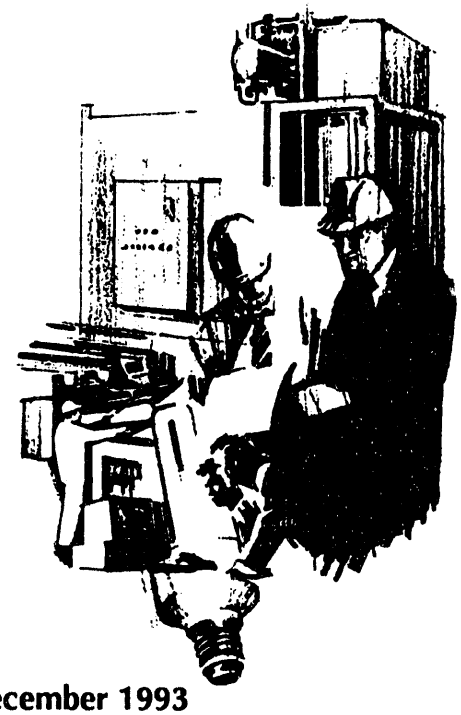
PNL-8969 Vol. 2
UC-350

Cape Canaveral Air Force Station Integrated Resource Assessment

Volume 2: Baseline Detail



December 1993

Prepared for the U.S. Department of Energy
Federal Energy Management Program
under Contract DE-AC06-76RLO 1830

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PNL-8969 Vol. 2
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CAPE CANAVERAL AIR FORCE STATION INTEGRATED RESOURCE ASSESSMENT

VOLUME 2: BASELINE DETAIL

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December 1993

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ABSTRACT

The U.S. Air Force (USAF) has tasked the Pacific Northwest Laboratory (PNL),[a] in support of the U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP), to assess energy use at Cape Canaveral Air Force Station (AFS). The information obtained from this assessment will be used in identifying energy resource opportunities to reduce overall energy consumption by the station.

The primary focus of this report is to assess the current baseline energy consumption at Cape Canaveral AFS. It is a companion report to Volume 1, the Executive Summary, and Volume 3, the Resource Assessment. This assessment requires that information be obtained and characterized for buildings, utilities, energy sources, energy uses, and load profiles to be used to improve the current energy system on the station. The characteristics of electricity, diesel fuel, No. 2 fuel oil, and motor vehicle gasoline (MOGAS) are analyzed for on-base facilities. The assessment examines basic regional information used to determine energy-use intensity (EUI) values for Cape Canaveral AFS facilities by building, fuel type, and energy end use. It also provides a summary of electricity consumption from Florida Power & Light Company (FPL) metered data for 1985-1991. Load profile information obtained from FPL data is presented for the North, South, and Titan Substations for the four seasons of the year, including weekdays and weekends.

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SUMMARY

The U.S. Air Force (USAF) has tasked the Pacific Northwest Laboratory (PNL), in support of the U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP), to assess energy use at Cape Canaveral Air Force Station (AFS). The information obtained from this assessment will be used in identifying energy resource opportunities to reduce overall energy consumption by the station.

The primary focus of this report is to assess the current baseline energy consumption by Cape Canaveral AFS. This assessment requires that information be obtained and characterized for buildings, utilities, energy sources, energy uses, and load profiles to be used to improve the characterization of energy use by the station.

The characteristics of electricity, diesel fuel, No. 2 fuel oil, and motor vehicle gasoline (MOGAS) are analyzed for on-site facilities. Electrical service is provided by Florida Power & Light (FPL), and diesel fuel, fuel oil, and gasoline are supplied through a contract with Johnson Controls World Services.

The assessment examines basic regional information used to determine energy-use intensity (EUI) values for Cape Canaveral AFS facilities by building, fuel type, and energy end use. It also provides a summary of electricity consumption from FPL metered data for 1985-1991. Load profile information obtained from FPL data is presented for the North, South, and Titan Substations for the four seasons of the year, including weekdays and weekends, providing an insight into the peak shaving or reduction potential at the station.

Cape Canaveral AFS is a 15,804-acre space command (SPACECOM) containing industrial facilities, a "Skid Strip," facilities for unmanned space launches, and a port operations area. In FY92, the number of people affecting energy consumption through their use of Cape Canaveral AFS facilities included 439 active-duty military personnel, 379 civilian personnel, and 6,965 civilian contractors. There is no military family housing at Cape Canaveral AFS.

A total of 766 buildings with 4,411,172 ft^2 of floorspace were identified at Cape Canaveral AFS. Utilities include electricity, water, and sewage.

Table S.1 shows a summation of the typical annual energy consumption and cost for all facilities at Cape Canaveral AFS. For each energy type, the annual total is shown in units appropriate to the energy type and in common units as a basis of comparison.

TABLE S.1. Typical Annual Energy Consumption and Costs at Cape Canaveral AFS

Energy Type	Annual Total	Annual Total MBtu[a]	Percent of Total	Energy Cost 1991$ x 10^3
Electricity	192,074 MWh	655,549[b]	61.5	9,876
No. 2 Fuel Oil	924 kgal	128,265[c]	12.0	952
Diesel Fuel	1,558 kgal	218,162[d]	20.5	1,558
MOGAS	502 kgal	63,805	6.0	619
TOTALS:		1,065,781	100.00	13,005

(a) 1 MBtu = 1,000,000 Btu
(b) 3,413 Btu/kWh
(c) 100,000 Btu/therm; 1,050 Btu/ft^3
(d) 0.1388 MBtu/gal

Table S.2 breaks down electric energy use for the facilities at Cape Canaveral AFS.

TABLE S.2. Cape Canaveral AFS Electrical Energy-Use Breakdown

Site Bldg-Type	Total Buildings	Site Total (sq ft)	Overall EUI	Total (MWh/yr)	Electric Heat	Electric Cool	Electric Ventilation	Electric DHW	Electric Cook	Electric Light	Electric Refrigeration	Electric Other
ADMIN	32	316,888	10.66	3,378	209,146	1,112,277	221,822	120,417	256,679	944,326	34,858	478,501
BRR/ADM	1	1,854	22.12	41	6,211	10,790	2,132	1,391	1,261	9,585	1,391	8,250
COMCATN	34	219,783	46.66	10,255	439,566	2,646,187	1,520,898	138,463	32,967	2,681,353	252,750	2,542,889
DET-RR	3	1,585	12.42	20	1,530	2,401	1,609	658	79	4,557	7,180	1,664
FUELDSP	2	2,399	46.66	112	4,798	28,884	16,601	1,511	360	29,268	2,759	27,756
HANGAR	1	40,519	12.42	503	39,101	61,386	41,127	16,815	2,026	116,492	183,551	42,545
LAB-MED	1	12,064	25.15	303	14,477	106,043	23,766	6,032	12,788	75,762	11,461	53,082
MTRPOOL	7	68,337	12.42	848	65,945	103,531	69,362	28,360	3,417	196,469	309,567	71,754
MWR	3	13,585	46.66	634	27,170	163,563	94,008	8,559	2,038	165,737	15,623	157,178
NASLEAS(a)	87	732,416	46.66	34,175	1,464,832	8,818,289	5,068,319	461,422	109,862	8,935,475	842,278	8,474,053
NASOWN(b)	230	745,470	46.66	34,784	1,490,940	8,975,459	5,158,652	469,646	111,821	9,094,734	857,290	8,625,088
OTHER	4	9,580	46.66	447	19,160	115,343	66,294	6,035	1,437	116,876	11,017	110,841
PLT-BLD	24	34,950	12.42	434	33,727	52,949	35,474	14,504	1,748	100,481	158,324	36,698
PLT-EQU	31	68,571	46.66	3,200	137,142	825,595	474,511	43,200	10,286	836,566	78,857	793,366
R&D	66	1,236,903	46.66	57,714	2,473,806	14,892,312	8,559,369	779,249	185,535	15,090,217	1,422,438	14,310,968
RESTRNT	1	16,443	42.45	698	13,648	229,709	65,443	58,373	12,332	95,863	158,346	64,292
SECURTY	29	37,542	46.66	1,752	75,084	452,006	259,791	23,651	5,631	458,012	43,173	434,361
SHOP	27	219,099	12.42	2,720	211,431	331,935	222,385	90,926	10,955	629,910	992,518	230,054
SHOP-ELC	7	77,132	12.42	958	74,432	116,855	78,289	32,010	3,857	221,755	349,408	80,989
SHOP-WPN	1	5,150	12.42	64	4,970	7,802	5,227	2,137	258	14,806	23,330	5,408
STOR-US	100	155,553	12.42	1,931	150,109	235,663	157,886	64,554	7,778	447,215	704,655	163,331
TRAING	2	5,548	8.38	46	1,442	16,589	3,828	2,164	1,442	14,591	2,497	3,939
WHS	73	389,801	12.42	4,839	376,158	590,549	395,648	161,767	19,490	1,120,678	1,765,799	409,291
Pumps (Est.)				1,658								
Ext. Light. (Est.)				1,750								
Line Loss (Est.)				28,811								
Totals:	766	4,411,172		192,074	MWh/yr total electricity consumption.							

(a) NASA leased buildings
(b) NASA owned buildings
All units are kWh/yr unless otherwise noted.

CONTENTS

FIGURES

TABLES

ABBREVIATIONS AND ACRONYMS

AFB	Air Force Base
AFS	Air Force Station
ASTG	Air Support Testing Group
Btu	British thermal unit
CG	U.S. Coast Guard
CLS	commercial launch system
CRIT	critical
CY	calendar year
D	diesel
DEIS	Defense Energy Information System
DHW	domestic hot water
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
EUI	energy-use intensity
FEMP	Federal Energy Management Program
FPL	Florida Power & Light
FSEC	Florida Solar Energy Center
FY	fiscal year
G	gasoline
GD	General Dynamics
GSLDT-3	General Service Large Demand Time-of-Use
HPS	high-pressure sodium
HVAC	heating, ventilating, and air conditioning
HW	hot water
HW-E	hot water-electric
IES	Illuminating Engineering Society of North America
Inc	incandescent
kBtu	thousand British thermal units
KSC	Kennedy Space Center
kVA	kilovoltampere
kW	kilowatt
kWh	kilowatt-hour
LPS	low-pressure sodium
MBtu	million British thermal units
MEP	mobile electric power
MH	metal halide
MOGAS	motor vehicle gasoline
MV	mercury vapor
MWh	megawatt-hour
N/C	noncritical
NASA	National Aeronautics and Space Administration
NLS	national launch system
NOTU	Naval Ordnance Test Unit
PNL	Pacific Northwest Laboratory
SERC	Southeastern Electric Reliability Council
SPACECOM	space command
ST	steam
TITN	commercial Titan

UEC	unit energy consumption
USAF	U.S. Air Force
V	volt
W	watt

1.0 PHYSICAL CHARACTERISTICS

1.1 SITE PROFILE

Cape Canaveral Air Force Station (AFS) is located on 15,804 acres on a barrier island off the central east coast of Florida. The site is approximately 50 miles east of Orlando and approximately equal distance between Miami and Jacksonville, Florida. The site is bounded on the north by the Kennedy Space Center (KSC), on the west by the Banana River, on the south by Port Canaveral, and on the east by the Atlantic Ocean. The Kennedy Space Center is owned and operated by the National Aeronautics and Space Administration (NASA).

The nearest civilian community to Cape Canaveral AFS is the city of Cape Canaveral, which is located adjacent to the south side of Port Canaveral. South of Cape Canaveral is Cocoa Beach, Florida. The nearest community to the west of the site is Titusville, Florida, which is approximately 20 miles away.

The topography of Cape Canaveral AFS is flat and much of the site is covered with native vegetation. Cape Canaveral AFS is the home of several threatened and endangered wildlife species. The site also has been designated as a national seashore to protect the current habitat and nesting area of sea turtles.

1.1.1 History

Cape Canaveral AFS was selected as the site for a U.S. missile testing range in 1947. The first launch on July 24, 1950 signaled the beginning of the space age for the United States.

After that initial launch, a long series of experimental launch programs began, initially including the Matador, Snark, Bomarc, Hound Dog, and Mace cruise missile programs. In 1953, the emphasis of the launch programs shifted to ballistic missiles, such as the Jupiter, Thor, Navy Polaris, and Atlas programs. Other programs followed that included the Mercury, Gemini, and Apollo manned space flights.

Since April 1981, Cape Canaveral AFS has provided lead support for NASA's Space Shuttle program, as well as lead range for the Strategic Defense Initiative Organization's in-orbit testing. Space Shuttle program launches are actually made from sites on the KSC.

1.1.2 Mission

Cape Canaveral AFS is the launch facility of the 45th Space Wing of the U.S. Air Force (USAF) Space Command (SPACECOM) that also includes Patrick Air Force Base (AFB), Antigua Air Station, Ascension Auxiliary Airfield, and other Florida mainland stations that provide tracking services. The focus of this document is Cape Canaveral AFS. A companion document has been prepared for Patrick AFB (Wahlstrom et al. 1993).

The primary mission of Cape Canaveral AFS is to provide the launch site, facilities, hardware, and support required to assemble, process, checkout, test, and launch all types of space boosters, upper stages, satellites, and other payloads (EDAW undated). The site also provides the facilities, infrastructure, and ground support for launch base instrumental requirements that include radar, telemetry, optics, command and control, communications, and collection and real-time processing of data.

Cape Canaveral AFS provides logistical support to a variety of major organizations in support of their primary missions. Some of the organizations that are tenants at Cape Canaveral AFS are the U.S. Naval Ordnance Test Unit, NASA, U.S. Army, and various commercial organizations.

The Cape Canaveral AFS is currently being considered as the site for either a national launch system (NLS) (Bechtel National, Inc. 1992) or a commercial launch system (CLS) that will be constructed north of the industrial area complex. The difference between the two systems is that CLS will provide greater opportunities for unmanned launch activities. Another distinct advantage of either the NLS or CLS is all fabrication and prelaunch activities are conducted at ground level compared to the present system where prelaunch activities are conducted while the missile is in a vertical position. Initial estimates indicate that the cost of launches using the NLS or CLS will be reduced by a factor of 10 over the current typical cost.

If either the NLS or CLS is constructed at Cape Canaveral AFS, a large additional electrical load of up to 100,000 kVA will be required. The possibility of construction of cogeneration facilities will also exist that can reduce the overall electrical load at the site.

A decision whether to construct the NLS or CLS has not been made. However, if a decision is made to construct either the NLS or CLS, energy resource requirements will need to be determined and ways to implement conservation or demand-site activities will need to be considered.

1.1.3 Population

Currently a total of 7,783 personnel are employed at Cape Canaveral AFS. The largest fraction of this total is civilian contractors (6,965). The remainder is either military personnel (439) or civilian personnel employed as the result of appropriated funds (379). There is no military family housing at Cape Canaveral AFS (EDAW undated).

1.1.4 Existing Land Use

Most support facilities at Cape Canaveral AFS are centrally located in what is known as the "industrial area." This area includes facilities for administration, launch and range support and control, community services, recreation, and other industrial land uses. Table 1.1 provides a listing of the existing and proposed land uses.

1.2 BUILDING AND FACILITY PROFILE

This section includes a characterization of the types of buildings found at Cape Canaveral AFS. The buildings, major energy sources, age, building count, and floorspace are discussed.

1.2.1 Building Characterization

A total of 23 primary building categories were identified at Cape Canaveral AFS. These categories were based on information contained in the real-property data base, which are separated by uniqueness in terms of operation or ownership, construction, age, and energy use. A mnemonic letter

TABLE 1.1. Land-Use Information at Cape Canaveral AFS

Land Use	Existing (acres)	Future (acres)
Airfield	1,129	1,120
Runway/Taxiway/Apron	105	105
Industrial	522	753
Administrative	-	266
Outdoor Recreation	-	410
Open Space	193	1,446
Water	1,768	1,768
Launch Operations	4,912	3,292
Launch and Range Support	7,075	5,366
Launch and Range Control	-	288
Port Operations	100	981
Total	15,804	15,794

code identifies each building type. A building categorization is provided in Table 1.2, along with information on floorspace, average age, average year built, and the number of buildings for each category.

The facility category entitled "Other" was identified from the real-property list and includes items such as utility vaults, waste treatment buildings, and other unique facilities that have very low energy use. Real property items, such as fire protection and sprinkler systems, fire and security alarm systems, and outdoor facilities with no energy consumption, were not included in Table 1.2.

Interior Lighting

The existing energy consumption corresponding to the interior lighting at Cape Canaveral AFB was calculated using a formula that estimates the total number of fixtures for each building type at the station. The total number of fixtures was calculated by taking the footcandles required for a particular building type, multiplying by the total floor area of the building type, and

TABLE 1.2. Building Characterization at Cape Canaveral AFS

Building Type	Description	Total Area (ft^2)	Average Area (ft^2)	Average Age	Number of Buildings	Percentage of Buildings
ADMIN	Adm Bldg	316,888	9,903	30	32	4.18
BRK/ADM	Barracks, Admin	1,854	1,854	32	1	0.13
COMCATN	Commun Fac	219,783	6,464	25	34	4.44
DET-RR	Detached Rstrm	1,585	528	25	3	0.39
FUELDSP	Fuel Bldg	2,399	1,200	20	2	0.26
HANGAR	Hangar	40,519	40,519	39	1	0.13
LAB-MED	Med Lab	12,064	12,064	35	1	0.13
MTRPOOL	Maint Shop	68,337	9,762	30	7	0.91
MWR	Morale, Rec	13,585	4,528	22	3	0.39
NASLEAS	NASA-Leased	732,416	8,419	27	87	11.36
NASOWN	NASA-Owned	745,470	3,241	34	230	30.03
OTHER	Other	9,580	2,395	22	4	0.52
PLT-BLD	Heat/Cool/Plant	34,950	1,456	28	24	3.14
PLT-EQU	Maint Shop-Equip	68,571	2,212	28	31	4.05
R&D	Research & Dev	1,236,903	18,741	31	66	8.62
RESTRNT	Restaurant	16,443	16,443	34	1	0.13
SECURTY	Security Fac	37,542	1,295	21	29	3.79
SHOP	Misc Maint Shop	219,099	8,115	27	27	3.52
SHOP-ELC	Maint Shops-Elec	77,132	11,019	31	7	0.91
SHOP-WPN	Maint Shops-Weapons	5,150	5,150	36	1	0.13
STOR-UH	Unheated Storage	155,553	1,556	26	100	13.05
TRAING	Training Fac	5,548	2,774	32	2	0.26
WHS	Warehouse	389,801	5,340	27	73	9.53
Total		4,411,172			766	100.00

dividing by the lumen output of the fixtures. The following assumptions were made to estimate the lighting energy consumption at Cape Canaveral AFS:

- The required footcandles were obtained from the Illuminating Engineering Society of North America (IES) Applications Handbook (IES 1981) or light-metered data gathered at the site.
- Installed lighting (footcandles) meets, but does not exceed, IES standards (IES 1981). Representative data obtained during site visits are listed in Table 1.3.

TABLE 1.3. Installed Lighting at Cape Canaveral AFS

Facility Number	Facility Name	Light Reading (footcandles)	Light Location
1744	Vehicle Maintenance Shop - Hangar U	350 80	hangar offices
1604	Hangar H Space Research Test	110	offices
54915	Engineering Building	75 11-35	offices halls
1731	Hangar M	75 15	offices halls
60680	AE Support	100	offices with newly painted walls
1645	Control Center	100-120	offices and selected work areas
1704	E&L Building	90 50-90	office lobby

- Light output from each fixture is the mean lumen from the Lighting Technology Systems Matrix (FEMP 1993).
- Operating hours for each building type were assumptions based on observations and discussions with Cape Canaveral AFS staff.
- Utilization factors depict the fraction of lights in operation during occupied and unoccupied hours of the day. For example, a value of 1.0 indicates that all lights are operating, while a value of 0.5 indicates that half of the lights are operating. The percentages for each type of fixture (incandescent, fluorescent, and high-pressure sodium) for each building type were based on detailed audit data collected at other federal sites (Dixon et al. 1992).
- All incandescent lamps were assumed to be 60 W based on spot checks performed during site visits.
- High-pressure sodium fixtures were assumed to be 150 W based on information in the draft lighting management plans.
- The fluorescent fixture type was obtained by site visits of several building types and then applied to the remaining areas.
- To estimate the energy consumption of exit signs at the station, the buildings were assumed to have two doors and three exit signs per door.

Table 1.4 shows the total number of fixtures for each building type and their corresponding energy consumption categorized by on- and off-peak hours, for occupied and unoccupied periods of the day, respectively.

Boilers

A total of 82 boilers are used at Cape Canaveral AFS. The USAF is responsible for the largest number of boilers (61) with a combined capacity of 37,117 kBtu/h. The U.S. Navy has responsibility for 6 boilers with a combined capacity of 3,230 kBtu/h. NASA is responsible for 15 of the boilers with a combined capacity of 11,384 kBtu/h. Table 1.5 lists all the boilers, including the facility number, facility name, the output (in thousands of British thermal units per hour), the type of boiler, the agency involved, and the operational status of the facility in which they are installed.

Air Conditioning and Refrigeration

A wide range of air-conditioning, refrigeration, and chiller units (1,074 total) exists at Cape Canaveral AFS. The equipment ranges from 1-ton to 520-ton units for a total of 16,336 tons. The units have been categorized in correspondence with the area of the station in which they are located. This information was gathered from the station's master heating, ventilating, and air-conditioning (HVAC) equipment list. The following assumptions were made to determine the baseline energy consumption of the equipment:

- The operating hours for the equipment assumes that half the tonnage is operated at equivalent rated full-load hours during the normal cooling season (PRAD Group 1992).
- Operating hours total 2,700 h/yr (PRAD Group 1992).
- On-peak hours are 30% and off-peak hours are 70% of the total operating hours.
- The efficiency of the existing equipment is 0.9 kW/ton (PRAD Group 1992).

TABLE 1.4. Interior Lighting Fixtures and Corresponding Energy Consumption at Cape Canaveral AFS

Building Type	area (sqft)	Fixture Type	No. of Fixtures	Utiliz. Occ.	Utiliz. Unocc.	On-Peak Occ. (h/yr)	On-Peak Unocc. (h/yr)	Off-Peak Occ. (h/yr)	Off-Peak Unocc. (h/yr)	Consumption			
										On-Peak Occ. (KWh/yr)	On-Peak Unocc. (KWh/yr)	Off-Peak Occ. (KWh/yr)	Off-Peak Unocc. (KWh/yr)
ADMIN	316,888												
incandescent	50,702	60 W Inc	9,353	1.0	0.3	900	1255	1,359	5,246	505,049	211,279	762,624	883,162
flourescent	266,186	2F34	3,328	1.0	0.3	900	1255	1,359	5,246	281,516	117,768	426,090	492,278
BRK/ADM	1,854												
incandescent	297	60 W Inc	55	1.0	0.0	2,154	0	3,686	2,920	7,072	0	12,102	0
flourescent	1,557	2F34	19	1.0	0.0	2,154	0	3,686	2,920	3,942	0	6,746	0
COMCATN	219,783												
incandescent	35,165	60 W Inc	6,487	1.0	0.4	900	1255	1,359	5,246	350,285	195,381	528,931	816,709
flourescent	184,618	4F34	3,658	1.0	0.4	900	1255	1,359	5,246	437,883	244,241	661,203	1,020,949
DET-RR	1,585												
incandescent	840	60 W Inc	31	1.0	0.4	293	1862	1,167	5,438	545	1,212	2,170	3,539
flourescent	745	4F34	3	1.0	0.4	293	1862	1,167	5,438	115	256	458	747
FUELDSP	2,399												
incandescent	384	60 W Inc	28	1.0	0.5	2,154	0	3,686	2,920	3,660	0	6,264	2,481
flourescent	2,015	4F40	13	1.0	0.5	2,154	0	3,686	2,920	3,682	0	6,300	2,496
HANGAR	40,159												
incandescent	6,425	60 W Inc	474	1.0	0.5	2,154	0	3,686	2,920	61,274	0	104,854	41,532
flourescent	23,292	4F40	347	1.0	0.5	2,154	0	3,686	2,920	99,296	0	169,919	67,304
HID	10,441	150 W HPS	92	1.0	0.5	2,154	0	3,686	2,920	37,213	0	63,680	25,223
LAB-MED	12,064												
incandescent	1,930	60 W Inc	142	1.0	0.0	2,154	0	6,606	0	18,407	0	56,451	0
flourescent	8,047	4F34	211	1.0	0.0	2,154	0	6,606	0	60,548	0	185,691	0
HID	2,256	150 W HPS	28	1.0	0.0	2,154	0	6,606	0	11,486	0	35,226	0
MTRPOOL	68,337												
incandescent	10,934	60 W Inc	807	1.0	0.5	2,154	0	3,686	2,920	104,267	0	178,425	70,673
flourescent	39,635	3F60	194	1.0	0.5	2,154	0	3,686	2,920	92,114	0	157,629	62,436
HID	17,768	150 W HPS	67	1.0	0.5	2,154	0	3,686	2,920	27,139	0	46,441	18,395
MWR	13,585												
incandescent	2,174	60 W Inc	160	1.0	0.3	2,154	0	3,686	2,920	20,728	0	35,470	8,430
flourescent	11,411	3F60	56	1.0	0.3	2,154	0	3,686	2,920	26,520	0	45,383	10,785
NASLEAS	732,416												
incandescent	117,187	60 W Inc	8,647	1.0	0.3	900	1255	1,359	5,246	466,923	195,330	705,054	816,493
flourescent	615,229	4F34	4,876	1.0	0.3	900	1255	1,359	5,246	583,690	244,177	881,371	1,020,678
OTHER	9,580												
incandescent	1,533	60 W Inc	283	1.0	0.4	900	1255	1,359	5,246	15,268	8,516	23,055	35,599
flourescent	8,047	3F60	99	1.0	0.4	900	1255	1,359	5,246	19,535	10,896	29,499	45,548

TABLE 1.4. (contd)

Building Type	area (sqft)	Fixture Type	No. of Fixtures	Utiliz. Occ.	Utiliz. Unocc.	On-Peak Occ. (h/yr)	On-Peak Unocc. (h/yr)	Off-Peak Occ. (h/yr)	Off-Peak Unocc. (h/yr)	Consumption			
										On-Peak Occ. (KWh/yr)	On-Peak Unocc. (KWh/yr)	Off-Peak Occ. (KWh/yr)	Off-Peak Unocc. (KWh/yr)
PLT-BLD	34,950												
General	31,455												
incandescent	5,033	60 W inc	1,733	0.7	0.5	2,154	0	3,686	2,920	156,778	0	268,284	151,808
flourescent	26,422	3F60	605	0.7	0.5	2,154	0	3,686	2,920	200,593	0	343,262	194,234
Control boards	3495												
flourescent	3495	3F60	80	0.7	0.5	2,154	0	3,686	2,920	26,533	0	45,405	25,692
PLT-EQU	68,571												
General	51,428												
incandescent	8,229	60 W inc	1,518	0.7	0.5	2,154	0	3,686	2,920	137,319	0	234,985	132,966
flourescent	6,912	3F60	85	0.7	0.5	2,154	0	3,686	2,920	28,111	0	48,105	27,220
Fine work	17,143												
incandescent	2,743	60 W inc	2,024	0.7	0.5	2,154	0	3,686	2,920	183,092	0	313,313	177,288
flourescent	14,400	3F60	706	0.7	0.5	2,154	0	3,686	2,920	234,261	0	400,875	226,834
R&D	1,236,903												
incandescent	197,904	60 W inc	36,506	1.0	0.3	900	1255	1,359	5,246	1,971,348	687,234	2,976,736	2,872,692
flourescent	1,038,999	4F34	27,290	1.0	0.3	900	1255	1,359	5,246	3,266,580	1,138,766	4,932,536	4,760,133
RESTRNT	16,443												
Cashier	1,644												
incandescent	263	60 W inc	19	1.0	0.0	2,154	0	3,686	2,920	2,509	0	4,293	0
flourescent	1,381	4F34	11	1.0	0.0	2,154	0	3,686	2,920	3,118	0	5,335	0
Cleaning	3,289												
incandescent	526	60 W inc	19	1.0	0.0	2,154	0	3,686	2,920	2,509	0	4,293	0
flourescent	2,762	4F34	11	1.0	0.0	2,154	0	3,686	2,920	3,118	0	5,335	0
Dining	11,510												
incandescent	1,842	60 W inc	34	1.0	0.0	2,154	0	3,686	2,920	4,390	0	7,513	0
flourescent	9,668	4F34	19	1.0	0.0	2,154	0	3,686	2,920	5,456	0	9,337	0
SECURIT Y	37,542												
Records	18,771												
incandescent	3,003	60 W inc	1,108	1.0	1.0	2,154	0	6,606	0	143,202	0	439,179	0
flourescent	15,768	4F34	621	1.0	1.0	2,154	0	6,606	0	177,967	0	545,799	0
Other	9,386												
incandescent	1,502	60 W inc	111	1.0	1.0	2,154	0	6,606	0	14,320	0	43,918	0
flourescent	7,884	4F34	62	1.0	1.0	2,154	0	6,606	0	17,797	0	54,580	0
SHOP	219,099												
incandescent	35,056	60 W inc	12,933	1.0	0.3	2,154	0	3,686	2,920	1,671,480	0	2,860,295	679,766
flourescent	127,077	3F60	3,116	1.0	0.3	2,154	0	3,686	2,920	1,476,659	0	2,526,911	600,536
HID	56,966	150 W HPS	1,074	1.0	0.3	2,154	0	3,686	2,920	435,053	0	744,478	176,930

TABLE 1.4. (contd)

Building Type	area (sqft)	Fixture Type	No. of Fixtures	Utiliz. Occ.	Utiliz. Unocc.	On-Peak Occ. (h/yr)	On-Peak Unocc. (h/yr)	Off-Peak Occ. (h/yr)	Off-Peak Unocc. (h/yr)	Consumption: On-Peak Occ. (KWh/yr)	Consumption: On-Peak Unocc. (KWh/yr)	Consumption: Off-Peak Occ. (KWh/yr)	Consumption: Off-Peak Unocc. (KWh/yr)
SHOP-ELEC	77,132												
incandescent	12,341	60 W Inc	4,553	1.0	0.3	2,154	0	3,686	2,920	588,431	0	1,006,943	239,306
flourescent	44,737	3F60	1,097	1.0	0.3	2,154	0	3,686	2,920	519,846	0	889,578	211,414
HID	20,054	150 W HPS	378	1.0	0.3	2,154	0	3,686	2,920	153,157	0	262,087	62,287
SHOP-WPN	5,150												
incandescent	824	60 W Inc	152	1.0	0.3	2,154	0	3,686	2,920	19,644	0	33,616	7,989
flourescent	2,987	3F60	37	1.0	0.3	2,154	0	3,686	2,920	17,355	0	29,698	7,058
HID	1,339	150 W HPS	13	1.0	0.3	2,154	0	3,686	2,920	5,113	0	8,750	2,079
STOR-UH	155,553												
incandescent	24,888	60 W Inc	918	1.0	0.3	2,154	0	3,686	2,920	118,670	0	203,071	48,261
flourescent	90,221	3F60	221	1.0	0.3	2,154	0	3,686	2,920	104,838	0	179,402	42,636
HID	40,444	150 W HPS	76	1.0	0.3	2,154	0	3,686	2,920	30,887	0	52,855	12,561
TRAINING	5,548												
incandescent	888	60 W Inc	327	1.0	0.4	900	1255	1,359	5,246	17,685	9,864	26,704	41,233
flourescent	4,660	3F60	114	1.0	0.4	900	1255	1,359	5,246	22,627	12,621	34,167	52,756
WHS	389,801												
incandescent	62,368	60 W Inc	2,301	1.0	0.3	293	1862	1,167	5,438	40,451	77,119	161,112	225,226
flourescent	226,085	3F60	554	1.0	0.3	293	1862	1,167	5,438	35,736	68,130	142,334	198,975
HID	101,348	150 W HPS	191	1.0	0.3	293	1862	1,167	5,438	10,529	20,072	41,934	58,622
Exit Lights	na	20 W Inc		1.0	1.0	3134	0	5626	0	125	0	225	0
						Total consumption (MWh/yr)				15,085	3,243	25,017	16,682

TABLE 1.5. Cape Canaveral AFS Boilers

Facility Number	Facility Name	Output (kBtu/h)	Type	Agency	Operational Status
01348	HANGAR C	216	ST[a]	USAF	N/C[b]
01386	TIM-FIRE SHOP	227	HW[c]	USAF	N/C
01428	NRC BLDG	219	HW	USAF	N/C
01604	HANGAR H	36	HW-E[d]	USAF	CRIT[e]
01605	RCDS STR BLDG	1,250	HW	USAF	N/C
01619	JAN SER BLDG	598	HW	USAF	CRIT
01625	COM STOR BLDG	178	HW	USAF	N/C
01635	RIGGING SHOP	702	HW	USAF	N/C
01646	RCC MECH BLDG	1,300	HW	USAF	CRIT
01708	PORTABLE	318	ST	USAF	N/C
01708	HANGAR R&D	921	HW-E	USAF	N/C
01708	PORTABLE	216	ST	USAF	N/C
01711	HANGAR I	819	HW-E	USAF	N/C
01724	PSL	694	HW	USAF	CRIT
01748	CAFE #2	204	ST	USAF	N/C
01748	CAFE #2	204	ST	USAF	N/C
29100	CX 41 AC SHR	2,275	ST-E	USAF	CRIT
29100	CX 41 AC SHR	2,275	ST-E	USAF	CRIT
29100	CX 41 AC SHR	2,253	HW-E	USAF	CRIT
29100	CX 41 AC SHR	2,253	HW-E	USAF	CRIT
29100R	CX 41	285	HW	USAF	CRIT
34706	TGSF	565	HW	USAF	CRIT
44410	PHOTO OPS BD	1,120	HW	USAF	N/C
44603	PNT EQP STOR	84	HW	USAF	N/C
44608	MNT PNT SHOP	112	HW	USAF	N/C
44608	MNT PNT SHOP	84	HW	USAF	N/C
44625	GEN SHOP	252	HW	USAF	N/C
47100R	CX 40	285	HW	USAF	CRIT
49639	CTL COMP COM	500	HW	USAF	CRIT
49639	CTL COMP COM	252	HW	USAF	CRIT
50801	RCT STOR BLDG	129	HW	USAF	CRIT
50803	RCT CKOT BLDG	189	HW	USAF	CRIT
55810	M/ASMB BD-AC	1,800	HW	USAF	CRIT
55815	M/ASMB BD-AD	835	HW	USAF	N/C
55840	GPS PROP FAC	423	HW	USAF	CRIT
56921	CX 30 BLKHSE	400	HW	USAF	N/C
60501	MACH SHOP	150	HW	USAF	N/C
60501	MACH SHOP	150	HW	USAF	N/C
66257	HANGAR S	2,209	HW	USAF	CRIT
67210	MK VI CK BLDG	125	HW	USAF	CRIT
67900	DELTA SPN BD	420	HW	USAF	CRIT
67901	CTL BD SP TS	203	HW	USAF	CRIT
70000	SMAB WEST	1,200	HW	USAF	CRIT
70000	SMAB WEST	1,200	HW	USAF	CRIT
70000	SMAB EAST	588	HW	USAF	CRIT
70500	VIB WEST	1,005	HW	USAF	CRIT

TABLE 1.5. (contd)

Facility Number	Facility Name	Output (kBtu/h)	Type	Agency	Operational Status
70500	VIB EAST	837	HW	USAF	CRIT
70510	ITL WRHSE	351	HW	USAF	N/C
70B396	PORTABLE	267	ST	USAF	CRIT
72650	MISS STR MAG	424	HW	USAF	CRIT
72665	MISS STR MAG	127	HW	USAF	CRIT
72680	MISS STR MAG	127	HW	USAF	N/C
75251	MISS INSP ST	250	HW	USAF	N/C
77375	PROP INSP BD	350	HW	USAF	N/C
78150	S/W CABLE BD	250	HW	USAF	CRIT
80505	MISS RSH BLD	212	HW	USAF	CRIT
81585	COMM CTL FAC	312	HW	USAF	CRIT
87X822	PORTABLE	920	ELEC	USAF	CRIT
88X843	PORTABLE	102	HW	USAF	CRIT
88x853	PORTABLE	267	ST	USAF	CRIT
HTMSC	PORTABLE	600	ST	USAF	CRIT
00320C	CX 46	90	HW	NAVY	N/C
01115	HANGAR Y	283	HW-E	NAVY	N/C
56920E	TRDT TST FAC	750	HW	NAVY	CRIT
62640	EQ MNT BLDG	750	HW	NAVY	N/C
62980	MISC CK BD-AK	1,074	HW	NAVY	CRIT
90302	DASO HDQ	283	HW-E	NAVY	N/C
01385	MISSION CONT	648	HW	NASA	N/C
01385	MISSION CONT	486	HW	NASA	N/C
01726	SCAPE SUIT	500	HW	NASA	CRIT
01726	HANGAR S	900	HW	NASA	CRIT
01728	HANGAR N	750	HW	NASA	CRIT
01732	HANGAR L	127	ST	NASA	CRIT
01732	HANGAR L	153	ST	NASA	CRIT
40431	GET AWAY SPL	292	HW	NASA	CRIT
54445	S&A LAB	660	HW-E	NASA	CRIT
54446	PROP LAB ESF	500	HW-E	NASA	CRIT
55005	M ANNEX	480	HW	NASA	CRIT
60530	HANGAR AO-AM	1,301	HW	NASA	CRIT
60530	HANGAR AO-AM	1,301	HW	NASA	CRIT
60680	HANGAR AE	1,613	HW	NASA	CRIT
66250	HANGAR AF	1,673	HW	NASA	N/C
Total		51,731			

(a) Steam
(b) Noncritical
(c) Hot Water
(d) Hot Water-Electric
(e) Critical

Table 1.6 summarizes the air-conditioning and refrigeration equipment at the station (PRAD Group 1992), as well as the corresponding energy consumption.

1.2.2 Utility Characterization

Cape Canaveral AFS Transformers

Table 1.7 lists the transformers found at Cape Canaveral AFS. A total of 814 transformers, with a total of 178,085 kVA, were identified (McCarthy 1992).

1.2.3 Water Distribution Characterization

Limited information regarding the water distribution system was available from the site.

1.2.4 Sewage Treatment Characterization

The main sewage treatment plant for Cape Canaveral AFS is located in the industrial area. The plant has a capacity to process 640 kgal/day of sewage. The plant itself is comprised of a series of facilities that house various activities of the sewage treatment process. The largest facility is the settling bed followed by the control building. Other facilities include the lift station, chlorination facility, settling tank, digester building, trickling filter, pump house, and sludge drying bed.

1.2.5 Exterior Lighting Characterization

The exterior lighting data for Cape Canaveral AFS was gathered from information in a series of unpublished Johnson Controls' reports that provide a general description and location of the exterior lighting at the station. Because of specific information deficiencies in these documents, the following assumptions were made:

- If a lamp's wattage was not provided in the document, a standard size was assumed for each fixture type.
- The total number of exterior lights for the industrial area, Fuel Storage Area No. 1, and the Port Area were taken from a report on changes and elimination of lights because of the adverse effect on sea turtles.

TABLE 1.6. Cape Canaveral AFS Air-Conditioning/Refrigeration Equipment

Area	Description	No. of Units	Total Capacity (tons)	Energy Use Off-Peak (MWh/yr)	Energy Use On-Peak (MWh/yr)
Area 1	window unit	2	3	8	12
	direct expansion*	1	50	64	3,205
	Total	3	53	72	3,216
Area 1W	window unit	8	15	154	288
	chilled water	8	1,365	13,998	2,388,414
	direct expansion	51	616	40,271	486,414
	other	3	105	404	14,133
	Total	70	2,101	54,827	2,889,249
Area 2	window unit	6	12	92	185
	chilled water	1	120	154	18,459
	direct expansion	13	168	2,800	36,180
	other	1	1	1	1
	Total	21	301	3,047	54,824
Area 3	chilled water	2	210	538	56,531
	direct expansion	51	530	34,649	360,078
	other	5	10	64	128
	Total	58	750	35,251	416,736
Area 3A	window unit	109	213	29,761	58,157
	chilled water	32	3,428	140,616	15,063,501
	direct expansion	255	2,660	869,493	9,070,006
	other	33	57	2,411	4,165
	Total	429	6,358	1,042,282	24,195,829
Area 4	window unit	32	48	1,969	2,953
	chilled water	1	25	32	801
	direct expansion	50	537	34,418	369,652
	other	4	4	21	21
	Total	87	614	36,440	373,427
Area 5	window unit	36	67	3,092	5,754
	chilled water	6	780	5,999	779,890
	direct expansion	51	622	40,664	495,935
	other	15	44	846	2,482
	Total	108	1,513	50,601	1,284,062
Area 6	window unit	16	27	554	934
	chilled water	7	625	5,608	500,731
	direct expansion	38	291	14,175	108,550
	other	11	71	1,001	6,462
	Total	72	1,014	21,338	616,677

TABLE 1.6. (contd)

Area	Description	No. of Units	Total Capacity (tons)	Energy Use Off-Peak (MWh/yr)	Energy Use On-Peak (MWh/yr)
Area 7	window unit	26	33	1,100	1,396
	chilled water	4	390	2,000	194,973
	direct expansion	58	788	58,587	795,970
	other	3	26	100	867
	Total	91	1,237	61,786	993,205
Area 8	window unit	51	81	5,295	8,410
	chilled water	2	1,340	3,435	2,301,727
	direct expansion	33	345	14,594	152,575
	other	14	32	574	1,313
	Total	100	1,798	23,899	2,464,025
IN	window unit	5	8	51	82
	chilled water	7	358	3,212	164,290
	direct expansion	11	200	2,820	51,275
	Total	23	566	6,084	215,647
Other	window unit	1	2	3	5
	direct expansion	6	24	185	738
	other	5	5	32	32
	Total	12	31	219	776
Total No. of Units:		1,074			
Total Energy Consumption:				1,335,845	33,507,673

* Split system

Table 1.8 shows the quantity of each fixture type and its energy consumption corresponding to each area of the station.

Assumptions regarding hours of operation were based on information contained in the lighting management plans for the various areas at the station. The hours of operation were detailed for some fixtures. For those identified as occasional use, a use rate of 3 times a month for 1.10 hours was assumed. If no frequency of operation was given, the fixture was assumed to be operating every night for 10 hours, every day of the year. Some fixtures were identified to operate only during launches. Those fixtures were assumed to operate for 10 hours at night, 4 days per launch with an average of one launch per month.

TABLE 1.7. Transformers at Cape Canaveral AFS

Total Number	kVA	Total kVA	Primary Voltage (kV)	Secondary Voltage (V)
16	3	48	13.2	208
16	5	48	13.2	208
69	10	690	13.2	208
68	15	1,020	13.2	208
112	25	2,800	13.2	208
3	25	75	13.2	480
2	30	60	13.2	208
40	37.5	1,500	13.2	208
93	50	4,650	13.2	208
90	75	6,750	13.2	208
41	100	4,100	13.2	208
5	112.5	562.5	13.2	208
1	112.5	112.5	13.2	480
7	150	1,020	13.2	208
6	150	900	13.2	480
50	167	8,350	13.2	208
11	225	2,475	13.2	208
11	225	2,475	13.2	480
11	250	2,750	13.2	208
18	300	5,400	13.2	208
6	300	1,800	13.2	480
3	333	999	13.2	208
21	500	10,500	13.2	208
34	500	17,000	13.2	480
6	750	4,500	13.2	208
23	750	17,250	13.2	480
1	1,000	1,000	13.2	208
21	1,000	21,000	13.2	480
2	1,125	2,250	13.2	208
1	1,500	1,500	13.2	208
10	1,500	15,000	13.2	480
3	2,000	6,000	13.2	480
1	2,500	2,500	13.2	208
10	2,500	25,000	13.2	480
1	3,000	3,000	13.2	208
1	3,000	3,000	13.2	480
814		**178,085**		

TABLE 1.8. Exterior Lighting Fixtures and Corresponding Energy Consumption at Cape Canaveral AFS

Area	Fixture Type	Quantity	Watt Draw	Energy Consumption (kWh/yr)
Industrial Area	75-W Inc[a]	50	75	13,688
	100-W Inc	83	100	30,295
	150-W Inc	216	150	118,260
	200-W Inc	23	200	16,790
	250-W Inc	65	250	59,313
	300-W Inc	61	300	66,795
	500-W Inc	34	500	62,050
	250-W HPS[b]	20	305	22,265
	300-W HPS	24	365	31,974
	400-W HPS	182	465	308,900
	1000-W MV[c]	2	1,000	7,300
	500-W Quartz	10	500	18,250
Port Area	150-W Inc	3	150	1,643
	35-W HPS	3	54	591
	100-W HPS	14	130	6,643
	150-W HPS	4	188	2,745
	200-W HPS	51	240	44,676
	400-W MH[d]	1	460	1,679
	1000-W MV	40	1,080	157,680
	400-W MV	60	460	100,740
	200-W Quartz	1	200	730
	500-W Quartz	9	500	16,425
	500-W Quartz	3	500	5,475
Fuel Storage Area	150-W Inc	14	150	7,665
	300-W Inc	37	300	15,770
	35-W HPS	175	55	29,200
	100-W HPS	6	130	2,847
	100-W LPS[e]	52	135	19,850
	400-W MH	16	460	26,864
	1000-W MH	30	1,000	14,400
	500-W Quartz	5	500	9,125
Launch Complex	300-W Inc	604	300	328,500
	35-W HPS	1,433	55	84,900
	100-W LPS	277	135	44,100
	400-W MV	65	400	24,600
	400-W MH	60	400	6,000
	1000-W MH	471	1,000	155,300
	500-W Quartz	71	500	17,200

TABLE 1.8. (contd)

Area	Fixture Type	Quantity	Watt Draw	Energy Consumption (kWh/yr)
Vertical Integration Bldg	300-W Inc	23	300	25,185
	35-W HPS	15	55	3,011
	200-W Quartz	13	200	9,490
Total Consumption (MWh/yr)				1,919

(a) Incandescent
(b) High-pressure sodium
(c) Mercury vapor
(d) Metal halide
(e) Low-pressure sodium

2.0 ENERGY SOURCE CHARACTERISTICS

Energy sources used by Cape Canaveral AFS include electricity, No. 2 fuel oil, diesel fuel, and motor vehicle gasoline (MOGAS). Table 2.1 provides information on the total energy consumption for these fuel types for 1991 and 1992. Diesel fuel is used to power portable generators, fork lifts, compressors, and some heavy vehicles. Fuel oil is used for boilers and MOGAS is used for both government and contractor vehicles. Information on electricity and No. 2 fuel oil energy use for 1992 was not available. However, 1991 data indicate that greater than 60% of the total energy usage was electricity, with the next highest being diesel fuel. The lowest amount of energy use was for motor vehicles.

2.1 ELECTRIC SUPPLY SOURCE DESCRIPTION

Electricity is supplied to Cape Canaveral AFS by Florida Power & Light (FPL) through three 115 kV lines. Three electric metering points are the North, South, and Titan Substations. From each substation, distribution is

TABLE 2.1. Typical Annual Energy Consumption and Energy Costs at Cape Canaveral AFS for 1991 and 1992

	Annual Total					Percent	Energy Cost
Energy Type	1991	1992	Units	Annual Total (MBtu)[a]		of Total (1991)	(1991$, in thousands)
Electricity[b]	192,074.0	NA	MWh[c,d]	655,549	NA	61.5	9,876
No. 2 Fuel Oil	924.1	NA	kgal[e]	128,265	NA	12.0	952
Diesel Fuel[f]	1558.3	1705.7	kgal[g]	218,162	238,798	20.5	1,558
MOGAS	502.4	508.6	kgal[h]	63,805	64,592	6.0	619
Total				1,065,781		100.0	13,005

(a) 1 MBtu = 1,000,000 Btu
(b) Florida Power & Light Billing Records
(c) Defense Energy Information System Records
(d) 1 MWh = 3,413,000 Btu
(e) 1 kgal = 138.8 MBtu
(f) Cape Canaveral AFS personnel
(g) 1 kgal = 140.0 MBtu
(h) 1 kgal = 127.0 MBtu

made to substations owned by the USAF and then distributed through 13.2 kV feeder circuits. Although some underground circuits exist, the primary mode of distribution is through overhead lines to the various facilities and launch sites.

Electricity supplied by FPL is billed under a time-of-use rate structure designated as General Service Large Demand Time-of-Use (GSLDT-3). The on-peak periods are from 6:00 a.m. to 10:00 a.m. and 6:00 p.m. to 10:00 p.m. for November 1 through March 31, and 12:00 noon to 9:00 p.m. from April 1 through October 31. The rate in effect in 1991 consisted of a customer charge of $400 and an on-peak demand charge of $6.25/kW. An on-peak energy and fuel charge of $0.01082/kWh and $0.02175/kWh, respectively, and an off-peak energy and fuel charge of $0.0949/kWh and $0.01975/kWh, respectively, were included. An oil backout charge of $0.00651/kWh and a conservation charge of $0.00135/kWh were included in the electric bill. Table 2.2 summarizes the above information.

There is no central generation plant at Cape Canaveral AFS. However, there are portable backup generators for critical facilities and pump stations that are powered by diesel fuel and typically operate less than 100 h/yr.

2.2 DIESEL/FUEL OIL SUPPLY SOURCE DESCRIPTION

Diesel fuel is used to power portable electric generators for standby power during launch periods at the station. Fuel oil is used for limited

TABLE 2.2. Cape Canaveral AFS Electric Rate Structure Breakdown - 1991

Season	Rate Type	Hours of Day	Demand Charge ($/kW)	Energy Charge (¢/kWh)	Fuel Charge (¢/kWh)	Oil Backout Charge (¢/kWh)	Conservation Charge (¢/kWh)	Total Energy (¢/kWh)
Winter	On-Peak	6:00am-10:00am	6.25	1.082	2.175	0.651	0.135	4.043
(Nov. 1-March 31)		6:00pm-10:00pm	6.25	1.082	2.175	0.651	0.135	4.043
	Off-Peak	12:00am-6:00am	0.00	0.949	1.975	0.651	0.135	3.71
		10:00am-6:00pm	0.00	0.949	1.975	0.651	0.135	3.71
		10:00pm-12:00am	0.00	0.949	1.975	0.651	0.135	3.71
Summer	On-Peak	12:00pm-9:00pm	6.25	1.082	2.175	0.651	0.135	4.043
(April 1-Oct.31)	Off-Peak	9:00pm-12:00pm	0.00	0.949	1.975	0.651	0.135	3.71

space and water heating through the oil-fired hot water or steam boilers listed in Table 1.5. During summer months, reheat is used in some buildings as part of the air-conditioning/dehumidification system. In CY91, Cape Canaveral AFS purchased 22,002 barrels of No. 2 fuel oil (128,262 MBtu) at a price of $1.03/gal for a total cost of $951,806.

Cape Canaveral AFS maintains several mobile electric power (MEP) generators for use as backup power in launch situations or when a building's power supply must be interrupted for maintenance reasons. The MEPs are not assigned to specific facilities, but are kept in a central location and moved to sites as they are required. All MEPs are fueled by diesel. No information was available concerning MEP hours of operation. Table 2.3 lists the number, output (kilowatt), and fuel consumption rate of the generators.

2.3 VEHICLE GASOLINE/DIESEL SUPPLY SOURCE DESCRIPTION

Fuels for motor vehicles at Cape Canaveral AFS are supplied through Rayethon Services. In FY91, the station vehicles consumed 503,079 gal of unleaded regular gasoline at a cost of $1.23/gal, for a total cost of $618,787. During the same period, 1,512,718 gal of diesel fuel were consumed at $1.03/gal, for a total cost of $1,558,099. Table 2.4 lists the total number of vehicles used at the station.

TABLE 2.3. Cape Canaveral AFS Mobile Electric Power Generators

Number of Generators	Output (kW)	Fuel Consumption Rate (gal/h)
16	15	2.6
19	30	3.3
17	100	8.7
9	150	13.3
7	200	30.0
2	300	20.0
1	350	29.0
1	500	17.0

TABLE 2.4. Vehicles Used at Cape Canaveral AFS

Number of Vehicles	Vehicle Description	Fuel Type
9	Sedan	G[a]
2	Bus	D[b]
1	Station Wagon	G
24	Panel Truck	G
4	Multistop (van)	G
68	Multistop (van)	D
24	Carry-All	G
288	Pickup	G
4	Pickup	D
7	Stake & Platform Cargo	G
29	Stake & Platform Cargo	D
2	Winch Truck	G
9	Truck/Tractor	D
45	Telephone M	

(a) Gasoline
(b) Diesel

2.4 NATURAL-GAS SUPPLY SOURCE DESCRIPTION

Currently, natural gas is not supplied to Cape Canaveral AFS. Gas is available at KSC to the west and Port Canaveral to the south. The supplier of natural gas in the region, City Gas of Florida, has expressed an interest in running a pipeline through Cape Canaveral AFS to connect KSC and Port Canaveral. If this occurs, gas can be made available to individual facilities for gas-driven chillers, boilers, water heating, as well as to power generation facilities.

3.0 ENERGY-USE INTENSITIES

Energy-use intensity (EUI) values are used to help develop baseline consumption for various building types when metered data is not available. This section describes the regional and site-specific EUI information that was gathered for use in the energy assessment at Cape Canaveral AFS. Tables A.1 to A.19 in the Appendix display the basic regional EUI information that was collected. These data provided reasonable EUI values from which site-specific values could be determined. Calculation of site-specific EUIs is described in more detail in the following sections.

3.1 REGIONAL ENERGY-USE DATA SOURCES

Energy-use intensities are defined as energy use per unit floor area, per unit time. EUIs are commonly expressed as thousands of British thermal units per square foot per year (kBtu/ft^2-yr), or kilowatt-hours per square foot per year (kWh/ft^2-yr).

Tables A.1 through A.19 break out regional energy use by facility type, building type, fuel type, and fuel end use. Energy use is expressed in kilowatt-hours per square foot per year for electric EUIs and thousands of British thermal units per square foot per year for fossil fuel EUIs. Energy-use data are reported for the following end-use categories: space heating, cooling, ventilation, domestic hot water (DHW), cooking, lighting (includes interior and exterior), refrigeration, and other. The category entitled "other" includes miscellaneous end uses made up of a variety of electrical appliances and motors, as well as water and steam heating for laundry and food preparation.

A primary product of the regional energy consumption analysis for Cape Canaveral AFS is site-specific EUI values for various building types and end uses that make up the energy consumption at the station. These EUI values are considered reasonable representations of the magnitude of energy consumption among various end uses and buildings.

3.2 SITE-SPECIFIC ENERGY-USE VALUES

As shown in Table 3.1, several users reimburse the USAF for electricity consumed by the users. The table shows typical annual consumption (CY91) for reimbursable facilities at the station. The consumption values are metered for each facility. NASA is billed for the facilities shown below as "NASA" in the column entitled "Agency," plus 5.12% of the nonreimbursable electricity consumption. Nonreimbursable consumption is defined as the total Cape Canaveral AFS electricity consumption minus the reimbursable accounts shown in Table 3.1.

The final step in EUI development was completed as part of the final allocation of energy process. This process incorporates various factors that influence energy consumption, and thus EUIs, among buildings. These factors include weather, occupancy, construction, age, operation, and function. Sometimes actual building metering data or single-building type area metering provided an exact whole-building EUI for a particular building type. Otherwise, EUI values were derived by an energy balance method. This method accounts for all energy use at the station and apportions it as accurately as possible among the building types and other uses. Table 3.2 summarizes the EUI information at the station.

TABLE 3.1. Cape Canaveral AFS Reimbursable Electricity Consumption - 1991

Facility	Number	Meters	kWh/Yr	Agency
APOLLO WAREHOUSE	66330	1	184,600	NASA
AREA 60A	59921	1	2,324,800	NASA
COMPLEX 19 SUBSTATION	15730	1	95,450	NASA
COMPLEX 34	21900	2	1,050,800	NASA
DISPENSARY	49635	1	876,720	NASA
E&O BUILDING	60650	3	984,960	NASA
HANGAR AE	60680	3	2,613,492	NASA
HANGAR AF	66250	2	3,782,400	NASA
HANGAR AM	60550	2	1,693,800	NASA
HANGAR AO	60530	2	3,378,600	NASA
HANGAR L	1732	3	3,942,744	NASA
HANGAR N	1728	2	650,360	NASA
HANGAR S	1726	4	1,708,520	NASA
HERF	67400	1	324,130	NASA
M ANNEX	55005	1	362,000	NASA
MISSILE INSP & STORAGE	60680	1	619,800	NASA
MISSION CONTROL	1385	1	731,440	NASA
PASSIVATION BUILDING	66220	1	417,840	NASA
SRB PAINT FACILITY	66310	1	855,040	NASA
COMPLEX 17	1270	5	4,423,520	ASTG[a]
COMPLEX 36	5500	1	3,157,200	ASTG
CPOCC II	27200	1	3,221,280	ASTG
DELTA SPIN TEST	6790	1	11,165,536	ASTG
DSIF	27200A	1	333,160	ASTG
E&L BUILDING	1704	3	1,257,780	ASTG
HANGAR J	1721	3	880,120	ASTG
HANGAR K	1725	2	1,044,540	ASTG
HANGAR M	1731	2	182,200	ASTG
NASA SUPPORT	1305A	4	680,970	ASTG
NAVSTAR PROCESSING FACILITY	55810	1	2,790,000	ASTG
COMMERCIAL TITAN FACILITY	55038	1	43,760	TITN[b]
COMPLEX 30	56920	3	614,747	NOTU[c]
COMPLEX 46 SUPPORT BUILDING	320	2	1,437,720	NOTU
DASO SUPPORT BUILDING	90302	1	944,800	NOTU
NAVY STORAGE BUILDING	85200	1	38,178	NOTU
NAVY TRAINING BUILDING	54815	1	480,000	NOTU
NAVY VEHICLE MAINT FACILITY	81701	1	214,400	NOTU
NOTU GTB	62700	1	148,080	NOTU
SOUTHSUB COMPLEX 29 CRCT 1		1	12,451,200	NOTU

TABLE 3.1. (contd)

Facility	Number	Meters	kWh/Yr	Agency
SOUTH SUBSTATION TRIDENT BASIN		1	5,320,800	NOTU
TEST OPS FACILITY	62615	1	2,066,880	NOTU
COMPLEX 20	18807	3	542,168	ARMY
FLORIDA SOLAR ENERGY CENTER		1	668,700	FSEC[d]
FUEL STORAGE AREA	1221	1	5,916	CG[e]
U.S.C.G. ARMORY	1381	1	71,301	CG
COMPLEX 36	5500	1	3,157,200	GD[f]
MODULAR BUILDING	55101	1	138,803	GD

(a) Air Support Testing Group
(b) Commercial Titan
(c) Naval Ordnance Test Unit
(d) Florida Solar Energy Center
(e) U.S. Coast Guard
(f) General Dynamics

TABLE 3.2. Cape Canaveral AFS EUI Information

Site Bldg-Type	Regional Bldg-Type	Site Total (sq ft)	Electric Total	Heat	Cool	Vent	DHW	Cook	Light	Refrig	Other
ADMIN	OFFICE	316,888	10.66	0.66	3.51	0.70	0.38	0.81	2.98	0.11	1.51
BRK/ADM	LODGING	1,854	22.12	3.35	5.82	1.15	0.75	0.68	5.17	0.75	4.45
COMCATN	MISC.	219,783	46.66	2.00	12.04	6.92	0.63	0.15	12.20	1.15	11.57
DET-RR	WAREHOUSE	1,585	12.42	0.97	1.52	1.02	0.42	0.05	2.88	4.53	1.05
FUELDSP	MISC.	2,399	46.66	2.00	12.04	6.92	0.63	0.15	12.20	1.15	11.57
HANGAR	WAREHOUSE	40,519	12.42	0.97	1.52	1.02	0.42	0.05	2.88	4.53	1.05
LAB-MED	HEALTH	12,064	25.15	1.20	8.79	1.97	0.50	1.06	6.28	0.95	4.40
MTRPOOL	WAREHOUSE	68,337	12.42	0.97	1.52	1.02	0.42	0.05	2.88	4.53	1.05
MWR	MISC.	13,585	46.66	2.00	12.04	6.92	0.63	0.15	12.20	1.15	11.57
NASLEAS	MISC.	732,416	46.66	2.00	12.04	6.92	0.63	0.15	12.20	1.15	11.57
NASOWN	MISC.	745,470	46.66	2.00	12.04	6.92	0.63	0.15	12.20	1.15	11.57
OTHER	MISC.	9,580	46.66	2.00	12.04	6.92	0.63	0.15	12.20	1.15	11.57
PLT-BLD	WAREHOUSE	34,950	12.42	0.97	1.52	1.02	0.42	0.05	2.88	4.53	1.05
PLT-EQU	MISC.	68,571	46.66	2.00	12.04	6.92	0.63	0.15	12.20	1.15	11.57
R&D	MISC.	1,236,903	46.66	2.00	12.04	6.92	0.63	0.15	12.20	1.15	11.57
RESTRNT	RESTAURANT	16,443	42.45	0.83	13.97	3.98	3.55	0.75	5.83	9.63	3.91
SECURTY	MISC.	37,542	46.66	2.00	12.04	6.92	0.63	0.15	12.20	1.15	11.57
SHOP	WAREHOUSE	219,099	12.42	0.97	1.52	1.02	0.42	0.05	2.88	4.53	1.05
SHOP-ELC	WAREHOUSE	77,132	12.42	0.97	1.52	1.02	0.42	0.05	2.88	4.53	1.05
SHOP-WPN	WAREHOUSE	5,150	12.42	0.97	1.52	1.02	0.42	0.05	2.88	4.53	1.05
STOR-UH	WAREHOUSE	155,553	12.42	0.97	1.52	1.02	0.42	0.05	2.88	4.53	1.05
TRAING	SCHOOL	5,548	8.38	0.26	2.99	0.69	0.39	0.26	2.63	0.45	0.71
WHS	WAREHOUSE	389,801	12.42	0.97	1.52	1.02	0.42	0.05	2.88	4.53	1.05
Total		4,411,172									

All values are kWh/sq ft-yr unless otherwise noted

4.0 ELECTRICAL CONSUMPTION

4.1 METERING AND DATA SUMMARY

There were two sources of electrical consumption data at Cape Canaveral AFS: utility company whole-substation meter readings and the information contained in Defense Energy Information System (DEIS) reports. The DEIS reports are based on total billing records and include reimbursable account information.

For each substation, a kilowatt-hour meter and a demand register are installed. Fifteen-minute demand readings are recorded from which the highest demand reading for the on-peak period can be determined. Tables 4.1 through 4.21 provide a summary of FPL metered data for the North, South, and Titan Substations from 1985 (base year for energy reduction requirements) through 1991. These tables provide information on kilowatt-hours for on-peak and off-peak hours, total kilowatt-hours, maximum kilowatt demand for the respective month, and the load factor.

Electrical consumption data obtained from DEIS records for each month for the period of January 1985 through December 1991 are provided in Figure 4.1. This summary data includes consumption by reimbursable usage by NASA, the U.S. Coast Guard, and other non-SPACECOM users. The primary purpose of Table 4.1 is to identify trends in consumption at the station. For the period of 1985 through 1988, the consumption pattern is similarly shaped. After that period, however, there is a steady trend in increasing consumption.

Figure 4.2 shows the station's total energy consumption by month for 1991. However, consumption data is categorized by major end users. The major reimbursable accounts are NASA, the U.S. Navy, and the 6555th Airspace Test Group. The amount of monthly consumption is determined by direct metering or previously agreed to rates based on a percentage of the total bill.

4.2 ENERGY-USE BREAKDOWN

The electrical consumption for Cape Canaveral AFS is shown in Table 4.22. Each building type and utility service is listed individually, as well as being grouped by site area or service. The consumption is apportioned within each building type to each of its primary end uses. Also included for each end use is the number and square footage of the buildings within each type that use electricity for that end use. The electrical end uses that are not tied to a specific building type (e.g., street lights) are shown with totals only. A value for the transmission and distribution loss throughout the electrical-distribution system is also shown.

4.3 LOAD PROFILE

Florida Power & Light provided representative load profile information for the North, South, and Titan Substations for the four seasons of the year. For each season, data was provided for two different day types: weekday (generally Wednesday) and weekend data (Saturday). Fifteen-minute data was used to develop the profiles so that kilowatt-demand information was available for each hour of the day. By analyzing this data, a better idea could be gained regarding the peak saving or conservation potential at the station.

The data for all three substations were plotted on the same graph and are represented in Figures 4.3 through 4.10. Some seasonal differences are obvious, such as the demand being less in the winter compared to the other seasons. However, for all seasons the profiles for the Titan and South Substations are relatively flat, whereas the North Substation has more "peakness" in its profile, especially during workdays. This peakness is expected because the industrial area at Cape Canaveral AFS is served by the North Substation. Each substation has a high baseline demand over all hours of the day, indicating a considerable amount of end-use equipment that operates continuously. The site appears to be a candidate for both conservation and demand-side management activities.

TABLE 4.1. Florida Power & Light Electric Meter Readings
North Substation - 1985

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	1,127,131	3,652,623	4,779,754	--	--
FEB	1,039,707	3,345,093	4,384,800	9,374	62.9%
MAR	1,142,470	3,351,530	4,494,000	9,495	68.0%
APR	1,515,931	3,658,469	5,174,400	9,909	72.5%
MAY	1,599,905	3,448,495	5,048,400	11,713	61.9%
JUN	1,777,101	4,010,499	5,787,600	11,330	70.9%
JUL	1,653,599	3,831,601	5,485,200	11,174	68.2%
AUG	1,818,165	4,297,035	6,115,200	11,385	69.9%
SEP	1,730,295	4,057,305	5,787,600	11,516	69.8%
OCT	1,880,976	4,116,624	5,997,600	11,663	71.4%
NOV	1,345,871	3,710,929	5,056,800	11,148	61.0%
DEC	1,296,240	4,146,960	5,443,200	11,164	65.5%
TOTALS	17,927,391	45,627,163	63,554,554		

TABLE 4.2. Florida Power & Light Electric Meter Readings
South Substation - 1985

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	517,623	1,758,126	2,275,749	--	--
FEB	581,241	1,871,559	2,452,800	6,223	53.0%
MAR	560,223	1,690,977	2,251,200	5,299	61.0%
APR	511,787	1,173,813	1,685,600	5,944	39.4%
MAY	777,815	1,910,185	2,688,000	6,757	57.2%
JUN	777,815	3,170,185	3,948,000	8,985	61.0%
JUL	928,191	2,387,009	3,315,200	8,282	55.6%
AUG	1,064,969	2,933,431	3,998,400	8,256	63.1%
SEP	989,456	2,465,744	3,455,200	8,299	57.8%
OCT	1,032,454	2,501,146	3,533,600	7,654	64.1%
NOV	878,306	2,918,494	3,796,800	7,668	66.6%
DEC	698,195	2,303,405	3,001,600	5,920	68.1%
TOTALS	9,318,075	27,084,074	36,402,149		

TABLE 4.3. Florida Power & Light Electric Meter Readings
Titan Substation - 1985

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	290,504	1,008,426	1,298,930	--	--
FEB	309,985	1,028,415	1,338,400	2,396	75.1%
MAR	342,246	1,040,954	1,383,200	2,644	75.2%
APR	420,270	1,046,930	1,467,200	2,762	73.8%
MAY	457,152	1,099,648	1,556,800	3,034	73.7%
JUN	301,102	751,698	1,052,800	2,785	52.5%
JUL	473,819	1,217,381	1,691,200	3,387	69.4%
AUG	692,845	1,855,155	2,548,000	4,324	76.7%
SEP	670,058	1,743,542	2,413,600	4,106	81.6%
OCT	667,234	1,628,766	2,296,000	3,955	80.6%
NOV	537,064	1,658,136	2,195,200	3,756	78.6%
DEC	328,485	1,065,915	1,394,400	3,427	54.7%
TOTALS	5,490,764	15,144,966	20,635,730		

TABLE 4.4. Florida Power & Light Electric Meter Readings
North Substation - 1986

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	1,174,635	3,806,565	4,981,200	9,208	69.3%
FEB	1,159,225	3,410,375	4,569,600	9,395	69.4%
MAR	1,150,342	3,402,458	4,552,800	10,226	60.2%
APR	1,475,163	3,371,637	4,846,800	10,584	63.6%
MAY	1,614,660	4,063,740	5,678,400	11,562	63.9%
JUN	1,697,144	3,830,056	5,527,200	11,910	66.7%
JUL	1,708,461	3,919,330	5,627,791	11,708	66.8%
AUG	1,809,930	4,389,270	6,199,200	11,557	69.8%
SEP	1,884,290	4,466,110	6,350,400	12,524	70.4%
OCT	1,950,299	4,358,101	6,308,400	12,645	71.7%
NOV	1,553,192	4,570,408	6,123,600	12,172	65.5%
DEC	1,371,666	4,474,734	5,846,400	11,113	68.6%
TOTALS	18,549,007	48,062,784	66,611,791		

TABLE 4.5. Florida Power & Light Electric Meter Readings
South Substation - 1986

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	671,256	2,279,944	2,951,200	6,072	63.3%
FEB	769,182	2,411,618	3,180,800	6,458	70.8%
MAR	757,841	2,333,359	3,091,200	7,768	57.2%
APR	1,016,010	2,579,190	3,595,200	8,306	60.1%
MAY	1,006,056	2,734,744	3,740,800	7,513	64.8%
JUN	989,495	2,342,505	3,332,000	6,948	68.9%
JUL	1,111,992	2,724,008	3,836,000	7,661	69.5%
AUG	1,210,675	3,174,125	4,384,800	7,970	71.6%
SEP	1,179,106	2,942,494	4,121,600	9,838	58.2%
OCT	1,061,893	2,650,907	3,712,800	7,775	68.6%
NOV	1,007,726	3,046,674	4,054,400	9,001	58.7%
DEC	920,249	2,904,551	3,824,800	8,195	62.7%
TOTALS	11,701,481	32,124,119	43,825,600		

TABLE 4.6. Florida Power & Light Electric Meter Readings
Titan Substation - 1986

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	453,380	1,573,820	2,027,200	3,454	76.4%
FEB	511,555	1,577,245	2,088,800	3,652	82.2%
MAR	470,440	1,433,560	1,904,000	3,629	75.4%
APR	557,540	1,447,260	2,004,800	3,515	79.2%
MAY	563,714	1,597,886	2,161,600	3,545	79.4%
JUN	578,179	1,443,421	2,021,600	3,545	81.9%
JUL	552,351	1,430,049	1,982,400	3,706	74.3%
AUG	498,473	1,321,527	1,820,000	2,967	79.9%
SEP	478,451	1,218,349	1,696,800	3,091	66.2%
OCT	362,737	1,003,663	1,366,400	3,068	64.0%
NOV	444,185	1,370,215	1,814,400	3,074	76.9%
DEC	408,564	1,310,636	1,719,200	3,239	71.3%
TOTALS	5,879,569	16,727,631	22,607,200		

TABLE 4.7. Florida Power & Light Electric Meter Readings
North Substation - 1987

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	1,233,167	4,075,633	5,308,800	9,420	69.9%
FEB	910,723	3,003,677	3,914,400	9,067	58.9%
MAR	1,160,246	3,476,554	4,636,800	9,717	67.3%
APR	1,174,270	2,857,730	4,032,000	8,376	68.7%
MAY	1,292,722	3,386,078	4,678,800	8,538	53.9%
JUN	1,285,654	2,939,546	4,225,200	8,437	72.0%
JUL	1,264,531	3,313,469	4,578,000	9,042	65.9%
AUG	1,315,854	2,976,546	4,292,400	8,286	71.9%
SEP	1,429,598	3,435,320	4,864,918	10,413	64.9%
OCT	1,554,999	3,955,401	5,510,400	10,362	71.5%
NOV	1,355,299	3,802,301	5,157,600	10,438	66.1%
DEC	1,346,098	4,260,702	5,606,800	9,999	75.0%
TOTALS	15,323,161	41,482,957	56,806,118		

TABLE 4.8. Florida Power & Light Electric Meter Readings
South Substation - 1987

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	857,623	2,922,377	3,780,000	7,106	69.3%
FEB	1,167,676	3,155,524	4,323,200	8,168	76.0%
MAR	997,072	2,878,128	3,875,200	9,747	57.1%
APR	1,082,920	2,758,680	3,841,600	8,309	66.4%
MAY	1,531,535	4,107,665	5,639,200	10,644	66.9%
JUN	1,590,034	3,819,566	5,409,600	11,290	68.8%
JUL	1,553,247	4,192,353	5,745,600	10,490	71.3%
AUG	1,735,268	4,155,932	5,891,200	11,442	71.5%
SEP	1,474,581	3,867,819	5,342,400	10,611	69.9%
OCT	1,096,480	2,969,120	4,065,600	8,610	63.5%
NOV	955,184	2,813,616	3,768,800	8,696	62.3%
DEC	695,089	2,071,311	2,766,400	7,669	50.1%
TOTALS	14,736,709	39,712,091	54,448,800		

TABLE 4.9. Florida Power & Light Electric Meter Readings
Titan Substation - 1987

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	391,079	1,356,121	1,747,200	3,071	74.1%
FEB	413,036	1,266,964	1,680,000	3,068	78.7%
MAR	404,431	1,253,169	1,657,600	3,195	74.5%
APR	510,539	1,287,061	1,797,600	3,666	70.5%
MAY	611,377	1,505,423	2,116,800	3,888	68.7%
JUN	595,914	1,442,486	2,038,400	3,798	77.1%
JUL	600,267	1,650,933	2,251,200	4,066	72.1%
AUG	699,307	1,663,893	2,363,200	4,477	73.3%
SEP	711,175	1,848,025	2,559,200	4,422	80.4%
OCT	681,666	1,883,134	2,564,800	4,331	79.6%
NOV	603,141	1,760,059	2,363,200	4,250	79.9%
DEC	452,787	1,400,813	1,853,600	3,970	64.8%
TOTALS	6,674,719	18,318,081	24,992,800		

TABLE 4.10. Florida Power & Light Electric Meter Readings
North Substation - 1988

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	1,253,161	4,400,039	5,653,200	11,390	62.7%
FEB	1,344,929	3,955,471	5,300,400	10,413	70.7%
MAR	1,133,940	3,385,260	4,519,200	9,808	66.2%
APR	1,376,054	3,764,746	5,140,800	9,117	73.4%
MAY	1,406,001	3,121,599	4,527,600	10,181	63.9%
JUN	1,552,716	3,646,884	5,199,600	10,367	69.7%
JUL	1,644,166	4,277,834	5,922,000	11,098	69.5%
AUG	1,766,092	4,038,308	5,804,400	13,270	62.8%
SEP	1,892,575	4,827,425	6,720,000	11,516	73.7%
OCT	1,734,647	3,893,353	5,628,000	11,269	69.4%
NOV	1,373,032	4,103,768	5,476,800	11,128	68.4%
DEC	1,232,965	4,125,192	5,358,157	10,292	67.8%
TOTALS	17,710,278	47,539,879	65,250,157		

TABLE 4.11. Florida Power & Light Electric Meter Readings
South Substation - 1988

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	845,048	2,890,152	3,735,200	7,458	63.2%
FEB	833,980	2,498,020	3,332,000	6,707	69.0%
MAR	778,343	2,318,457	3,096,800	6,881	64.7%
APR	1,167,367	3,060,633	4,228,000	8,585	64.1%
MAY	1,252,427	3,070,773	4,323,200	8,556	72.6%
JUN	1,176,610	2,939,390	4,116,000	8,410	68.0%
JUL	1,091,064	3,047,336	4,138,400	8,240	65.4%
AUG	1,134,618	2,701,382	3,836,000	9,082	60.7%
SEP	1,197,232	3,226,768	4,424,000	8,707	64.2%
OCT	1,094,647	2,534,153	3,628,800	6,861	73.5%
NOV	881,751	2,657,449	3,539,200	6,752	72.8%
DEC	911,565	3,031,684	3,943,249	6,799	75.5%
TOTALS	12,364,652	33,976,197	46,340,849		

TABLE 4.12. Florida Power & Light Electric Meter Readings
Titan Substation - 1988

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	308,113	1,394,287	1,702,400	4,197	51.2%
FEB	573,773	1,733,427	2,307,200	5,361	59.8%
MAR	816,256	2,414,944	3,231,200	6,271	74.0%
APR	1,086,630	2,995,770	4,082,400	6,938	76.6%
MAY	897,060	2,334,140	3,231,200	7,115	65.2%
JUN	996,206	2,856,594	3,852,800	6,769	79.1%
JUL	1,178,337	3,374,463	4,552,800	6,955	85.2%
AUG	1,146,717	2,997,283	4,144,000	6,954	85.6%
SEP	1,104,130	3,140,670	4,244,800	6,834	78.4%
OCT	935,784	2,289,816	3,225,600	5,366	83.5%
NOV	804,383	2,510,817	3,315,200	5,771	79.8%
DEC	811,147	2,872,402	3,683,549	5,939	80.8%
TOTALS	10,658,536	30,914,613	41,573,149		

TABLE 4.13. Florida Power & Light Electric Meter Readings
North Substation - 1989

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	1,173,897	3,630,903	4,804,800	11,043	58.5%
FEB	1,332,609	3,925,791	5,258,400	10,307	70.9%
MAR	1,303,609	4,223,591	5,527,200	10,196	75.3%
APR	1,451,112	3,555,288	5,006,400	11,219	64.1%
MAY	1,844,809	4,261,991	6,106,800	11,874	73.9%
JUN	2,182,443	5,755,557	7,938,000	13,497	76.6%
JUL	2,646,131	6,434,269	9,080,400	17,005	74.2%
AUG	2,776,987	6,437,813	9,214,800	16,561	77.3%
SEP	2,608,777	6,807,623	9,416,400	16,692	73.5%
OCT	2,615,218	6,011,582	8,626,800	15,947	75.1%
NOV	1,912,415	6,117,985	8,030,400	14,636	71.4%
DEC	1,772,036	5,467,138	7,239,174	14,465	69.5%
TOTALS	23,620,043	62,629,531	86,249,574		

TABLE 4.14. Florida Power & Light Electric Meter Readings
South Substation - 1989

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	1,093,284	3,453,916	4,547,200	9,492	66.5%
FEB	1,202,743	3,478,857	4,681,600	9,374	69.4%
MAR	1,079,676	3,607,524	4,687,200	9,732	64.7%
APR	1,313,445	3,233,755	4,547,200	7,757	84.2%
MAY	1,261,281	3,196,319	4,457,600	9,348	68.5%
JUN	1,281,552	3,573,648	4,855,200	9,322	67.8%
JUL	1,234,372	3,211,228	4,445,600	9,421	65.5%
AUG	1,247,975	3,064,025	4,312,000	9,882	60.6%
SEP	1,180,218	3,394,982	4,575,200	9,383	63.5%
OCT	1,098,902	2,759,498	3,858,400	9,796	54.7%
NOV	1,035,050	3,439,350	4,474,400	8,415	69.2%
DEC	902,556	2,972,644	3,875,200	7,822	68.8%
TOTALS	13,931,054	39,385,746	53,316,800		

TABLE 4.15. Florida Power & Light Electric Meter Readings
Titan Substation - 1989

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	714,911	2,359,489	3,074,400	5,515	77.4%
FEB	925,127	2,770,873	3,696,000	5,964	86.1%
MAR	828,209	2,834,191	3,662,400	6,539	75.3%
APR	949,372	2,517,028	3,466,400	5,957	83.6%
MAY	901,724	2,346,276	3,248,000	5,919	78.8%
JUN	735,571	2,109,229	2,844,800	5,440	68.1%
JUL	490,699	1,329,301	1,820,000	3,932	64.3%
AUG	573,526	1,442,474	2,016,000	4,081	68.6%
SEP	448,745	1,315,255	1,764,000	3,256	70.5%
OCT	406,019	1,044,381	1,450,400	2,671	75.4%
NOV	397,277	1,349,923	1,747,200	3,053	74.5%
DEC	447,863	1,467,074	1,914,937	3,318	80.2%
TOTALS	7,819,043	22,885,494	30,704,537		

TABLE 4.16. Florida Power & Light Electric Meter Readings
North Substation - 1990

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	1,732,288	5,382,512	7,114,800	13,800	62.4%
FEB	1,469,460	4,780,140	6,249,600	13,457	62.4%
MAR	1,416,862	4,253,138	5,670,000	11,678	69.8%
APR	1,771,416	4,259,784	6,031,200	12,071	71.8%
MAY	2,123,922	4,764,078	6,888,000	13,759	69.5%
JUN	2,247,870	5,866,530	8,114,400	14,747	71.6%
JUL	2,254,332	5,515,668	7,770,000	13,981	77.2%
AUG	2,442,293	6,050,107	8,492,400	14,823	74.6%
SEP	2,242,757	5,577,643	7,820,400	14,858	75.6%
OCT	2,410,277	5,519,323	7,929,600	14,445	76.2%
NOV	1,739,755	5,394,680	7,134,435	13,028	69.1%
DEC	1,543,975	4,755,696	6,299,671	13,124	66.7%
TOTALS	23,395,207	62,119,299	85,514,506		

TABLE 4.17. Florida Power & Light Electric Meter Readings
South Substation - 1990

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	884,267	2,649,333	3,533,600	7,194	68.2%
FEB	1,183,437	3,862,163	5,045,600	9,781	69.3%
MAR	987,220	2,949,580	3,936,800	9,156	61.8%
APR	1,056,396	2,785,204	3,841,600	7,368	74.9%
MAY	1,295,944	3,133,656	4,429,600	9,505	64.7%
JUN	1,183,285	3,660,715	4,844,000	10,004	63.0%
JUL	1,318,956	3,631,444	4,950,400	9,497	72.4%
AUG	1,201,330	3,284,270	4,485,600	8,285	70.5%
SEP	1,164,422	3,147,578	4,312,000	8,706	71.2%
OCT	1,154,893	2,776,307	3,931,200	6,999	78.0%
NOV	1,230,135	4,006,286	5,236,421	8,612	76.8%
DEC	896,771	2,810,429	3,707,200	8,420	61.2%
TOTALS	13,557,056	38,696,965	52,254,021		

TABLE 4.18. Florida Power & Light Electric Meter Readings
Titan Substation - 1990

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	342,596	1,096,604	1,439,200	3,002	66.6%
FEB	649,965	2,105,235	2,755,200	3,307	69.8%
MAR	766,159	2,280,241	3,046,400	5,653	77.4%
APR	980,604	2,569,796	3,550,400	6,527	78.2%
MAY	1,098,402	2,715,198	3,813,600	6,594	80.3%
JUN	1,103,661	3,146,739	4,250,400	7,085	78.1%
JUL	916,586	2,353,814	3,270,400	6,206	73.2%
AUG	1,135,446	3,030,954	4,166,400	6,276	86.4%
SEP	1,061,012	2,858,988	3,920,000	6,399	88.0%
OCT	1,139,211	2,803,189	3,942,400	6,307	86.8%
NOV	801,898	2,586,102	3,388,000	5,751	74.4%
DEC	604,089	1,904,711	2,508,800	4,806	72.5%
TOTALS	10,599,629	29,451,571	40,051,200		

TABLE 4.19. Florida Power & Light Electric Meter Readings
North Substation - 1991

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	1,144,397	4,063,603	5,208,000	12,560	54.0%
FEB	1,827,098	5,464,102	7,291,200	12,257	85.5%
MAR	1,787,228	5,007,908	6,795,136	13,185	74.0%
APR	2,014,581	4,814,619	6,829,200	13,366	73.4%
MAY	2,203,037	5,037,763	7,240,800	14,036	74.1%
JUN	2,325,632	6,410,368	8,736,000	15,422	73.8%
JUL	2,402,878	5,854,322	8,257,200	15,397	74.5%
AUG	2,562,761	6,457,752	9,020,513	16,622	70.7%
SEP	2,428,957	5,912,243	8,341,200	16,365	70.8%
OCT	2,302,634	5,265,627	7,568,261	14,545	72.3%
NOV	1,809,181	5,372,819	7,182,000	14,152	66.1%
DEC	1,635,067	5,278,133	6,913,200	13,706	65.7%
TOTALS	24,443,451	64,939,259	89,382,710		

TABLE 4.20. Florida Power & Light Electric Meter Readings
South Substation - 1991

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	1,377,885	4,457,315	5,835,200	8,492	89.5%
FEB	968,724	2,912,076	3,880,800	9,153	60.9%
MAR	960,092	3,290,308	4,250,400	9,326	65.5%
APR	1,203,171	3,052,829	4,256,000	9,216	66.4%
MAY	1,183,502	2,870,898	4,054,400	7,894	73.8%
JUN	1,304,358	3,741,242	5,045,600	8,731	75.2%
JUL	1,393,592	3,719,208	5,112,800	9,537	74.5%
AUG	1,500,854	4,183,146	5,684,000	9,820	75.4%
SEP	1,292,652	3,372,148	4,664,800	8,872	73.0%
OCT	1,294,292	3,133,696	4,427,988	10,369	59.3%
NOV	1,335,986	4,079,214	5,415,200	9,885	71.3%
DEC	969,358	3,180,242	4,149,600	8,227	65.7%
TOTALS	14,784,466	41,992,322	56,776,788		

TABLE 4.21. Florida Power & Light Electric Meter Readings
Titan Substation - 1991

Month	kWh On-Peak	kWh Off-Peak	Total kWh	Maximum kW Demand	Load Factor
JAN	656,509	2,115,491	2,772,000	5,611	64.3%
FEB	578,385	2,830,788	3,409,173	6,184	79.2%
MAR	899,045	2,757,755	3,656,800	6,234	84.3%
APR	962,039	2,476,361	3,438,400	6,137	80.5%
MAY	1,086,120	2,710,680	3,796,800	6,838	79.8%
JUN	1,053,928	2,611,968	3,665,896	6,774	70.5%
JUL	1,107,544	2,863,003	3,970,547	6,807	81.0%
AUG	1,131,438	3,022,315	4,153,753	6,653	81.3%
SEP	1,260,285	3,302,386	4,562,671	7,444	85.1%
OCT	1,249,666	3,011,934	4,261,600	7,523	78.7%
NOV	1,057,418	3,254,582	4,312,000	7,195	78.0%
DEC	937,209	2,977,191	3,914,400	7,600	67.1%
TOTALS	11,979,586	33,934,454	45,914,040		

TABLE 4.22. Cape Canaveral AFS Electric Energy-Use Breakdown

Site Bldg-Type	Total Buildings	Site Total (sq ft)	Overall EUI	Total (MWh/yr)	Electric Heat	Electric Cool	Electric Ventilation	Electric DHW	Electric Cook	Electric Light	Electric Refrigeration	Electric Other
ADMIN	32	316,888	10.66	3,378	209,146	1,112,277	221,822	120,417	256,679	944,326	34,858	478,501
BRK/ADM	1	1,854	22.12	41	6,211	10,790	2,132	1,391	1,261	9,585	1,391	8,250
COMCATN	34	219,783	46.66	10,255	439,566	2,646,187	1,520,898	138,463	32,967	2,681,353	252,750	2,542,889
DET-RR	3	1,585	12.42	20	1,530	2,401	1,609	658	79	4,557	7,180	1,664
FUELDSP	2	2,399	46.66	112	4,798	28,884	16,601	1,511	360	29,268	2,759	27,756
HANGAR	1	40,519	12.42	503	39,101	61,386	41,127	16,815	2,026	116,492	183,551	42,545
LAB-MED	1	12,064	25.15	303	14,477	106,043	23,766	6,032	12,788	75,762	11,461	53,082
MTRPOOL	7	68,337	12.42	848	65,945	103,531	69,362	28,360	3,417	196,469	309,567	71,754
MWR	3	13,585	46.66	634	27,170	163,563	94,008	8,559	2,038	165,737	15,623	157,178
NASLEAS(a)	87	732,416	46.66	34,175	1,464,832	8,818,289	5,068,319	461,422	109,862	8,935,475	842,278	8,474,053
NASOWN(b)	230	745,470	46.66	34,784	1,490,940	8,975,459	5,158,652	469,646	111,821	9,094,734	857,290	8,625,088
OTHER	4	9,580	46.66	447	19,160	115,343	66,294	6,035	1,437	116,876	11,017	110,841
PLT-BLD	24	34,950	12.42	434	33,727	52,949	35,474	14,504	1,748	100,481	158,324	36,698
PLT-EQU	31	68,571	46.66	3,200	137,142	825,595	474,511	43,200	10,286	836,566	78,857	793,366
R&D	66	1,236,903	46.66	57,714	2,473,806	14,892,312	8,559,369	779,249	185,535	15,090,217	1,422,438	14,310,968
RESTRNT	1	16,443	42.45	698	13,648	229,709	65,443	58,373	12,332	95,863	158,346	64,292
SECURTY	29	37,542	46.66	1,752	75,084	452,006	259,791	23,651	5,631	458,012	43,173	434,361
SHOP	27	219,099	12.42	2,720	211,431	331,935	222,385	90,926	10,955	629,910	992,518	230,054
SHOP-ELC	7	77,132	12.42	958	74,432	116,855	78,289	32,010	3,857	221,755	349,408	80,989
SHOP-WPN	1	5,150	12.42	64	4,970	7,802	5,227	2,137	258	14,806	23,330	5,408
STOR-UH	100	155,553	12.42	1,931	150,109	235,663	157,886	64,554	7,778	447,215	704,655	163,331
TRAING	2	5,548	8.38	46	1,442	16,589	3,828	2,164	1,442	14,591	2,497	3,939
WHS	73	389,801	12.42	4,839	376,158	590,549	395,648	161,767	19,490	1,120,678	1,765,799	409,291
Pumps (Est.)				1,658								
Ext. Light. (Est.)				1,750								
Line Loss (Est.)				28,811								
Totals:	766	4,411,172		192,074	MWh/yr total electricity consumption.							

(a) NASA leased buildings

(b) NASA owned buildings

All units are kWh/yr unless otherwise noted.

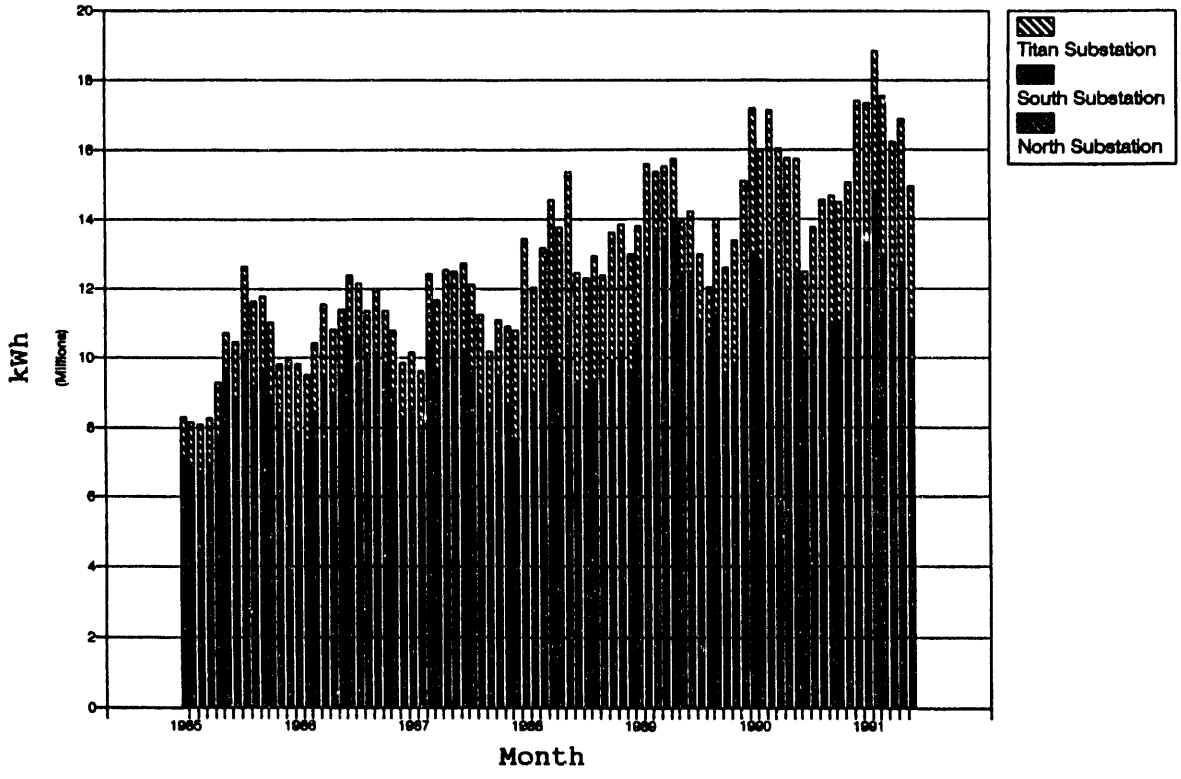

FIGURE 4.1. Cape Canaveral AFS Electrical Consumption, January 1985 to December 1991

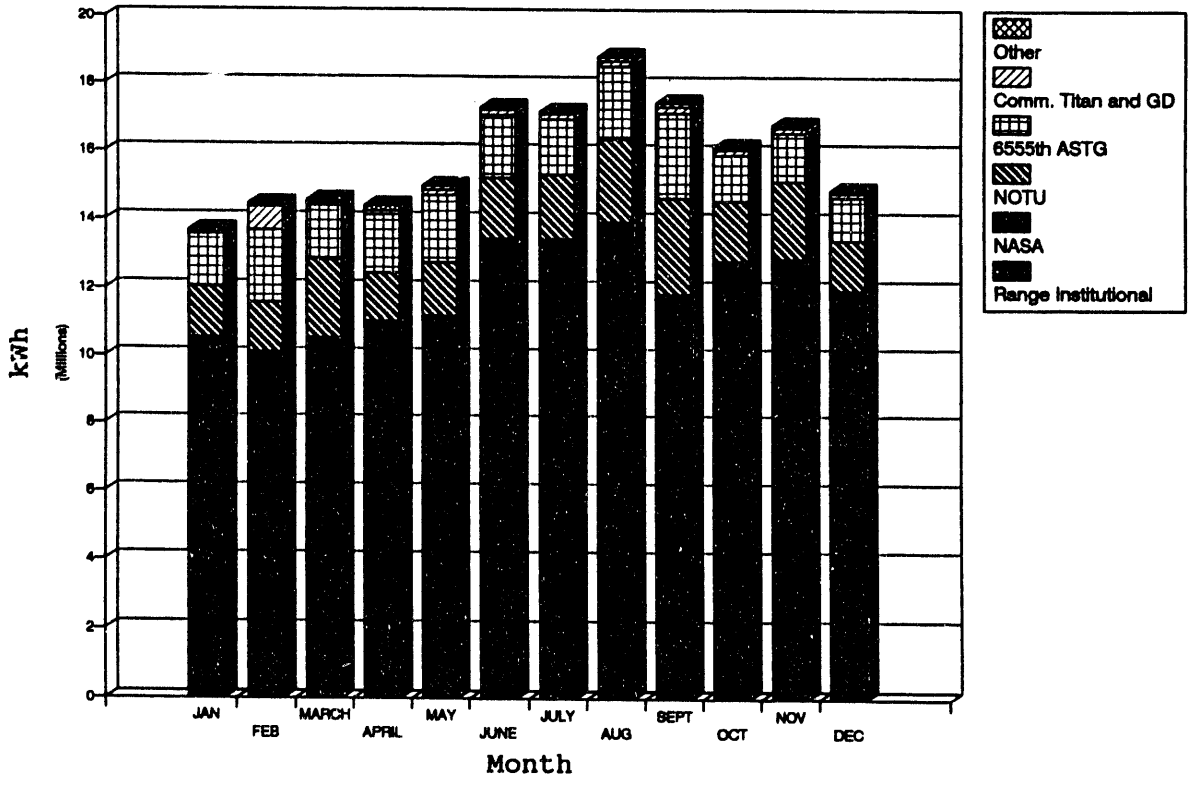

FIGURE 4.2. Cape Canaveral AFS End User Electrical Consumption, 1991

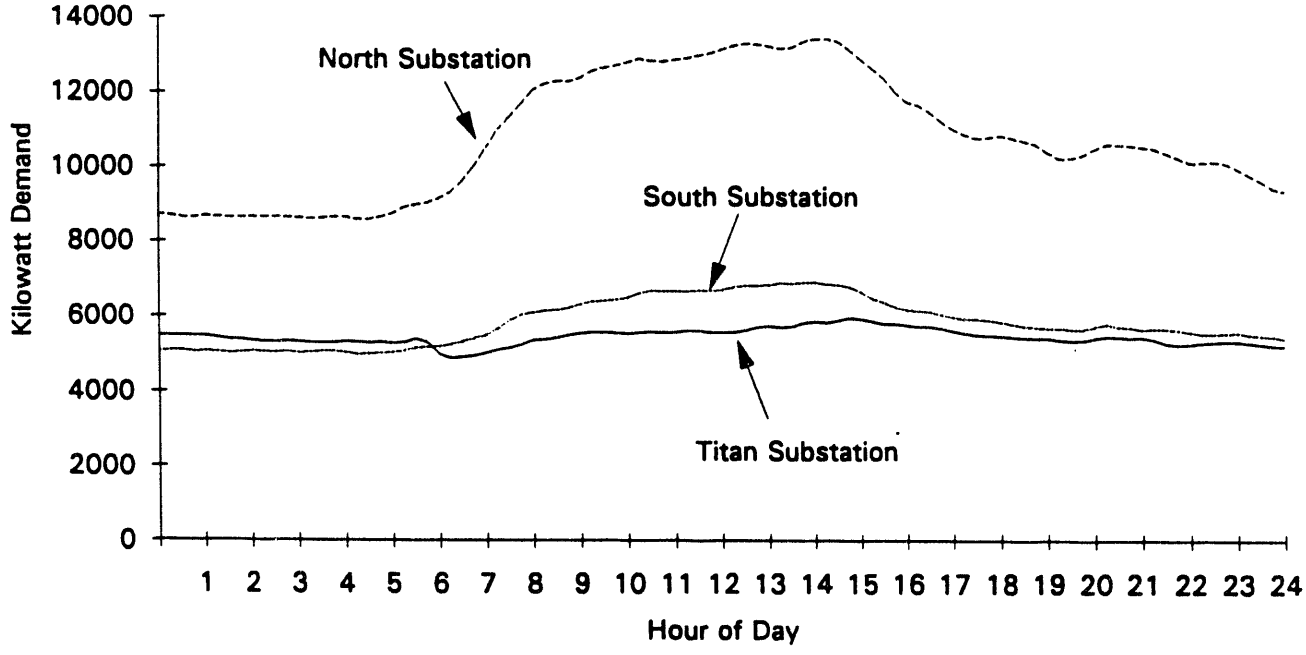

FIGURE 4.3. Load Profile at Cape Canaveral AFS - Spring Weekday (1991)

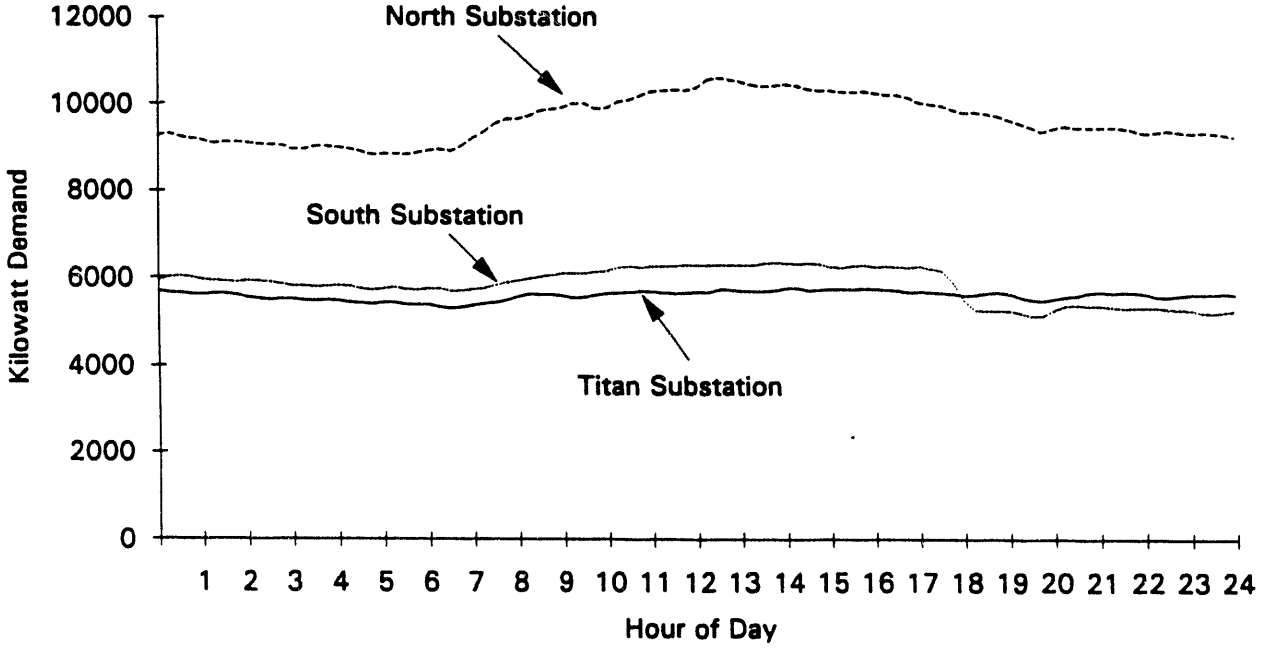

FIGURE 4.4. Load Profile at Cape Canaveral AFS - Spring Weekend (1991)

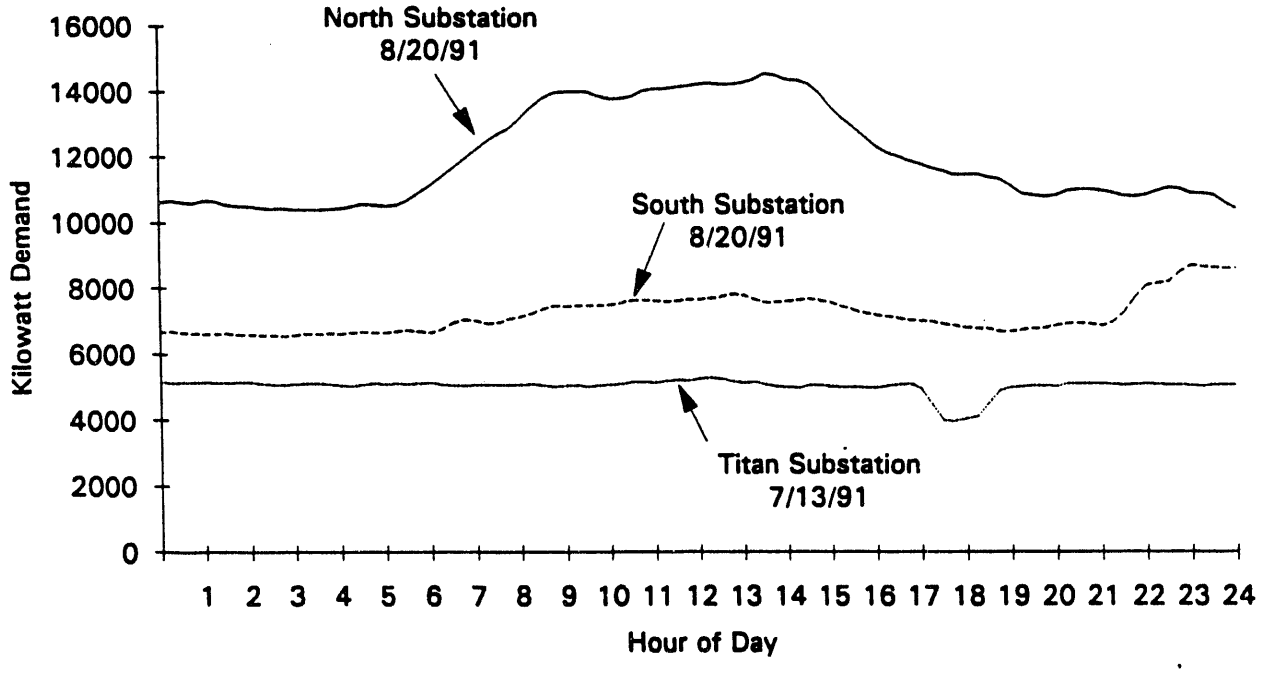

FIGURE 4.5. Load Profile at Cape Canaveral AFS - Summer Weekday (1991)

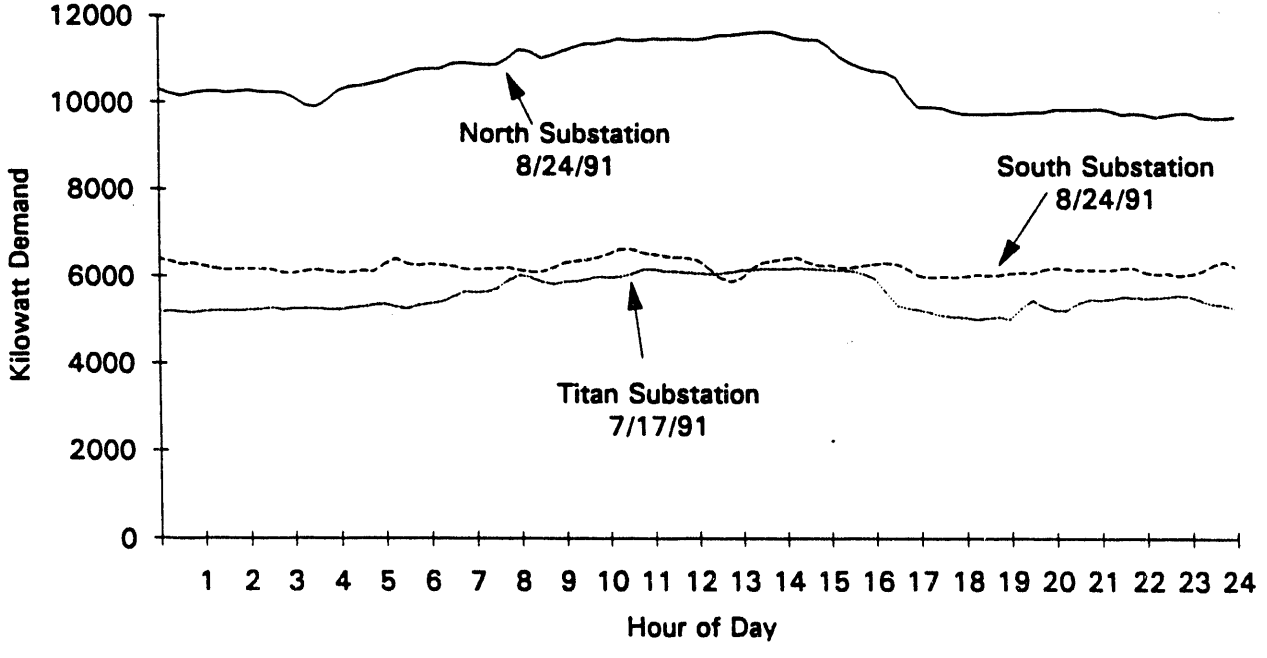

FIGURE 4.6. Load Profile at Cape Canaveral AFS - Summer Weekend (1991)

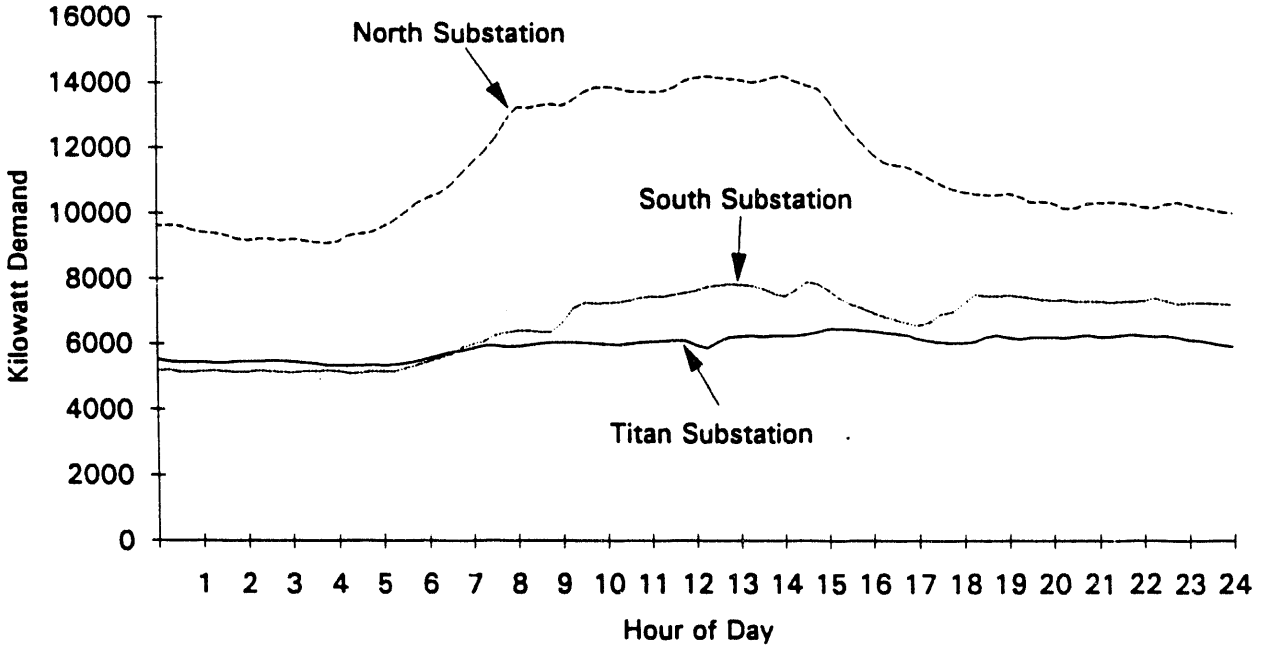

FIGURE 4.7. Load Profile at Cape Canaveral AFS - Fall Weekday (1991)

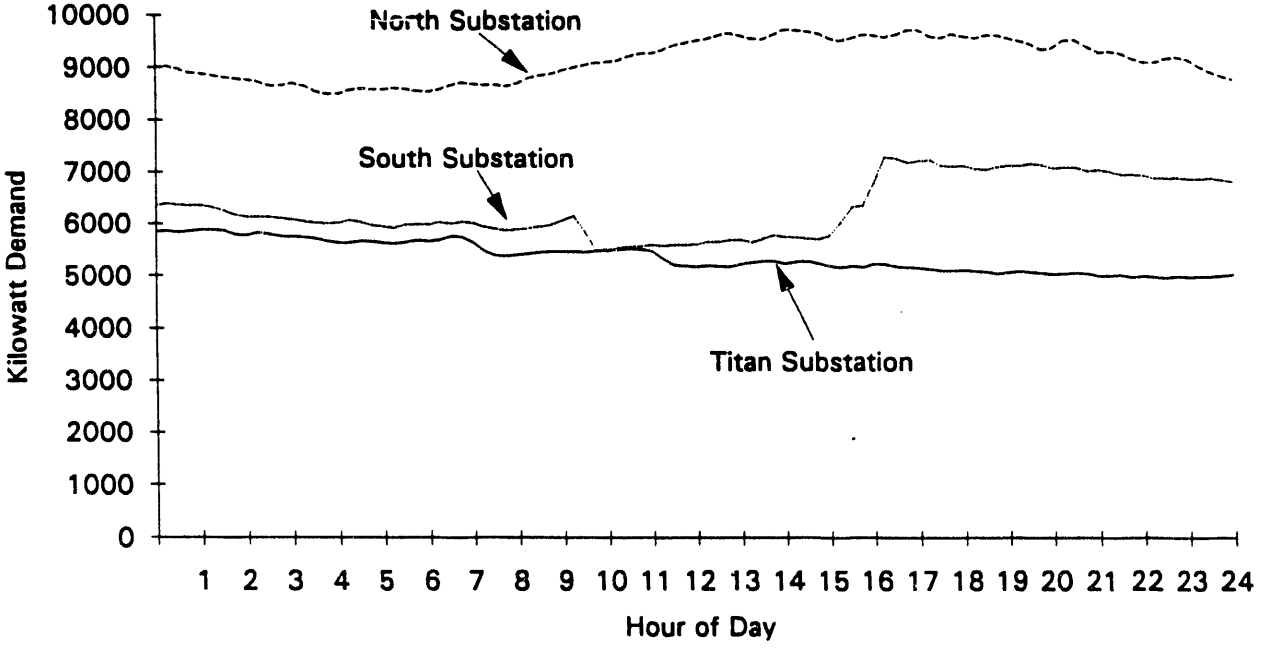

FIGURE 4.8. Load Profile at Cape Canaveral AFS - Fall Weekend (1991)

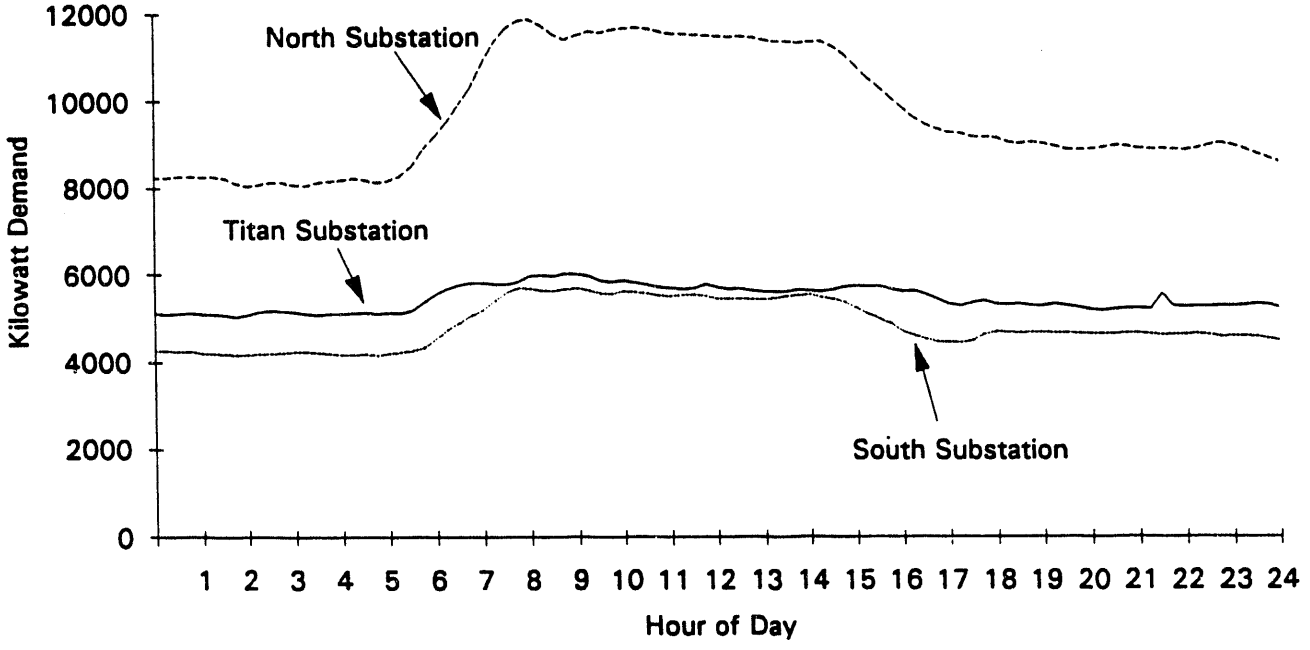

FIGURE 4.9. Load Profile at Cape Canaveral AFS - Winter Weekday (1991)

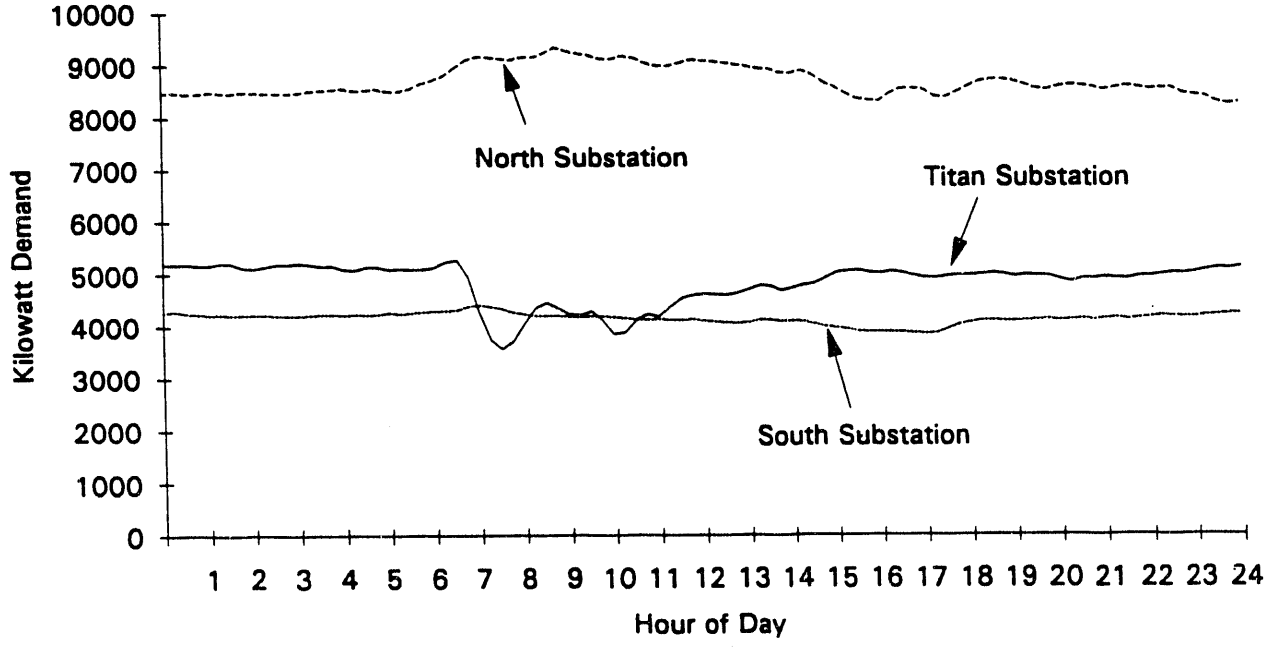

FIGURE 4.10. Load Profile at Cape Canaveral AFS - Winter Weekend (1991)

5.0 NATURAL-GAS CONSUMPTION

5.1 METERING AND DATA SUMMARY

Currently, natural gas is not available to any portion of Cape Canaveral AFS. Negotiations are underway between City Gas of Florida, NASA, and the USAF to bring a gas line through KSC to the industrial area of Cape Canaveral AFS and then down to Port Canaveral. If a gas line is installed, natural gas will be available to various portions of the site.

6.0 DIESEL FUEL CONSUMPTION

6.1 METERING AND DATA SUMMARY

Fuel-use data are available from the operating contractor, Johnson Controls World Services. Information is available on diesel and fuel oil usage and gasoline use for carts and vehicles. Diesel fuel usage can be divided into three areas: portable generators, larger construction vehicles, and fork lifts and compressors. Fuel oil is used to power boilers. Annual contracts are negotiated with companies to provide and deliver diesel oil and gasoline. Information was not available on fuel usage by specific vehicle or generator.

6.2 ENERGY-USE BREAKDOWN

Diesel fuel is used at Cape Canaveral AFS for a variety of activities. Diesel fuel powers portable generators used as back-up power during launch activities and is the primary power source for isolated locations, and fork lifts and air compressors. Consumption data of fuel use in these three areas for fiscal year 1992 are outlined in Table 6.1.

Of the three areas of consumption, the use of fuel oil for boilers is the highest, followed by diesel fuel use for fork lifts and compressors, then portable generators. Almost 90% of the diesel fuel is used to operate fork lifts and air compressors. The monthly consumption patterns for boilers is consistent, while consumption in the other areas has a larger pattern of fluctuation that is dependent on the frequency of launches.

TABLE 6.1. Fossil Fuel Use for Cape Canaveral AFS - October 1991 through September 1992

Month	Portable Generators (gals)	Boilers (gals)	Fork Lifts, Compressors (gals)	Total (gals)
Oct 1991	11,501	72,814	46,886	131,201
Nov	22,832	77,675	45,677	146,184
Dec	17,490	81,216	39,482	138,188
Jan 1992	20,140	79,898	41,583	141,621
Feb	14,329	67,812	60,127	142,268
Mar	8,827	73,360	57,215	139,402
Apr	7,238	67,204	44,836	119,278
May	6,017	76,122	59,141	141,280
Jun	12,293	74,337	64,190	150,820
Jul	9,366	71,685	37,813	118,864
Aug	25,685	71,142	43,436	140,263
Sep	24,745	73,518	77,060	175,323
Total	180,463	886,783	617,446	1,684,692

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APPENDIX

REGIONAL ENERGY-USE INTENSITY (EUI) VALUES

APPENDIX

REGIONAL ENERGY-USE INTENSITY (EUI) VALUES

Tables A.1 through A.19 show the regional EUI information where various sources of information were considered: U.S. Environmental Protection Agency (EPA)/Southeastern Electric Reliability Council (SERC), Gulf Power, Georgia Power, and FPL for the electrical EUIs. All of these sources are shown to indicate that some variation exists among them and that these numbers are not absolute values, but are broad estimates for the various building classifications. However, for this report, the FPL EUI numbers were used to maintain consistency with any work that FPL may do in connection with or related to these efforts. Tables A.1 through A.10 address electrical EUIs. The remaining tables, A.11 through A.19, relate to fuel oil EUIs. EPA/SERC, Gulf Power, and Georgia Power are the sources for the fuel oil EUIs. Average EUI values were determined from the various sources of fuel oil information. There is a considerable variation between the EUIs; thus, average values were used to obtain the EUI numbers used throughout the analysis.

The broad classifications shown for building types (office, restaurant, retail, grocery, warehouse, school, health, lodging, miscellaneous, and church/assembly) are the way that utilities or other providers of this type of information report their findings. Therefore, the building classifications shown in Table 1.2 were mapped to correspond to the more broad and general categories shown in Tables A.1 to A.19. The criterion used to map the facilities was mainly functionality. The more specific classifications in Table 1.2 were compared to the EUI source information and relationships were noted.

TABLE A.1. Office Electricity Baseline Development Notes
EUI Development (kWh/ft^2-yr)

Source	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	2.20	5.50	2.50	0.80	0.60	6.70	0.30	3.60	22.20
GULF POWER	0.66	3.51	0.70	0.38	0.81	2.98	0.11	1.51	10.66
GEORGIA POWER	1.64	4.30	3.00	0.70	0.23	8.12	0.24	3.30	21.53
FPL[b]	0.20	6.05	1.75	0.15	0.40	7.10[c]	0.75	6.15	22.55

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for office category.

(a) Defined as miscellaneous EUI.
(b) Average EUI value of large and small office.
(c) Light is combined value of indoor and outdoor.

TABLE A.2. Restaurant Electricity Baseline Development Notes
EUI Development (kWh/ft^2-yr)

Source	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	2.30	4.30	1.90	3.90	7.20	5.20	5.50	2.10	32.40
GULF POWER	0.83	13.97	3.98	3.55	0.75	5.83	9.63	3.91	42.45
GEORGIA POWER	0.99	22.52	3.33	2.27	10.82	10.60	17.96	4.60	73.09
FPL	0.30	19.70	2.20	3.80	23.10	13.00[b]	16.90	5.60	84.60

EPA/SERC,GULF POWER, GEORGIA POWER, and FPL data for restaurant category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.

TABLE A.3. Retail Electricity Baseline Development Notes
EUI Development (kWh/ft^2-yr)

Source	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	2.30	3.10	1.40	0.60	0.90	6.10	0.70	1.40	16.50
GULF POWER	0.96	3.95	0.99	0.46	0.01	4.26	1.41	3.51	15.55
GEORGIA POWER	1.62	4.75	1.80	0.89	0.19	6.75	0.56	2.79	19.35
FPL[b]	0.15	6.90	1.25	0.25	0.40	8.01[c]	1.10	2.50	20.60

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for retail category.

(a) Defined as miscellaneous EUI.
(b) Average EUI value of large and small retail.
(c) Light is combined value of indoor and outdoor.

TABLE A.4. Grocery Electric Baseline Development Notes
EUI Development (kWh/ft^2-yr)

Source	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	3.70	4.70	3.80	0.80	2.10	15.30	28.70	2.30	61.40
GULF POWER	0.75	10.80	2.49	0.49	0.14	10.73	16.35	2.99	44.74
GEORGIA POWER	0.32	8.23	2.23	0.69	0.77	13.23	24.00	2.71	52.18
FPL	0.20	11.50	1.80	0.40	2.80	16.50[b]	24.10	6.00	63.30

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for grocery category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.

TABLE A.5. Warehouse Electricity Baseline Development Notes
EUI Development (kWh/ft^2-yr)

Source	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	1.90	1.80	1.30	0.60	-	3.80	8.60	1.20	19.2
GULF POWER	-	-	-	-	-	-	-	-	-
GEORGIA POWER	0.03	1.23	0.73	0.23	0.05	1.95	0.46	0.90	5.58
FPL[b]	0.20	5.40	0.20	0.00	0.20	3.30[c]	0.50	1.80	11.60

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for warehouse category.

(a) Defined as miscellaneous EUI.
(b) Non-refrigerated EUI values used.
(c) Light is combined value of indoor and outdoor.

TABLE A.6. School Electricity Baseline Development Notes
EUI Development (kWh/ft^2-yr)

Source	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	4.20	1.30	0.60	1.10	2.10	4.20	0.40	0.60	14.5
GULF POWER	0.26	2.99	0.69	0.39	0.26	2.63	0.45	0.71	8.38
GEORGIA POWER	0.49	1.79	0.76	0.26	0.27	2.79	0.70	1.44	8.50
FPL	0.20	4.30	1.40	0.70	1.50	4.5[b]	0.80	1.20	14.60

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for school category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.

TABLE A.7. Health Electricity Baseline Development Notes
EUI Development (kWh/ft^2-yr)

Source	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	2.70	6.50	2.40	2.50	0.40	5.90	0.60	2.4	23.4
GULF POWER	1.20	8.79	1.97	0.50	1.06	6.28	0.95	4.40	25.15
GEORGIA POWER	0.97	6.01	2.58	0.42	0.96	7.49	1.54	4.23	24.2
FPL[c]	2.00	9.90	7.80	3.80	1.00	9.60 [b]	1.20	1.20	45.3

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for health category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.
(c) Hospital data from FPL was used for health.

TABLE A.8. Lodging Electricity Baseline Development Notes
EUI Development (kWh/ft^2-yr)

Source	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	3.00	4.90	1.40	5.80	6.20	5.30	1.10	2.40	30.10
GULF POWER	3.35	5.82	1.15	0.75	0.68	5.17	0.75	4.45	22.12
GEORGIA POWER	2.22	4.02	0.95	0.50	0.34	3.49	1.34	2.72	15.58
FPL	0.50	6.40	2.50	3.00	1.60	5.90[b]	1.50	4.10	25.50

EPA/SERC, GULF POWER, and FPL data for lodging category.
GEORGIA POWER data for hotel/motel category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.

TABLE A.9. Miscellaneous Buildings Electricity Baseline Development Notes EUI Development (kWh/ft^2-yr)

Source	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	4.50	2.70	1.30	0.40	0.70	3.10	0.90	1.30	14.90
GULF POWER	2.00	12.04	6.92	0.63	0.15	12.20	1.15	11.57	46.66
GEORGIA POWER	0.23	3.30	1.18	0.28	0.25	3.62	1.07	2.39	12.32
FPL	0.30	6.60	1.50	0.30	0.90	1.40	6.60[b]	5.80	23.40

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for miscellaneous building category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.

TABLE A.10. Church/Assembly Building Electricity Baseline Development Notes EUI Development (kWh/ft^2-yr)

Source	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
GULF POWER	0.51	2.27	0.23	0.61	-	2.18	0.02	0.45	6.27
FPL[c]	0.30	6.60	1.50	0.30	0.90	6.6[b]	1.40	5.80	23.4

GULF POWER and FPL data for church/assembly building.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.
(c) Miscellaneous building EUI value, which includes church, is used for FPL data.

TABLE A.11. Office Fossil Fuel Baseline Development Notes
EUI Development (kBtu/ft^2-yr)

Source	Heat	DWH	Cook	Cool	Other[a]	Total
FUEL TYPE: Fuel Oil						
EPA/SERC	37.70	14.70	-	-	-	52.40
GULF POWER	3.65	-	-	-	-	3.65
GEORGIA POWER	1.18	0.34	-	-	-	1.52

All EUI data for office category.

(a) Defined as miscellaneous EUI.

TABLE A.12. Restaurant Fossil Fuel Baseline Development Notes
EUI Development (kBtu/ft^2-yr)

Source	Heat	DWH	Cook	Cool	Other[a]	Total
FUEL TYPE: Fuel Oil						
EPA/SERC	5.80	30.60	-	-	-	36.40
GULF POWER	0.05	0.84	-	-	-	0.89
GEORGIA POWER	-	1.06	-	-	-	1.06

All EUI data for restaurant category.

(a) Defined as miscellaneous EUI.

TABLE A.13. Retail Fossil Fuel Baseline Development Notes
EUI Development (kBtu/ft^2-yr)

Source	Heat	DWH	Cook	Cool	Other[a]	Total
FUEL TYPE: Fuel Oil						
EPA/SERC	41.10	99.40	-	-	-	140.50
GULF POWER	0.10	-	-	-	-	0.10
GEORGIA POWER	0.92	-	-	-	-	0.92

All EUI data for retail category.

(a) Defined as miscellaneous EUI.

TABLE A.14. Grocery Fossil Fuel Baseline Development Notes
EUI Development (kBtu/ft^2-yr)

Source	Heat	DWH	Cook	Cool	Other[a]	Total
FUEL TYPE: Fuel Oil						
EPA/SERC	47.80	37.60	-	-	-	85.40
GULF POWER	1.94	0.02	-	-	-	1.96
GEORGIA POWER	0.41	0.50	-	-	-	0.91

All EUI data for grocery category.

(a) Defined as miscellaneous EUI.

TABLE A.15. Warehouse Fossil Fuel Baseline Development Notes
EUI Development (kBtu/ft^2-yr)

Source	Heat	DWH	Cook	Cool	Other[a]	Total
FUEL TYPE: Fuel Oil						
EPA/SERC	89.20	108.40	-	-	-	197.60
GULF POWER	-	-	-	-	-	-
GEORGIA POWER	0.17	-	-	-	-	0.17

All EUI data for warehouse category.

(a) Defined as miscellaneous EUI.

TABLE A.16. School Fossil Fuel Baseline Development Notes
EUI Development (kBtu/ft^2-yr)

Source	Heat	DWH	Cook	Cool	Other[a]	Total
FUEL TYPE: Fuel Oil						
EPA/SERC	78.50	32.00	-	-	-	110.50
GULF POWER	0.01	-	-	-	-	0.01
GEORGIA POWER	1.18	0.12	-	-	-	1.30

All EUI data for school category.

(a) Defined as miscellaneous EUI.

TABLE A.17. Health Fossil Fuel Baseline Development Notes
EUI Development (kBtu/ft^2-yr)

Source	Heat	DWH	Cook	Cool	Other[a]	Total
FUEL TYPE: Fuel Oil						
EPA/SERC	53.20	39.80	-	-	-	93.00
GULF POWER	0.11	0.03	-	-	-	0.14
GEORGIA POWER	0.83	0.69	-	-	-	1.52

All EUI data for health category.

(a) Defined as miscellaneous EUI.

TABLE A.18. Lodging Fossil Fuel Baseline Development Notes
EUI Development (kBtu/ft^2-yr)

Source	Heat	DWH	Cook	Cool	Other[a]	Total
FUEL TYPE: Fuel Oil						
EPA/SERC	43.90	29.00	-	-	-	72.90
GULF POWER	0.01	0.01	-	-	-	0.02
GEORGIA POWER	0.65	1.73	-	-	-	2.36

All EUI data for lodging category.

(a) Defined as miscellaneous EUI.

TABLE A.19. Miscellaneous Buildings Fossil Fuel Baseline Development Notes EUI Development (kBtu/ft^2-yr)

Source	Heat	DWH	Cook	Cool	Other[a]	Total
FUEL TYPE: Fuel Oil						
EPA/SERC	56.30	6.80	-	-	-	63.10
GULF POWER	-	-	-	-	-	-
GEORGIA POWER	1.11	0.10	-	-	-	1.12

All EUI data for miscellaneous category.

(a) Defined as miscellaneous EUI.

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