial Machinery and Equipment	36 Electronic and Other Electric Equipment	37 Transportation Equipment	38 Instruments and Related Products	39 Miscellaneous Manufacturing Industries
assembly	7,485	-	-	520	2,600	-	4,971	2,690	3,262	-	3,709	-	1,043	520	297	4,737	5,727	2,730	2,691	3,405
athletic	6,633	-	6,893	2,928	2,600	3,298	4,650	8,330	3,539	8,736	6,042	-	7,671	6,241	4,453	3,969	4,823	7,701	5,114	2,660
bathroom	5,333	-	5,360	6,787	3,564	3,832	5,106	5,684	5,606	7,476	4,688	-	4,081	7,194	3,517	4,539	3,842	6,599	3,524	2,667
boarding	3,935	-	-	-	2,080	2,860	2,347	2,528	-	-	7,578	1,060	2,496	-	3,380	3,120	2,560	2,395	3,696	4,680
class	5,776	-	2,340	-	7,004	2,617	5,103	3,758	2,760	4,680	5,240	-	3,143	7,483	4,238	5,405	5,307	2,569	3,860	2,835
dining	7,442	-	4,495	3,457	5,282	3,043	5,478	5,401	4,405	7,666	5,984	1,040	5,383	5,286	4,236	4,745	3,955	5,581	3,335	3,959
display	5,132	-	2,329	2,608	2,898	1,331	3,464	4,036	3,366	260	3,884	-	3,362	6,620	3,325	3,366	3,091	2,916	2,640	2,230
exit	8,542	-	8,736	8,736	8,736	8,736	8,736	8,502	8,596	8,736	8,736	-	8,736	8,725	8,736	8,734	8,645	8,736	8,736	8,736
ext-archi	6,316	-	-	-	8,612	5,200	3,913	4,086	8,424	-	4,216	-	3,299	8,282	3,952	3,618	5,546	8,469	3,651	4,360
ext-park	4,761	-	3,878	4,282	5,646	4,342	4,218	4,298	4,074	3,850	4,644	4,081	4,317	4,544	4,104	4,204	4,254	4,980	4,151	3,899
ext-sign	4,019	-	4,368	4,004	-	4,368	4,179	8,044	4,210	-	4,146	-	-	5,359	4,260	4,317	3,770	3,891	2,765	2,080
exterior	-	-	2,600	-	2,340	3,639	3,515	4,303	3,900	-	2,600	-	3,996	2,340	4,358	3,640	2,828	-	-	2,963
food prep	5,183	-	2,340	2,360	1,718	2,914	5,026	4,432	3,592	8,382	3,609	1,040	1,926	1,793	2,164	3,632	4,030	4,830	2,290	3,926
hall	5,887	-	3,880	4,094	5,811	4,536	6,540	6,377	4,201	4,834	3,622	2,080	4,214	4,726	6,011	5,051	4,751	6,621	4,971	4,149
healthcare	4,856	4,160	3,717	6,791	3,263	2,953	5,161	5,567	6,888	8,017	4,140	7,540	4,404	7,870	3,165	4,418	4,384	4,684	4,226	5,356
office	3,760	-	2,953	2,692	3,030	2,961	3,949	4,031	3,259	4,135	3,580	2,412	3,230	3,358	3,167	3,254	3,663	3,105	3,543	2,482
ship/rec	6,193	-	4,955	2,867	6,919	2,549	6,867	6,365	4,463	8,736	7,333	-	6,051	7,720	3,529	4,776	3,571	4,699	2,772	3,071
shop	6,429	6,240	4,953	3,546	6,340	4,073	6,018	5,552	4,995	6,310	6,587	4,506	6,385	6,044	4,933	4,844	5,137	7,495	3,083	3,019
storage	6,641	6,240	7,190	5,041	4,802	4,039	6,580	5,088	4,619	7,321	6,022	-	6,319	6,131	4,259	5,720	4,864	3,961	2,775	2,792
task	-	-	6,240	2,710	2,514	3,048	5,647	4,554	-	-	3,622	-	1,820	2,405	3,795	4,010	2,931	3,541	6,128	2,670
unknown	5,970	-	5,650	3,926	6,557	4,312	7,218	6,357	5,243	4,112	6,234	8,271	6,187	5,954	3,708	6,777	4,586	3,943	2,792	2,433
utility	7,087	-	6,106	4,101	4,288	3,974	7,263	6,003	6,060	4,496	6,008	5,379	7,355	7,446	3,563	5,401	5,693	4,980	3,911	3,719



<b>Table F-5. Lamp Properties for Average Industrial Sector Light Sources</b>			
<b>Lamp Type</b>	<b>Wattage</b>	<b>efficacy</b>	<b>Watts/lamp</b>
Standard - General Service	126	17	83
Standard - Reflector	102	9	104
Halogen - General Service	0	15	64
Halogen – Quartz	452	20	226
Halogen - refl. - low volt	58	11	48
Low wattage (less than 25W)	19	9	15
Misc incandescent	0	13	0
T5	10	50	8
T8 – less than 4'	23	82	23
T8 – 4'	31	85	33
T8 – More than 4'	53	88	50
T8 – U-bent	32	74	34
T12 – less than 4'	32	63	29
T12 – 4'	44	74	45
T12 – More than 4'	95	79	93
T12 – U-bent	46	69	46
Compact – Plug-in	31	60	17
Compact – Screw base	14	55	16
Compact – Plug-in – reflector	0	55	16
Compact – Screw base – reflector	14	55	0
Circline	35	58	30
Induction discharge	0	53	0
Miscellaneous fluorescent	34	60	18
Mercury vapor	409	46	331
Metal halide	438	65	472
High pressure sodium	394	112	260
Low pressure sodium	90	140	104
Xenon	0	40	0
Electrodeless (e.g. mercury)	0	150	0
LED	6	20	6
Electroluminescent	2	10	2

<b>Table F-6. Industrial Energy Consumption</b>			
<b>Industrial Sector</b>	<b>Energy Consumption by Building Type</b>	<b>Number of Facilities</b>	<b>Total Energy Consumption (TWh)</b>
20 Food and Kindred Products	490,062,280	18,074	8.86
21 Tobacco Products	941,181,204	316	0.3
22 Textile Mill Products	1,241,737,049	7,151	8.88
23 Apparel and Other Textile Products	161,043,492	12,566	2.02
24 Lumber and Wood Products	413,834,647	11,663	4.83
25 Furniture and Fixtures	260,720,794	11,274	2.94
26 Paper and Allied Products	984,205,306	4,676	4.6
27 Printing and Publishing	132,003,715	25,782	3.4
28 Chemicals and Allied Products	1,245,132,750	8,962	11.16
29 Petroleum and Coal Products	312,578,577	1,756	0.55
30 Rubber and Miscellaneous Plastics Products	569,539,468	11,944	6.8
31 Leather and Leather Products	333,041,991	995	0.33
32 Stone, Clay, and Glass Products	372,954,194	11,333	4.23
33 Primary Metal Industries	1,618,790,325	3,830	6.2
34 Fabricated Metal Products	200,188,985	40,743	8.16
35 Industrial Machinery and Equipment	379,325,170	19,577	7.43
36 Electronic and Other Electric Equipment	465,190,702	9,925	4.62
37 Transportation Equipment	1,604,235,846	8,380	13.44
38 Instruments and Related Products	1,643,372,965	4,526	7.44
39 Miscellaneous Manufacturing Industries	125,423,350	13,630	1.71
<b>Total Energy Consumption</b>		<b>227,103</b>	<b>107.89</b>

<b>Table G-1. Outdoor Stationary Installations and Hours</b>			
<b>Installations</b>	<b>Hours lighted / year</b>	<b>Estimate of Installions</b>	<b>Hours/year All Installations</b>
Billboard 8	2,680	140,000	375,200,000
Billboard 30	2,680	200,000	536,000,000
Billboard bulletin	2,680	56,000	150,080,000
Traffic Signals	2,677	300,000	803,000,000
Turn Arrows	811	300,000	243,333,333
Pedestrian Signals	2,738	225,000	615,937,500
Approach Systems	2,190	720	1,576,800
Touchdown Lights	2,190	5,000	10,950,000
Centerline Lights	2,190	5,000	10,950,000
Taxiway/Runway Edgelights	2,190	7,500	16,425,000
Street Lighting	4,380	37,850,000	165,783,000,000
Parking Lots	3,650	22,670,000	82,745,500,000



**Table G-3. Operating Hours summed for Outdoor Stationary Sources, all US Installations**

	Billboard 8	Billboard 30	Billboard bulletin	Traffic Signals	Turn Arrows	Pedestrian Signals	Approach Systems	Touchdown Lights	Centerline Lights	Taxiway/Ru nway Edgelights	Street lighting	Parking Lots
Row Sum	375,200,000	1,072,000,000	450,240,000	19,272,000,000	486,666,667	4,927,500,000	151,372,800	1,971,000,000	1,314,000,000	1,149,750,000	165,811,944,928	82,745,500,000
Standard - General Service	-	-	-	19,079,280,000	481,800,000	4,878,225,000	-	-	-	-	6,476,226,185	4,964,730,000
Standard - Reflector	-	-	-	-	-	-	75,686,400	985,500,000	657,000,000	574,875,000	-	1,654,910,000
Halogen - General Service	-	-	-	-	-	-	-	-	-	-	-	-
Halogen - Quartz	-	-	-	-	-	-	75,686,400	985,500,000	657,000,000	574,875,000	-	4,137,275,000
Halogen - refl. - low volt	-	-	-	-	-	-	-	-	-	-	-	-
Low wattage (less than 25W)	-	-	-	-	-	-	-	-	-	-	-	-
Misc incandescent	-	-	-	-	-	-	-	-	-	-	-	-
T5	-	-	-	-	-	-	-	-	-	-	-	-
T8 - less than 4'	-	-	-	-	-	-	-	-	-	-	-	-
T8 - 4'	-	-	-	-	-	-	-	-	-	-	-	-
T8 - More than 4'	26,264,000	75,040,000	31,516,800	-	-	-	-	-	-	-	-	-
T8 - U-bent	-	-	-	-	-	-	-	-	-	-	-	-
T12 - less than 4'	-	-	-	-	-	-	-	-	-	-	-	-
T12 - 4'	-	-	-	-	-	-	-	-	-	-	-	-
T12 - More than 4'	26,264,000	75,040,000	31,516,800	-	-	-	-	-	-	-	-	-
T12 - U-bent	-	-	-	-	-	-	-	-	-	-	-	-
Compact - Plug-in	-	-	-	-	-	-	-	-	-	-	-	-
Compact - Screw base	-	-	-	-	-	-	-	-	-	-	-	-
Compact - Plug-in - reflector	-	-	-	-	-	-	-	-	-	-	-	-
Compact - Screw base - reflector	-	-	-	-	-	-	-	-	-	-	-	-
Circline	-	-	-	-	-	-	-	-	-	-	-	-
Induction discharge	-	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous fluorescent	-	-	-	-	-	-	-	-	-	-	3,887,433,280	3,309,820,000
Mercury vapor	22,512,000	64,320,000	27,014,400	-	-	-	-	-	-	-	33,156,600,000	16,549,100,000
Metal halide	300,160,000	857,600,000	360,192,000	-	-	-	-	-	-	-	8,289,150,000	8,274,550,000
High pressure sodium	-	-	-	-	-	-	-	-	-	-	97,811,970,000	43,855,115,000
Low pressure sodium	-	-	-	-	-	-	-	-	-	-	16,190,565,463	-
Xenon	-	-	-	-	-	-	-	-	-	-	-	-
Electrodeless (e.g. sulfur)	-	-	-	-	-	-	-	-	-	-	-	-
LED	-	-	-	192,720,000	4,866,667	49,275,000	-	-	-	-	-	-





**Table G-5. Estimated Outdoor Stationary Energy Use**

	<b>watt-hours</b>	<b>TWh</b>
Billboards	104,538,974,400	0.1
Traffic Signals	2,864,782,800,000	2.86
Turn Arrows	60,273,666,667	0.06
Pedestrian Signals	610,517,250,000	0.61
Street lighting	30,957,288,159,502	30.96
Approach Systems	56,764,800,000	0.06
Touchdown Lights	118,260,000,000	0.12
Centerline Lights	157,680,000,000	0.16
Taxiway/ Runway Edgelights	137,970,000,000	0.14
Parking Lots	22,279,373,894,239	22.28
		57.35