GL00859

PART IV SECTION M

ATTACHMENT H

MX AND MX-RES SYSTEMS POWER CHARACTERISTICS
AND REQUIREMENTS

15 July 1980

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ATTACHMENT H

MX AND MX-RES SYSTEMS POWER CHARACTERISTICS AND REQUIREMENTS

This attachment provides specific characteristics of the MX-RES power requirements and load demands. Because the RES power requirements are based directly on the characteristics and power demands of the basic MX System, this attachment includes descriptions of the MX system as well as the MX baseline power system concept.

The power demands of the MX-RES System are given independently for three basic elements of the System, i.e., a shelter, a representative cluster group (RCG), and operating bases (OBs). Operating base loads are given for a baseline configuration (OB #1) and two adaptations thereof, one smaller (OB #2) and one larger (OB #1A). Electrical load profiles are given for all of these. For the bases, the electrical load profiles show the power demand that can be satisfied electrically only. Additionally, for the bases, thermal profiles are provided which show the thermal power demands (heating, cooling, and domestic hot water) that can be satisfied electrically or by other means.

The following sections are contained in this Attachment: (1) MX System Summary, (2) MX System Description, (3) MX Baseline Power System Concept, and (4) MX-RES Specific Power Characteristics and Requirements. The first three sections provide MX interface information; the fourth provides data for use in MX-RES proposal preparation. A list of acronyms is given in the fifth section.

1.0 MX SYSTEM SUMMARY

1.1 INTRODUCTION

The present U.S. ICBM force is expected to become vulnerable to attack in the mid-1980s when Soviet missile systems achieve increased throw weight and improved accuracy. To counter this threat, the DOD has entered Full-Scale Engineering Development (FSED) of the MX Weapon System. Responsibility for FSED is assigned to the Ballistic Missile Office (BMO), located at Norton Air Force Base, California. The Strategic Air Command (SAC), located at Omaha, Nebraska, has the responsibility for the design of the base and support facilities at the Operating Bases (OBs) and will operate and maintain the MX System when it becomes operational.

The MX-RES is a parallel activity with the objective of definition and development of alternative renewable energy resource power systems for the MX missile system. RES technologies will reduce or eliminate MX missile dependence on conventional energy sources. MX-RES will also promote the acceleration of commercial RES applications in support of national goals for energy independence. Responsibility for the MX-RES project is assigned to a joint DOE/DOD Program Office, located in Washington, D.C.

1.2 MX SYSTEM DESCRIPTION

The completed system will include 200 missiles each housed in a linear cluster of 23 shelters. Key features of the system will be dispersal and a secure basing mode. Dispersal will be achieved by deploying the system throughout a large number of valley areas. The currently preferred deployment area is central Nevada and Western Utah (see Figure 1, Attachment J) although other locations are under consideration. Secure basing will be achieved by mobility and location uncertainty. These features are further addressed in Section 2.

1.3 MX POWER SYSTEM CONCEPT

The Ballistic Missile Office (BMO) has defined a conceptual Baseline Power System (BPS). The BPS is now conceived as a conventional (non-RES) grid system, served from commercial power sources. Operational power will initially be required by 1986 and increase to full power demand by 1989, exclusive of construction power. Section 3, a description of current BPS definition, provides an overall understanding of MX power system concept. The specific MX-RES power characteristics and requirements for the shelter, cluster, and operating base load levels are addressed in Section 4.

2.0 MX SYSTEM DESCRIPTION

2.1 GENERAL

The heart of the MX System is the 200 missiles with each missile located in a linear cluster of 23 shelters. The system survivability is assured by dispersal and a secure basing mode. Dispersal is achieved by deploying the system throughout a large number of valleys over a wide geographic area. Secure basing is achieved by the ability to rapidly relocate the missile at anytime between the 23 shelters in the cluster and the uncertainty of which shelter houses the missile. The shelters and clusters are supported by a large number of support facilities.

2.2 SHELTERS AND CLUSTERS

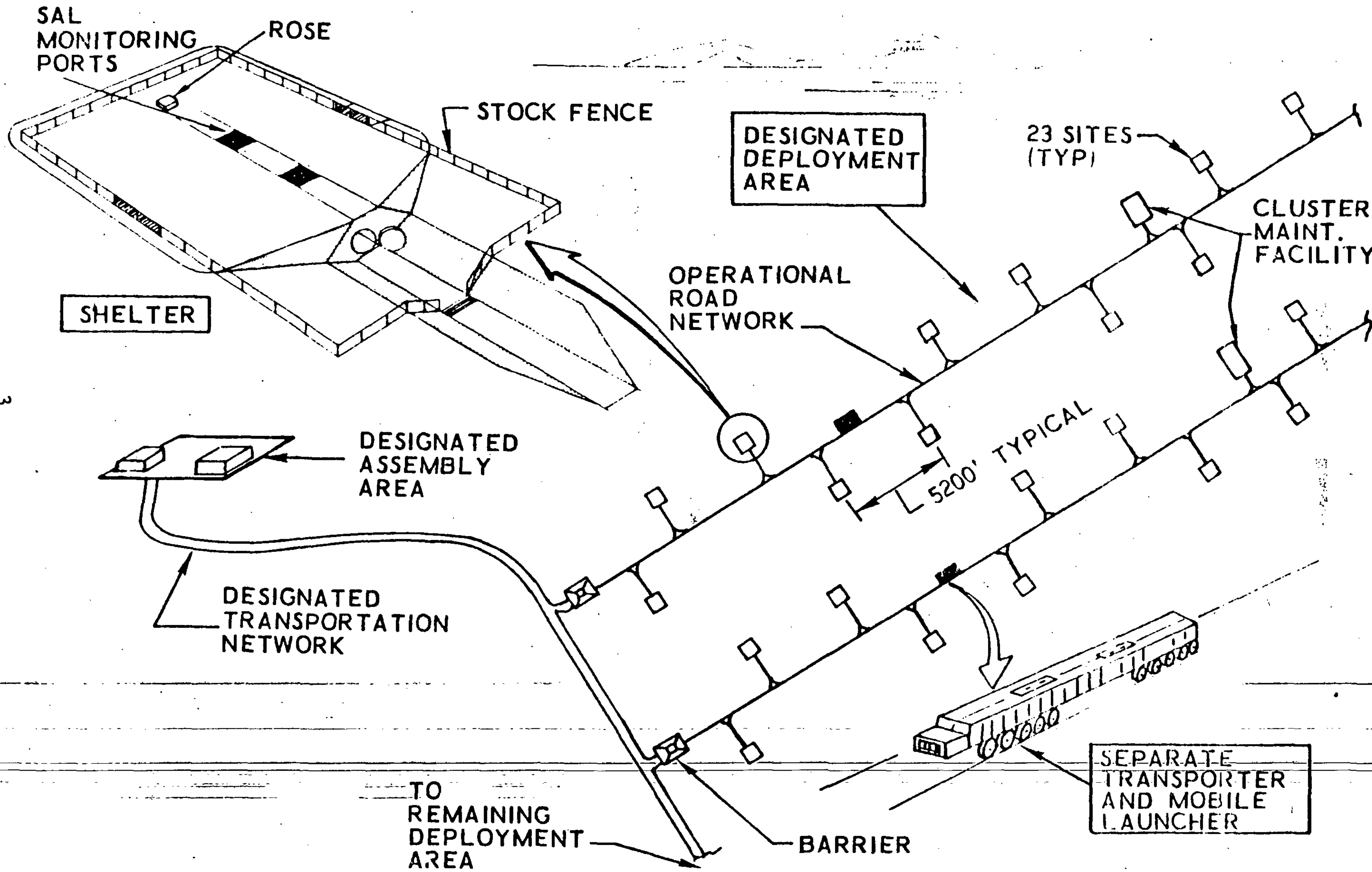
Two hundred clusters are planned, each containing 23 shelters, for a total of 4600 individual shelters. A conceptual sketch of the shelters and conceptual layout of the clusters is shown in Figure 1.

2.2.1 Shelters

Shelters will be constructed of reinforced concrete and covered by a soil overburden. Any one of 23 shelters in a cluster may contain the missile. To preserve missile location uncertainty, each shelter will be powered to the same degree, with dummy loads imposed in "empty" shelters. Each shelter site will cover approximately two and one-half acres enclosed by a stock fence. A Resident Operational Support Equipment Enclosure (ROSEE) will be situated at each shelter site which will interface with the RES.

FIGURE 1

Shelter/Cluster Conceptual Layout



2.2.2 Clusters

Clusters will be geographically dispersed in valleys throughout the deployment area (see Figure 1, Attachment J). Each of the 200 clusters will consist of 23 shelters, interconnected by a roadway. Clusters will also be interconnected by a road network, providing access to the Designated Assembly Area (DAA). A Representative Cluster Group (RCG) of 10 clusters is shown in Figure 8 of Attachment J.

2.3 SUPPORT FACILITIES

The shelters and clusters are supported by a number of operating bases and surveillance, security, maintenance and assembly facilities.

2.3.1 Cluster Maintenance Facility (CMF)

Each cluster will contain a Cluster Maintenance Facility providing limited checkout and repair capabilities for selected missile system components.

2.3.2 Remote Surveillance Sites (RSSs)

RSSs, shown in Figure 2, will provide unmanned, remote detection of shelter threats. There are 183 RSSs planned.

2.3.3 Area Support Centers (ASCs)

Four ASCs (shown in Figure 2) are being proposed and are strategically located throughout the deployment area. An ASC will be collocated with each of the two operating bases described in 2.3.7 (locations are shown in Figures 11 and 12 of Attachment J). Two other ASCs will be located in the Designated Deployment Area. ASCs will provide facilities to support security alert response teams and their associated helicopters, crews, and maintenance personnel.

2.3.4 Designated Deployment Area (DDA)

The DDA encompasses the area in which the MX weapons systems is deployed. The DDA applies to all the shelter, RSS, CMF, and ASC sites that are not collocated with OBs.

2.3.5 Operational Base Test Site (OBTS)

The OBTS is located in close proximity to Operating Base #1. The function of the OBTS is to test each component of the MX weapon system under actual field operating conditions. The OBTS contains three shelters, one CMF, one RSS and a large test support building.

2.3.6 Designated Assembly Area (DAA)

The DAA will be collocated with Operating Base #1. As shown in Figure 3, the DAA will provide a launcher assembly area, major maintenance facilities, and capabilities to support security, storage, munitions, and depot requirements at the depot level.

FIGURE 2

Proposed Deployment Area Facilities

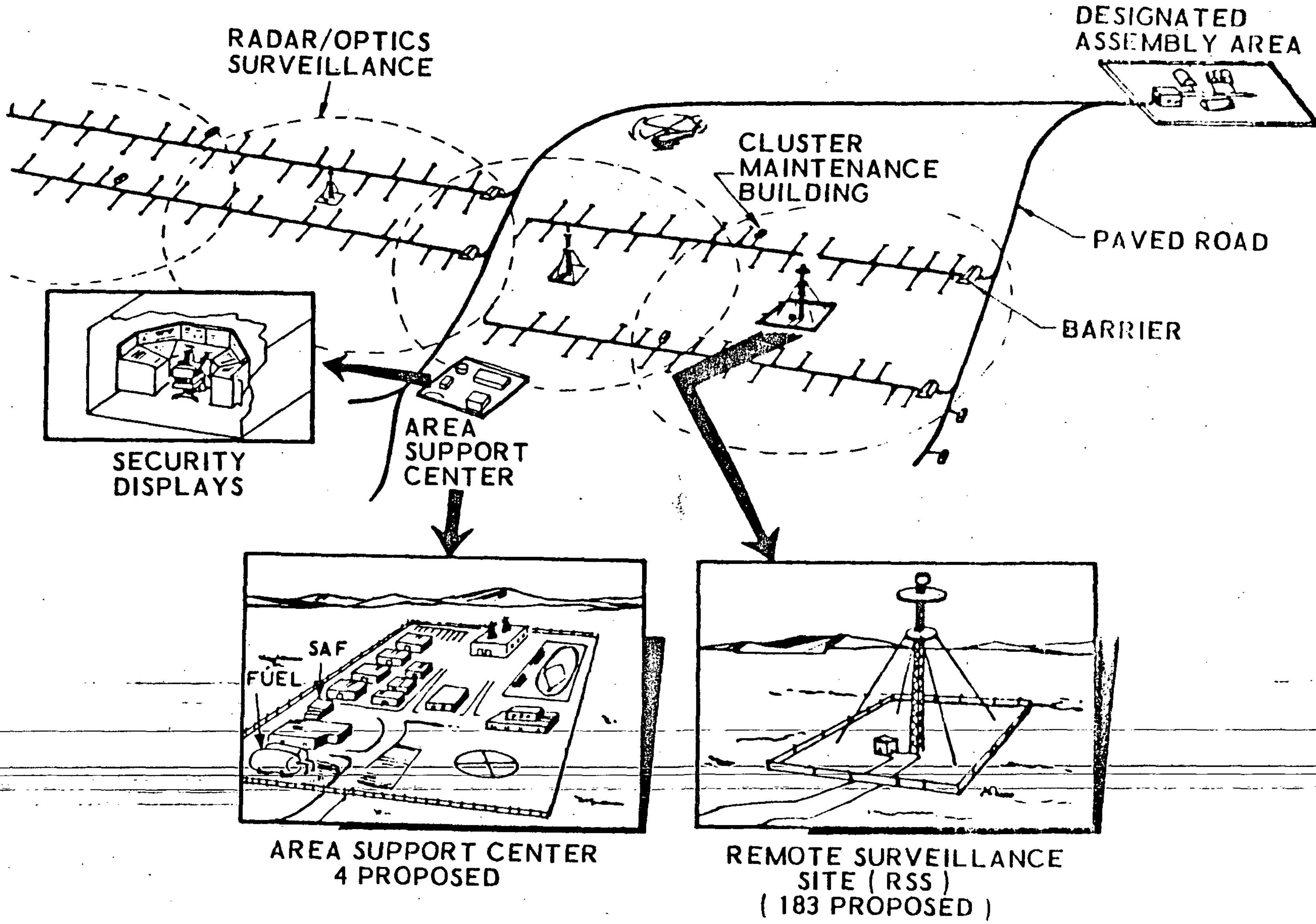
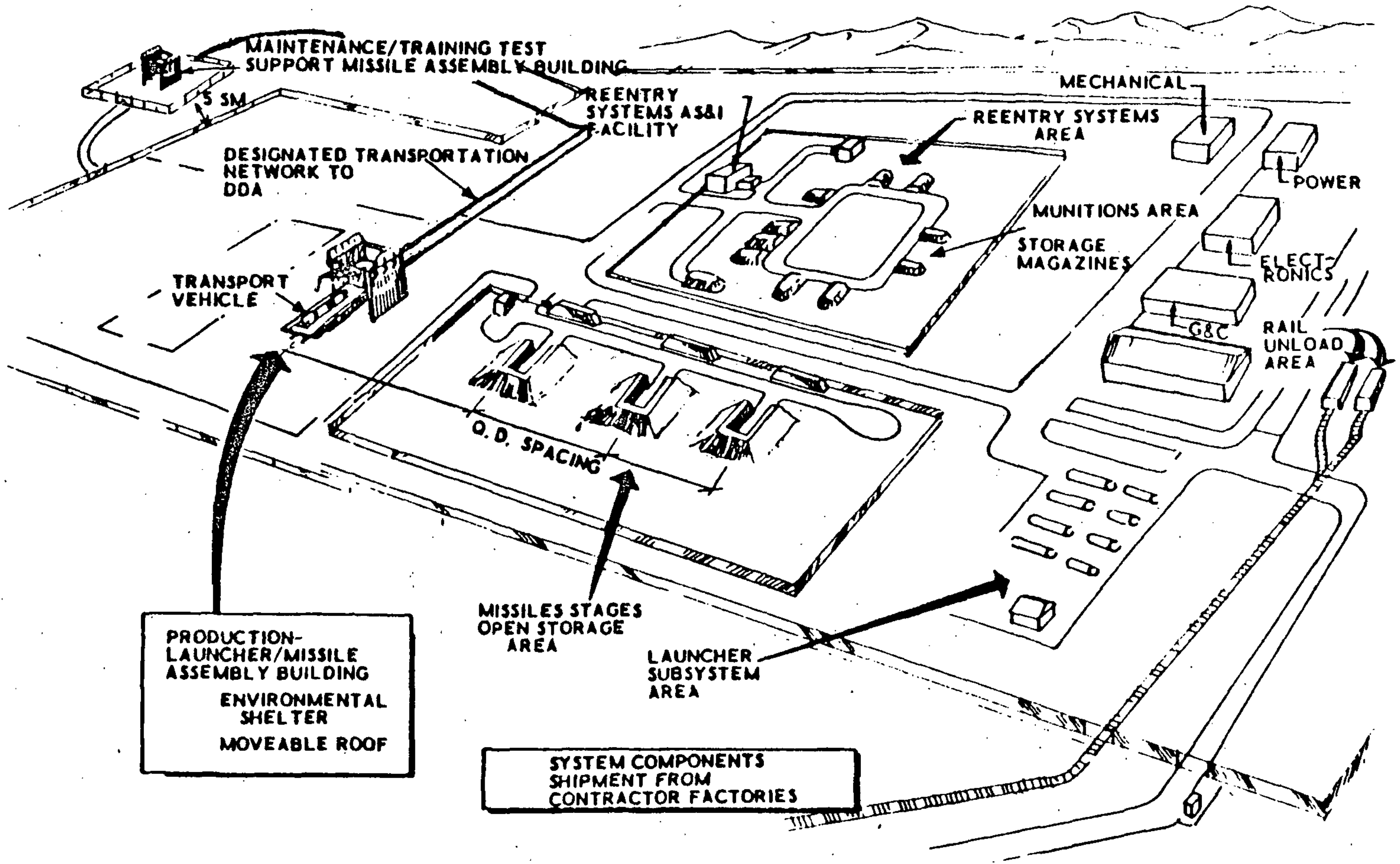


FIGURE 3
DESIGNATED ASSEMBLY AREA CONCEPT



2.3.7 Operating Bases (OBs)

Five sites are being considered for the MX system Operating Bases. For purposes of this proposal, it will be assumed that there are two OBs; they are OB #1 and OB #2 located at Beryl, Utah and Ely, Nevada, respectively.

Operating Base #1 (see Figure 11, Attachment J) will accommodate maintenance, supply, off-loading facilities, an airfield complex and base/community support complexes. Associated with OB #1 is a DAA, an OBTS, and an ASC, all collocated (near proximity) with the OB.

Operating Base #2 (see Figure 12, Attachment J) supports a collocated (near proximity) ASC and potentially an airfield complex.

2.4 IMPLEMENTATION SCHEDULE

The schedule for the design and construction of the MX Facilities is provided in Figure 4. MX-RES development activities are being conducted in parallel. MX system requirements will evolve simultaneously with MX-RES development; therefore design interactions are anticipated.

2.5 SYSTEM OPERATIONS

Only one missile will be assigned to each of 200 clusters. Missiles will be housed within an integral canister. To preserve location uncertainty within the cluster, the missile-transporter will periodically be moved over the linear network from shelter to shelter. Mobility will be provided by a highly specialized vehicle called the Separate Transporter and Mobile Launcher (STML). The missile will be operationally ready for launch while in the shelter. To comply with Strategic Arms Limitation (SAL) requirements, appropriate measures to allow verification are being incorporated. The entire concept is therefore referred to as the Verifiable Horizontal Multiple Protective Structure (VHMPS) basing mode.

2.6 SYSTEM PROCESS

System components will be delivered to the OB/DAA. Missile canister assembly will then be accomplished at the DAA, collocated with an OB. The assembled missile-canister will be transported to a specific cluster. At the CMF the missile-canister will be transferred to the STML, appropriately processed, and moved from shelter to shelter. The launcher section may be deposited at any one of the 23 shelters. For major maintenance or checkout, the entire process may be reversed, returning the missile to the CMF or DAA, as required.

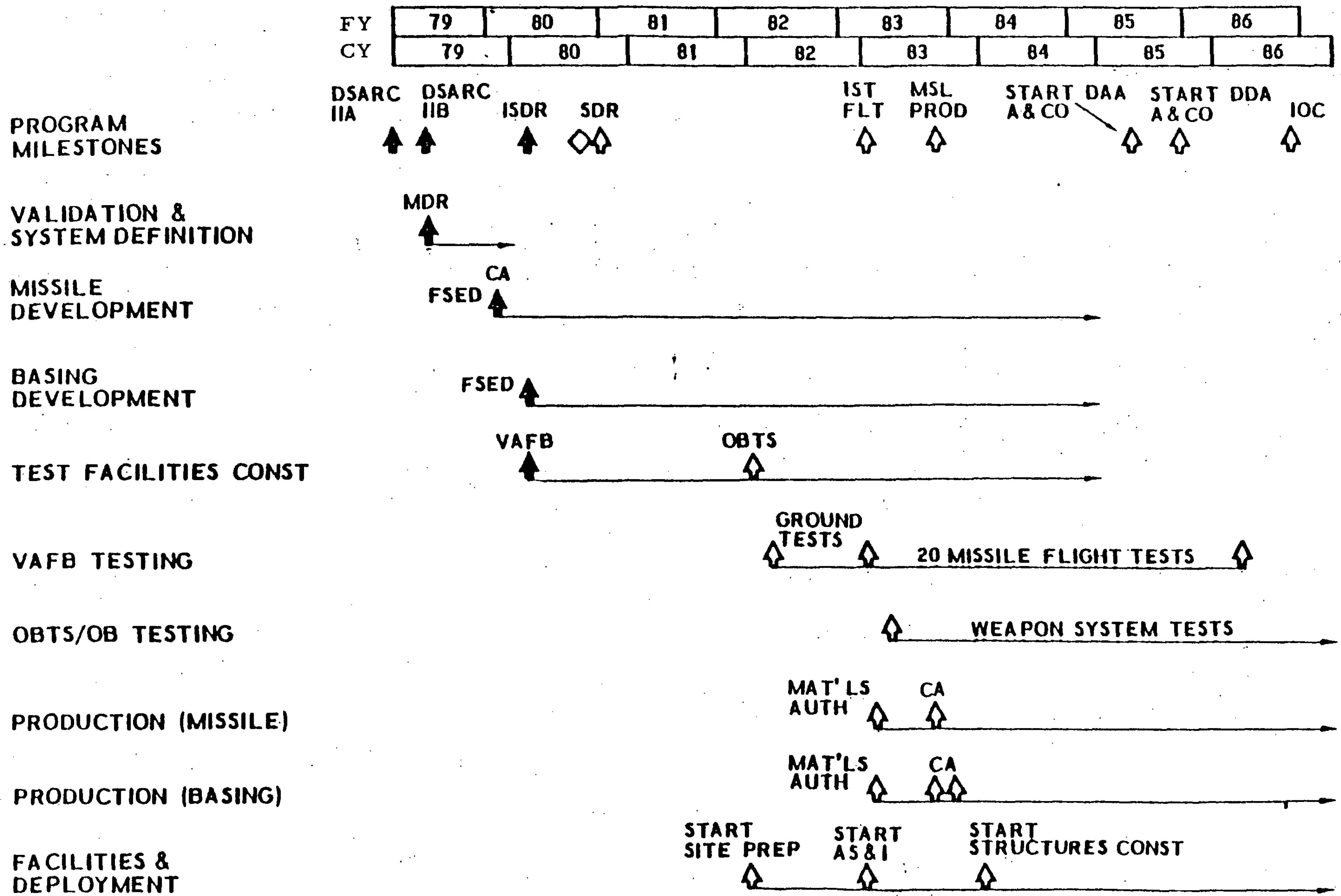
3.0 MX BASELINE POWER SYSTEM CONCEPT

3.1 INTRODUCTION

In a parallel effort, a MX Baseline Power System (BPS) is being designed as a conventional (non-RES) grid system, served from commercial power sources. Paragraph 3.2 provides a brief description of the MX BPS. Power demands for MX-RES application have been derived from the BPS; these are described in Section 4.

FIGURE 4

MX Program Summary



3.2 MX BASELINE POWER SYSTEM

3.2.1 General

The BPS concept layout shown in Figure 5 is being designed as a conventional transmission grid which distributes power from the source to all MX system elements. For reliability, the BPS will obtain power at two or more utility switching stations, located at geographically dispersed points. The Corps of Engineers will determine the number and location of MX switching stations. Also, the Corps will plan and design the MX transmission network including all switching stations, area substations, distribution feeders, and all transmission lines including those to the distribution centers. These plans and designs will be handed to the utilities who will construct and own the transmission network. The utility interface is at the input to the distribution centers.

3.2.2 Substations

The MX BPS will supply power through the switching stations to 15 area substations, interconnected by a ring bus transmission network. At each area substation power will be transformed to the distribution voltage. The BPS distributes power from each area substation to several distribution centers, also interconnected by a ring bus distribution network. Power from each distribution center is, in turn, distributed by another bus network to approximately two clusters and two RSSs.

3.2.3 Transmission/Distribution/Control

MX BPS power transmission and distribution, including cluster networks, switching stations, area substations, distribution centers, and shelter connections will be monitored and controlled by a BPS Supervisory, Control and Data Acquisition (SCADA) system. To maintain a high degree of power reliability, the SCADA will be designed as an automatic system with manual override.

3.2.4 BPS Backup

BPS reliability will be further enhanced by standby diesel generators at each distribution center. These standby diesel generators, which will have at least 30 days operational capability, will be activated by the SCADA system. The standby diesel generators at all distribution centers (111 total planned) will consist of three 800 kW units, any two of which can be brought on-line to carry the load of the shelters and RSSs. A shelter emergency internal power system will be capable of providing uninterrupted power for two hours. The OBs, DAA, ASCs, CMFs and OBTs are not provided with standby diesel backup. Special uninterruptible power supplies (UPS) will be applied to selected facilities at or near these locations.

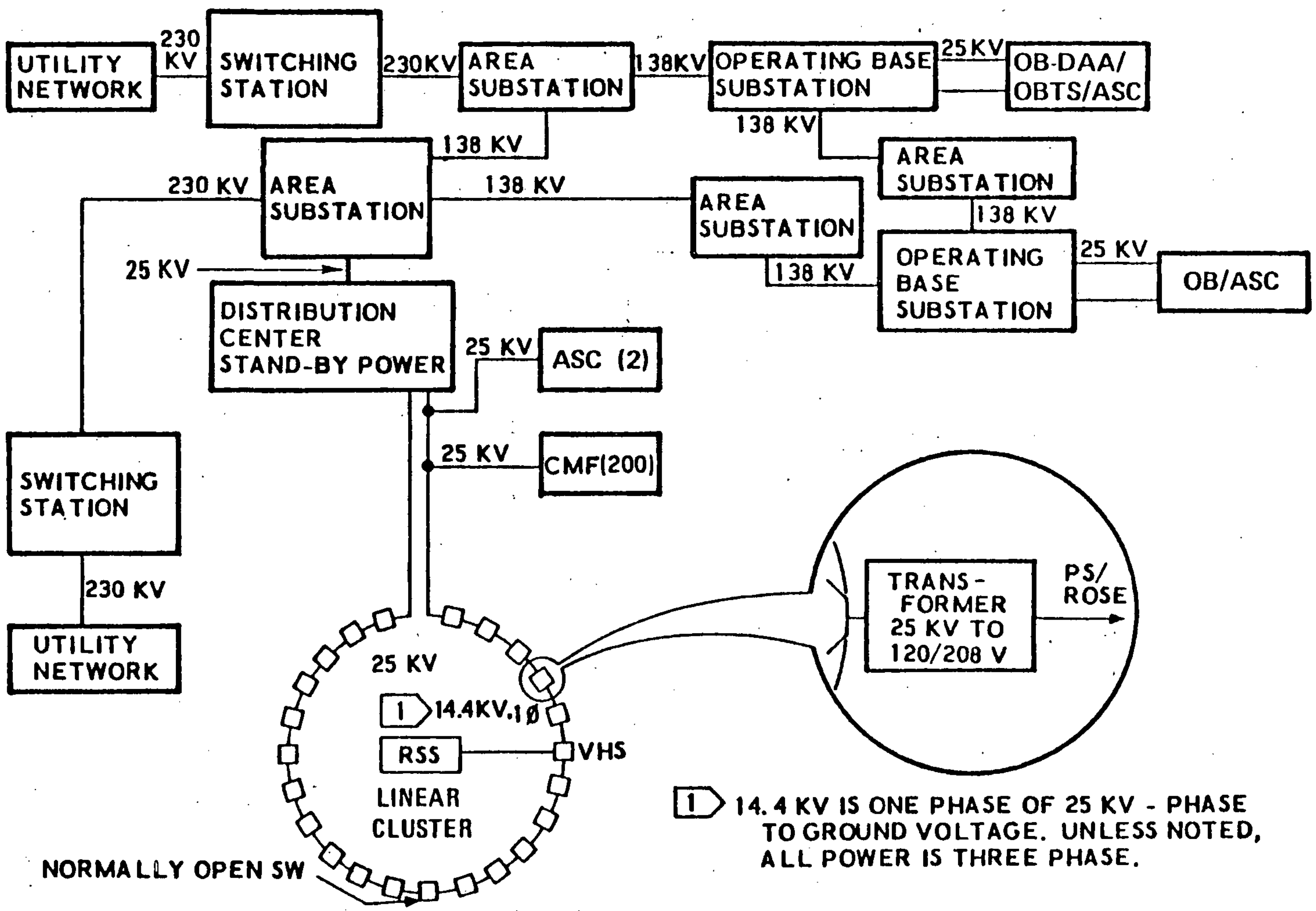
3.2.5 Availability Estimate

On the basis of at least two commercial utility interfaces and the generators at the distribution centers, power availability at the shelters and clusters (including RSSs, but excluding the CMFs), is estimated at 0.9999. Since the generators located at the distribution centers do not back up the OBs, DAA, ASCs, OBTS, or CMFs, power

FIGURE 5

Baseline Power System (BPS) Concept

MX BASELINE POWER SYSTEM (BPS) CONCEPT



availability to those facilities is a function of the commercial power sources and the network configuration. The availability of this portion of the system is estimated to be 0.999. Availability is defined as the ratio of the time power of acceptable quality is available to the time it is required, which in the case of MX is continuous.

3.2.6 BPS Survivability

The BPS will furnish normal commercial and standby diesel power for MX pre-attack modes. The pre-attack BPS is conceived as a highly reliable commercial power system with backup as described in paragraph 3.2.5. MX post-attack power to critical mission loads will be furnished by a separate survival power source carried on the Launcher.

3.2.7 Load Schedule

MX power requirements include both construction and operation power requirements. Construction power will be required beginning in 1983, buildup to approximately 15 MW by mid-1984, remain at this level until mid-1988, and then taper off to zero by 1989. Operational power will initially be required in 1986, buildup to full rated power in 1989, and remain at this level for the life of the system. The largest power requirement will be from 1986 through 1989, when both construction and operational power will be required. To support the missile assembly and checkout activity, 3 MW of BPS will be required by October 1985.

3.2.8 BPS Status

The BPS described above was prepared prior to the Defense System Acquisition Review Council (DSARC) II as a basis for budgetary costing. This DOD process is similar to the DOE's Major System Acquisition (MSA) process; the DSARC is roughly equivalent to DOE's Energy Systems Acquisition Advisory Board (ESAAB). Subsequent studies and analyses are addressing performance, reliability, and cost factors for an optimized configuration. These studies are scheduled for completion by mid-1980 for System Design Review (SDR).

4.0 MX-RES SPECIFIC POWER CHARACTERISTICS AND REQUIREMENTS

This section is provided for purposes of MX-RES proposal preparation.

4.1 INTRODUCTION

Power demands for the MX-RES have been derived and/or estimated from the current definition of the MX Baseline Power System (BPS). The total MX-RES average annual demand is 108.6 MWe (see Table 1); however, at any one time the total demand may vary substantially depending on facility operations. Peak demand is the maximum expected load imposed and is listed herein for individual facilities. The connected load is the sum of the maximum demand of all energy consuming components of the total system. However, neither the connected load nor the sum of peak demand actually occur; i.e., they do not reflect diversity because all energy consuming demands do not occur simultaneously. The specific power demands for the individual facilities of the MX are discussed below.

Approximately 31 percent of the operational power requirements described below will be required at the end of fiscal year (FY) 1986; 51 percent at the end of FY 1987; 78 percent at the end of FY 1988; and full rated power will be required by the end of 1989.

For all systems described below (Shelter, Cluster and OBs), the loads given do not include losses associated with systems control and maintenance as well as transmission, distribution and conditioning losses from the MX-RES power plant(s) to the user interfaces. The MX-RES transmission and distribution design and the losses noted above must be accounted for in the RES design.

4.2 SYSTEM AND FACILITY POWER REQUIREMENTS

Independent load rquirements are provided for the shelters, clusters and operating bases. These requirements are discussed individually in this section.

4.2.1 Shelter

Shelter power loads and associated power levels are shown schematically in Figure 6. The RES provides regulated 120 ± 5 percent VDC electrical power of 14.5 kW (21.06 kW peak) to each shelter ROSE interface. The distribution of the RES power to various shelter functions is shown as steady and/or noncontinuous quantities as indicated.

Throughout most of the year the shelter load demand has a steady state value of 14.5 kW DC with an additional peak of 1.0 kW for 10 seconds every five minutes. The most severe shelter load transient, shown in Figure 7, has a peak power of 21.06 kW and a duration of 48 hours before reverting to the steady state load. This transient is expected to occur randomly, but only once a year per shelter, and its primary feature is an eight hour charge of the MOSE emergency battery at the 4.0 kW level and a 0.6 kW charge of the ROSE emergency battery for four hours. Random but possibly simultaneous functions including operation of the ROSEE sump pump (48 hours) and lighting (12 hours) are also included in this profile. Four additional transients to peak loads of 21.06 kW are expected to occur randomly throughout the year for durations of one hour or less.

TABLE 1

TOTAL MX-RES ELECTRICAL LOADS

MX FACILITIES		LOADS PER FACILITY (KW)			TOTAL LOADS (MW)		
FACILITY	NUMBER REQUIRED	AVERAGE DEMAND (1)	PEAK DEMAND (4)	TOTAL CONNECTED (2)	AVERAGE DEMAND (1)	PEAK DEMAND (4)	TOTAL CONNECTED (2)
CLUSTERS							
SHELTERS	4,600	14.5	21.1	21.1	66.7	(NOTE 4)	97.1
CMF	200	11.5	165.0	421.0	2.3		84.2
RSS	183	9.3	11.0	11.0	1.7		2.0
ASC	2	380.0	510.0	650.0	0.8		1.3
TOTAL ALL CLUSTERS					71.5	---	184.6
OB #1 (BERYL)	1	18570		41027	18.6	25.3	41.0
DAA	1	6540	8900	17800	6.5	8.9	17.8
OBTS	1	810	1100	2100	0.8	1.1	2.1
ASC	1	380	510	650	0.4	0.5	0.6
SUBTOTAL (OB#1 & ASSOCIATED FACILITIES)					26.3 (3)	---	61.5 (3)
OB #2 (ELY)	1	10440	14200	22968	10.4	14.2	23.0
ASC	1	380	510	650	0.4	0.5	0.6
SUBTOTAL (OB#2 & ASSOCIATED FACILITIES)					10.8 (3)	---	23.6 (3)
TOTAL BOTH BASES AND ASSOCIATED FACILITIES					37.1 (3)	---	85.1 (3)
TOTAL MX=RES LOAD					108.6	---	269.7

(1) Based on annual average. Loads will vary substantially with time of day and time of year; See Figures 7, 9, and 11.

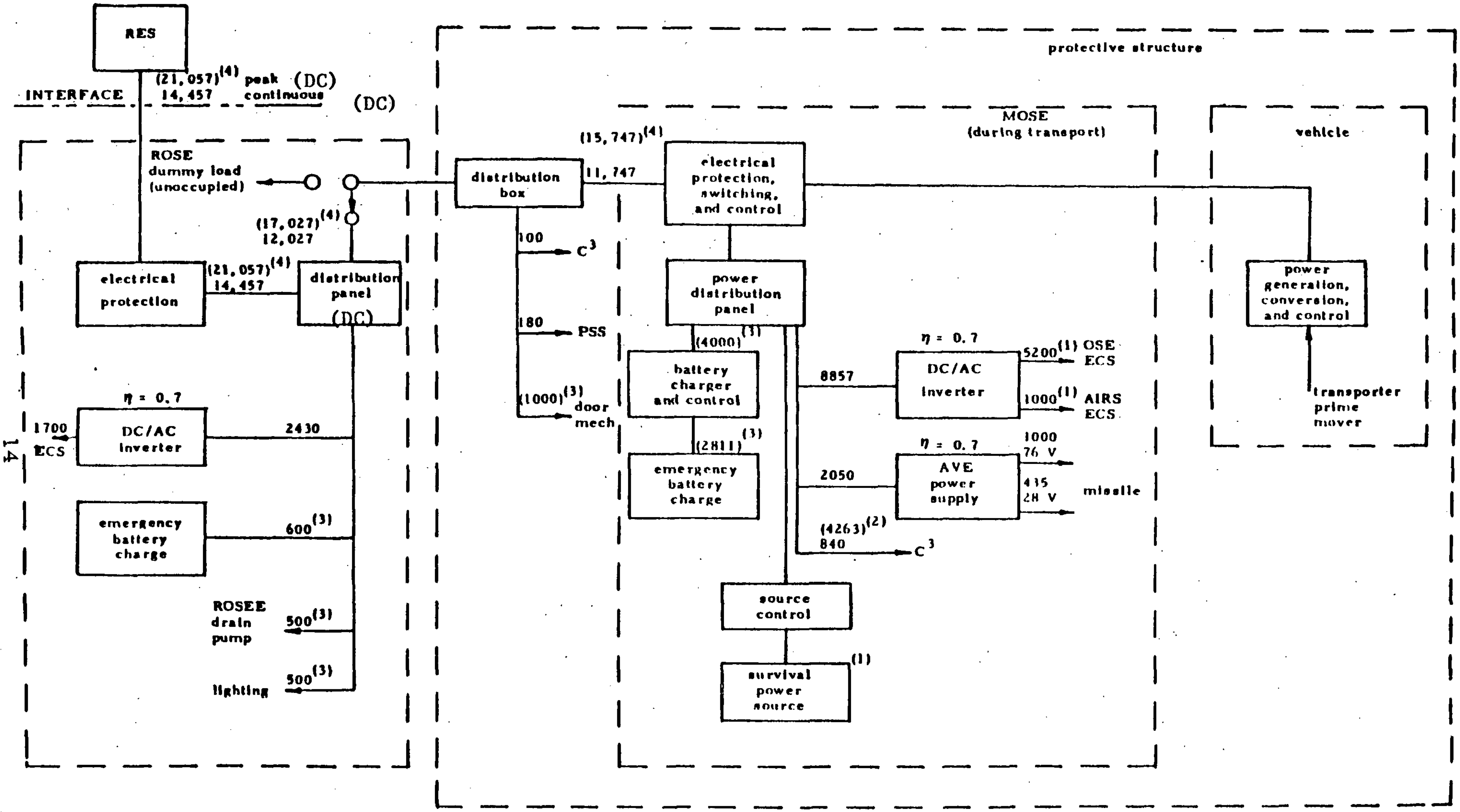
(2) Sums of all energy user capacities.

(3) For OBs, excludes thermal demand for heating, cooling and domestic hot water.

(4) Peak demands are not additive due to load diversity.

FIGURE 6

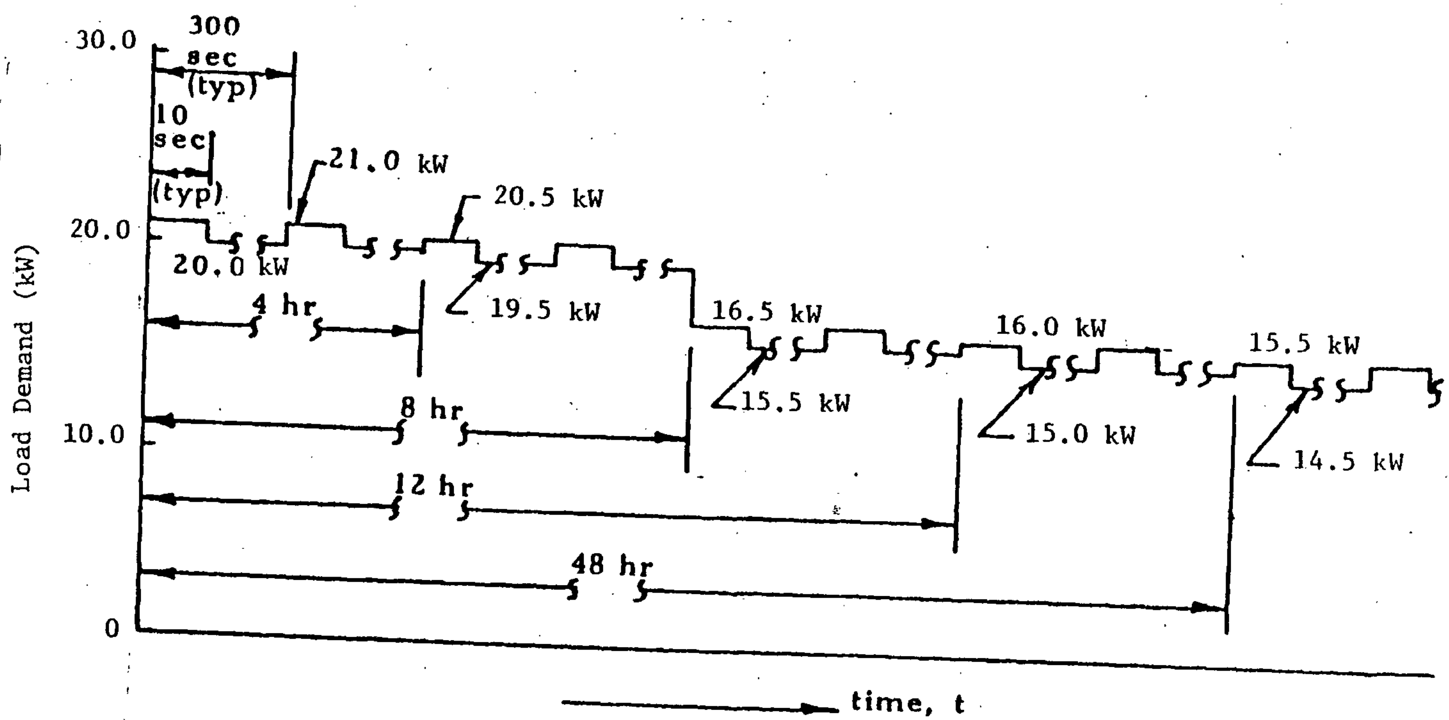
MX-RES SHELTER POWER BLOCK DIAGRAM



(1) Power for emergency and survival periods not shown
(2) C^3 peak power supplied by battery
(3) Individual noncontinuous loads shown in ( ), otherwise loads are average values
(4) Noncontinuous and steady (average) loads combined
(5) All loads expressed in watts

FIGURE 7

SHELTER LOAD PROFILE - DC POWER
(WORST CASE TRANSIENT - ONCE PER YEAR)



Notes: 1. Worst case transient returns to steady state after 48 hours.

2. Four additional transients to 21.0 kW occur randomly throughout the year for durations of approximately one hour.

The shelter power interface is at the ROSE (see Figure 9, Attachment J, and Figure 10, this Attachment).

4.2.2 Clusters

The power requirements of individual cluster groups is dependent on the number of 23 shelter clusters and supporting facilities associated with the group. The group size is dependent on the land area and topography of the valleys in which the group will be deployed. A histogram of the number of clusters per valley as a function of the number of valleys for that group size is shown in Figure 8 and a listing of valley sites and corresponding number of clusters is given in Table 2. A Representative Cluster Group (RCG) consisting of 10 clusters, 10 RSS, and 10 CMF has been defined for the purpose of proposal preparation. The power demand and power characteristics for the RCG, including its supporting facilities, are identified in Table 3.

For most days the RCG power demand is relatively constant averaging 3536 kW with a maximum ±5 percent random load variation. The most severe load requirement may occur one day per month when a number of CMFs could be manned and operated simultaneously. The resulting RCG worst case load profile is shown in Figure 9. Peak power is 3970 kWe and the average power for this worst case day is 3730 kW. Load demands for other cluster group sizes are given in Figure 10.

The cluster power interfaces with the utilities are at the Distribution Centers (see Figure 8, Attachment J). The cluster RES interfaces with the user loads are at the individual shelters, RSSs, CMFs (and ASCs when associated with a cluster).

4.2.3 Operating Bases

Operating Base power loads are divided into electrical and thermal demands. Thermal demands include heating, cooling, and domestic hot water heating. Determinations of Operating Base load profiles was based on the use of peak power demands furnished by SAC and the use of load profiles available for operating military bases but corrected for the effects of size, location, and climate of the MX-RES Operating Bases. These profiles are likely to change as the bases become better defined.

For purposes of this proposal, OB #1 is considered to be the baseline operating base. Load requirements for this base include demands of a DAA, an OBTS, and an ASC, all collocated with the base. The total population of this base is 18,610, which includes all personnel both military and civilian, who reside on the base. OB #2 is a satellite base for which power requirements have been scaled down from OB #1 based on: (1) a population of 10,236, all residing on base, and (2) one collocated facility, an ASC. OB #1A is a scaled-up version of OB #1 assuming the base, its population and its collocated facilities to be constant with OB #1, and requirements are added to support a civilian base-related population of 12,500 who reside off base, but in near proximity to the base. The total population of OB #1A is, therefore 31,110.

An RES electrical load interface is located at a substation at each Base (see Figures 11 and 12, Attachment J, for OB #1 (Beryl) and OB #2 (Ely), respectively. The thermal load interface will be located at the Base Thermal Distribution Center collocated with the bases (see Figures 22 and 12, Attachment J).

FIGURE 8

Number of Clusters and Valleys

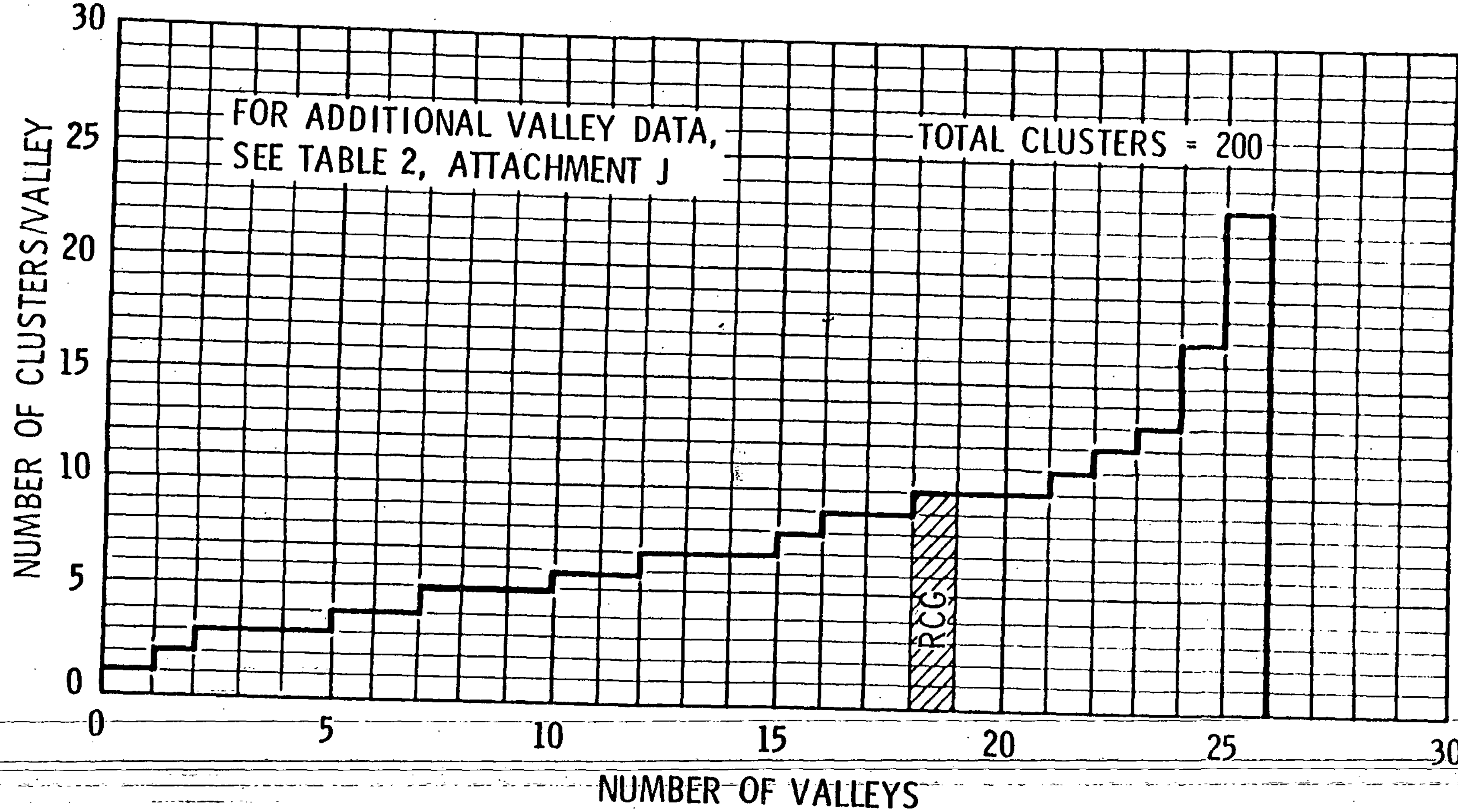


TABLE 2

VALLEY AND POTENTIAL CLUSTER LOCATIONS

Valley	Number of Potential Clusters
UTAH	
Whirlwind	12
Fish Springs	3
Tule	13
Wah Wah	7
Pine	7
Snake	17
NEVADA	
Hamlin	10
Spring	6
Lake	9
Cave	3
Muleshoe	2
Dry Lake (RCG)	10
Delamar	4
Pahroc	1
White River	10
Coal	6
Garden	7
Penoyer	5
Railroad	23
Antelope	8
Little Smoky	3
Big Sand Springs	4
Hot Creek	5
Reveille	5
Stone Cabin	11
Ralston	9
	200

TABLE 3

REPRESENTATIVE CLUSTER GROUP ELECTRICAL POWER DEMAND

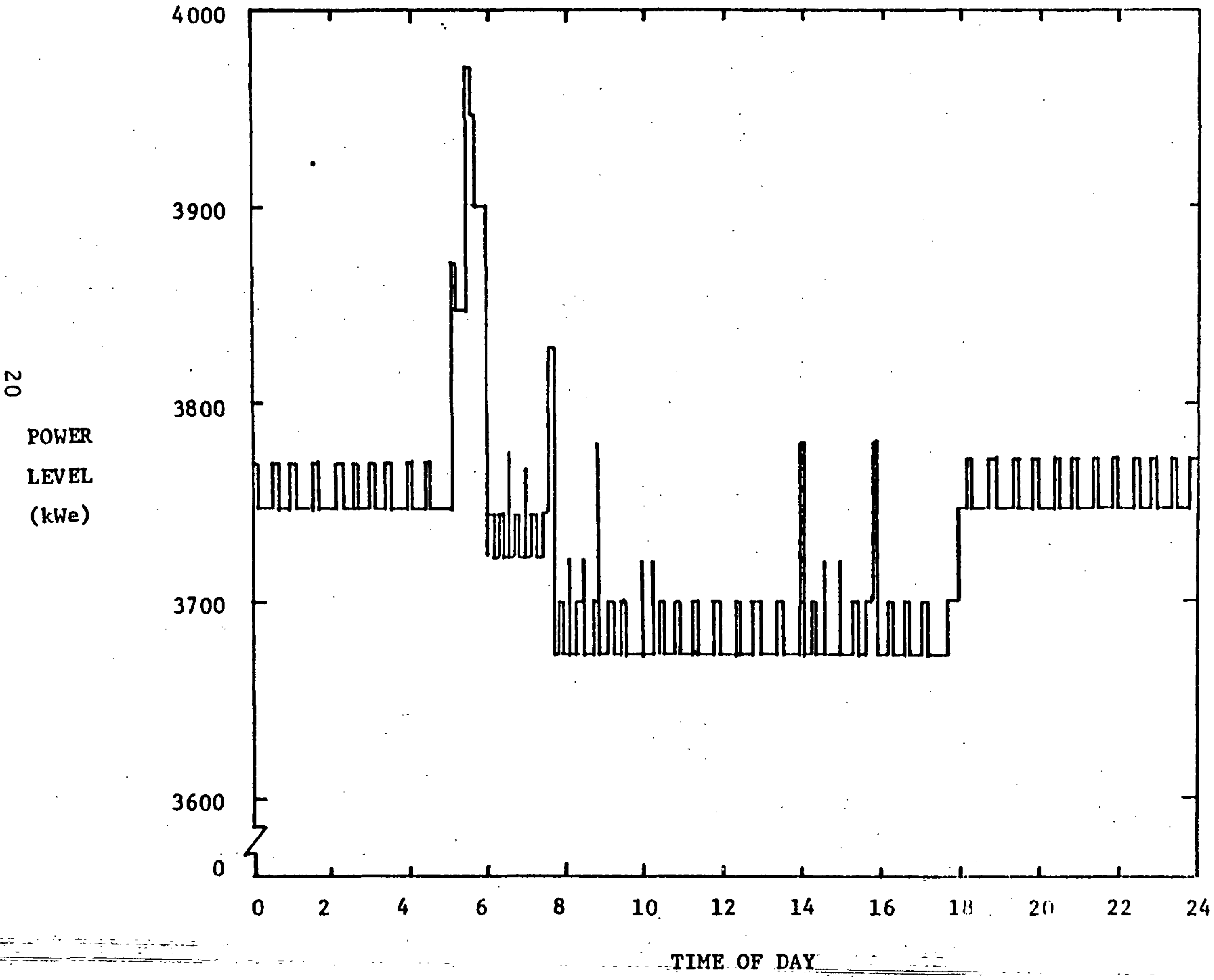
RCG FACILITIES		EACH FACILITY		TOTAL RCG [4]		POWER
FACILITY	NUMBER	AVERAGE (KW)	PEAK (KW)	AVERAGE (KW)	PEAK (KW)	CHARACTERISTICS
SHELTERS	230	14.5	21.06	3361 [1]	NOTE 2	120 ± 5% VDC
CMF	10	8.2 [5]	165.0	82 [5]		25 ± 10% kVAC Frequency Reg. ± 1%
RSS	10	9.3	11.0	93		14.4 ± 10% kVAC Frequency Reg. ± 1%
TOTALS		---	---	3536 [3]	3970	

NOTES:

1. Includes four shelters operating at peak load of 21.06 kW.
2. Does not reflect demand at any time because of diversity.
3. Average RCG power for 29 or 30 days of month; peak day average power is 3730 kW; See Figure 14.
4. Does not include conditioning and distribution losses.
5. Average for the days the CMF is unmanned (29 of 30 days). Monthly average is 11.5 kW which includes one day manned.

Figure 9

MAXIMUM DEMAND DAY POWER LOAD PROFILE

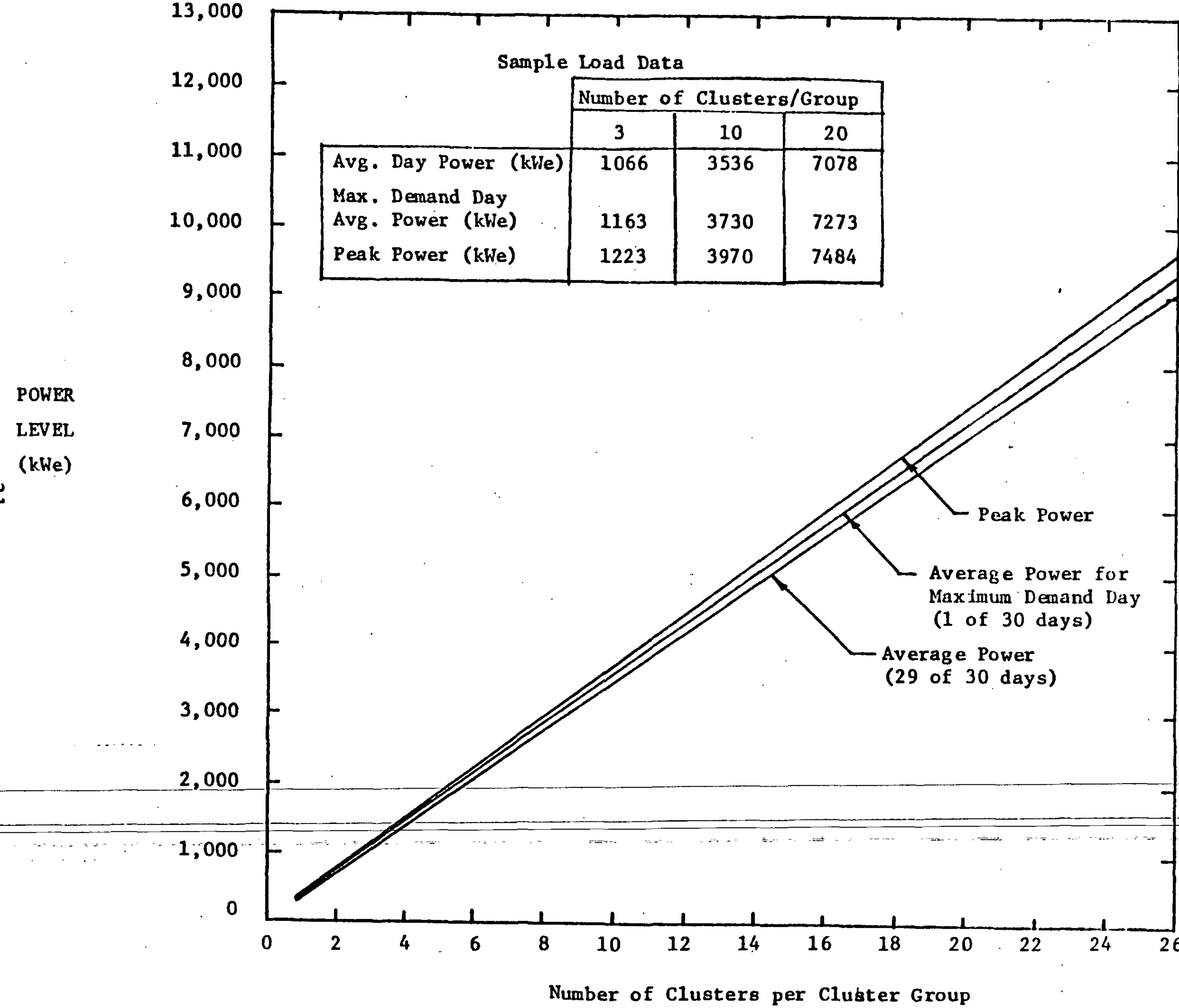


Notes

1. RCG consists of 230 shelters, 10 RSS and 10 CMF
2. Peak Power = 3970 kWe
3. Average Power for Maximum Demand Day = 3730 kWe
4. Maximum Demand Day occurs once per month.

Figure 10

LOAD DEMAND AS A FUNCTION OF CLUSTER GROUP SITE



Sample Load Data

	Number of Clusters/Group		
	3	10	20
Avg. Day Power (kWe)	1066	3536	7078
Max. Demand Day Avg. Power (kWe)	1163	3730	7273
Peak Power (kWe)	1223	3970	7484

4.2.3.1 Electrical Demands

The OB and associated facilities' peak power and average daily energy demands are tabulated in Table 4. Associated with the baseline OB #1 are the DAA, ASC, and OBTS. The average, maximum and minimum day load profiles for this combination are shown in Figure 11. The hourly electrical demand values are repeated in Table 5. The average daily demand and the distribution of daily loads around that average are essentially independent of the time of the year.

Also shown in Table 4 are: (1) the load demand of OB #2 and its associated ASC to be used for the downward adaptation of the baseline design, and (2) the loads for OB #1-A, a larger version of OB #1 to be used for an upward adaptation of the baseline design. The form of the daily load profile for OB #2 and OB #1-A is assumed similar to that of the baseline design as shown in Figure 11.

4.2.3.2 Thermal Demands

The OB thermal energy usage categories are space heating, space cooling, and domestic hot water. Monthly thermal energy demand profiles and the total annual consumption estimates in each category are presented for OB #1, OB #2 and OB #1-A in Figure 12, 13, and 14, respectively. The estimates include the thermal loads associated with the DAA, OBTS, and ASC facilities in the case of OB #1 and OB #1-A, and the thermal loads associated with an ASC in the case of OB #2. However, those facilities contribute only 0.007 percent, 0.004 percent, and 0.012 percent of the annual thermal energy loads for OB #1, OB #1-A, and OB #2, respectively.

The composition of the annual thermal loads is presented in summary form in Table 6.

Figures 15, 16, and 17 present hourly thermal demand profiles for the three OB designations. Also noted in these figures is the peak hourly demand expected in each thermal load category for the maximum demand days in the case of space heating and cooling, and for a typical day in the case of domestic hot water. A tabulation of hourly thermal demands is repeated in Table 7.

The thermal loads given herein are for the thermal energy consumption of buildings and within a five-foot line surrounding each building. Distribution losses between the energy production facilities and the five-foot line as well as losses in energy conversion equipment such as absorption chillers and vapor compression systems are not included in these loads.

4.3 POWER AVAILABILITY REQUIREMENTS

Availability of power at the various MX facilities is based on MX power availability estimates given in paragraph 3.2.5 of this Attachment. Availability is defined as the ratio of the time power of acceptable quality is available to the time it is required, which in the case of MX is continuous.

TABLE 4

MX-RES OPERATING BASE ELECTRICAL LOADS

OPERATING BASE AND ASSOCIATED FACILITIES	AVERAGE DAILY DEMAND (MW)			ANNUAL PEAK DEMAND (MW)	REMARKS
	MAXIMUM DEMAND DAY	AVERAGE DEMAND DAY	MINIMUM DEMAND DAY		
OB #1 (BERYL)	22.7	18.57	15.1	25.27	BASELINE FOR RFP RESPONSE AND MX-RES POINT DESIGN. SEE FIGURE 11 FOR LOAD PROFILES
DAA	8.0	6.54	5.32	8.90	
OBTS	1.0	.81	.66	1.10	
ASC	.46	.38	.3	.51	
OB #1+ FACILITIES	32.16	26.30	21.38	35.78	
OB #2 (ELY)	12.87	10.44	8.49	14.2	FOR DOWNWARD ADAPTATION OF POINT DESIGN (SOW SUBTASKS 2.7 & 4.7)
ASC	.46	.38	.31	.51	
OB #2 +ASC	13.33	10.82	8.80	14.71	
TOTAL OB#1+OB#2+ FACILITIES	45.49	37.12	30.18	---	INCLUDED IN TABLE 1
OB #1A (BERYL)	28.45	23.26	18.9	31.65	FOR UPWARD ADAPTATION OF POINT DESIGN (SOW SUBTASKS 2.7 & 4.7)
DAA	8.0	6.54	5.32	8.9	
OBTS	1.0	.81	.66	1.1	
ASC	.46	.38	.3	.51	
OB #1A + FACILITIES	37.91	30.99	25.18	42.16	

POWER CHARACTERISTICS

Voltage	25 kVAC, 3 phase 4 wire
Frequency	60 Hz
Steady State Voltage Regulation	$\pm$ 10%
Steady State Frequency Regulation	$\pm$ 1%

FIGURE 11

DAILY ELECTRICAL POWER LOAD PROFILE FOR OB #1

(Operating Base #1 with DAA, OBTS, ASC)

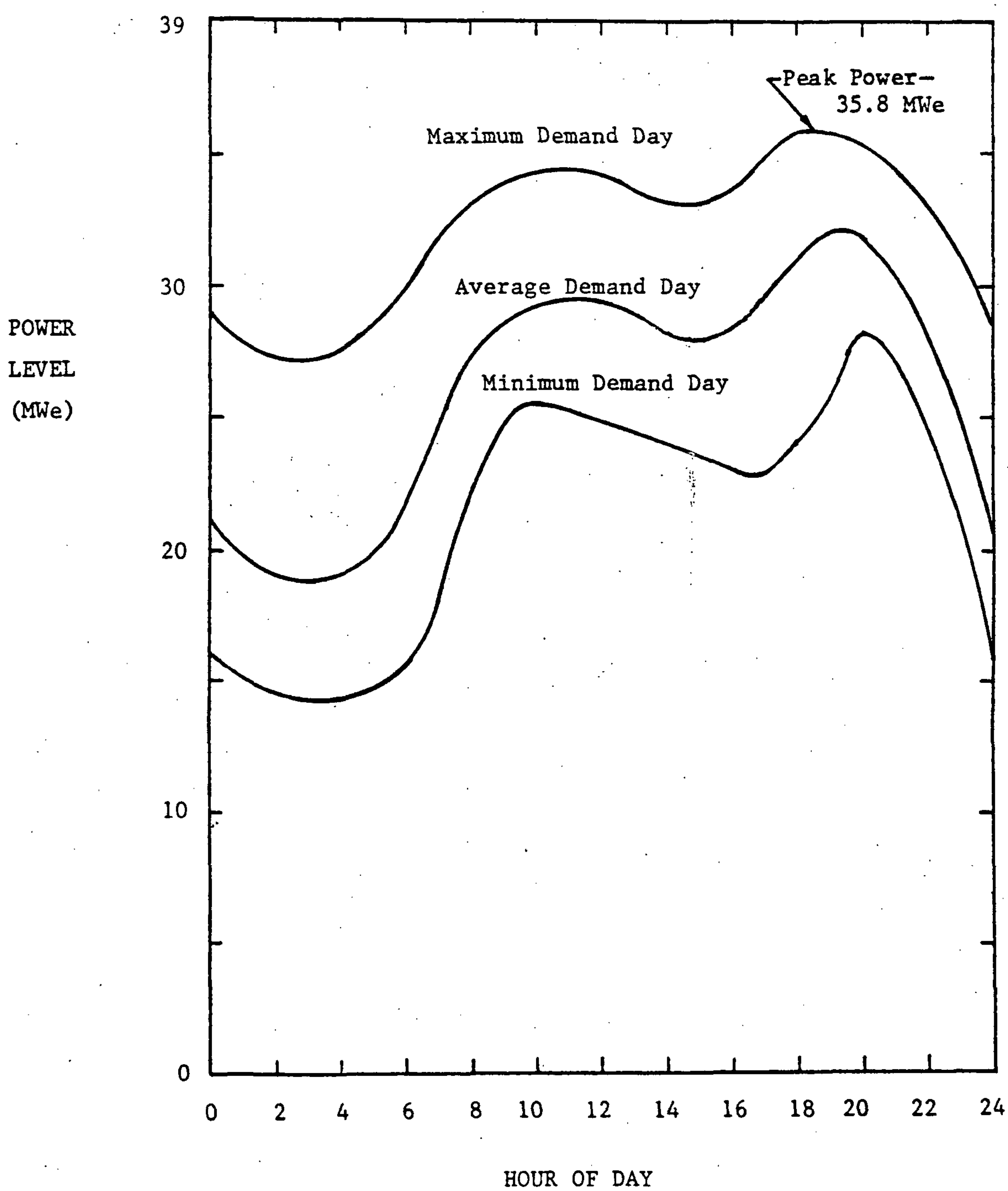


TABLE 5

OB #1 AND ASSOCIATED FACILITIES
HOURLY ELECTRIC DEMANDS (1)
(OB #1 + DAA + OBTS + ASC)

Hour of Day	Min. Demand Day (MWe)	Avg Demand Day (MWe)	Max Demand Day (MWe)
0	15.8	21.1	28.6
1	15.2	19.8	28.3
2	14.4	19.2	27.5
3	14.1	18.9	27.2
4	14.4	19.2	27.9
5	14.7	19.8	28.6
6	15.5	22.4	29.7
7	17.8	24.6	32.2
8	22.0	27.2	33.3
9	24.6	28.8	33.6
10	25.4	29.4	34.0
11	25.4	29.4	34.3
12	24.9	29.4	34.0
13	24.6	28.8	33.6
14	24.0	28.2	33.3
15	23.7	28.2	33.3
16	23.2	28.5	33.6
17	23.2	29.5	34.7
18	23.7	31.0	35.8
19	25.4	32.0	35.8
20	28.2	31.7	35.4
21	27.4	30.4	34.3
22	24.3	28.5	32.9
23	21.2	24.6	30.8
Daily Average	21.4	26.3	32.2

(1) Tabulation of data shown in Figure 11

FIGURE 12

MONTHLY THERMAL DEMAND PROFILE FOR OB#1
(10^6 BTU)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Consumption
Sp. Htg.	79,770	63,640	58,410	37,920	20,050	6,105	0	436	8,280	30,080	55,795	75,410	435,896
Sp. Cool.	0	0	0	0	2,120	22,805	67,270	53,260	15,960	1,465	0	0	162,880
DHW	3,965	3,585	3.965	3,840	3,965	3,840	3,965	3,965	3,840	3,965	3,840	3,965	46,700
TOTALS	83,735	67,225	62,375	41,760	26,135	32,750	71,235	57,661	28,080	35,500	59,635	79,375	645,476

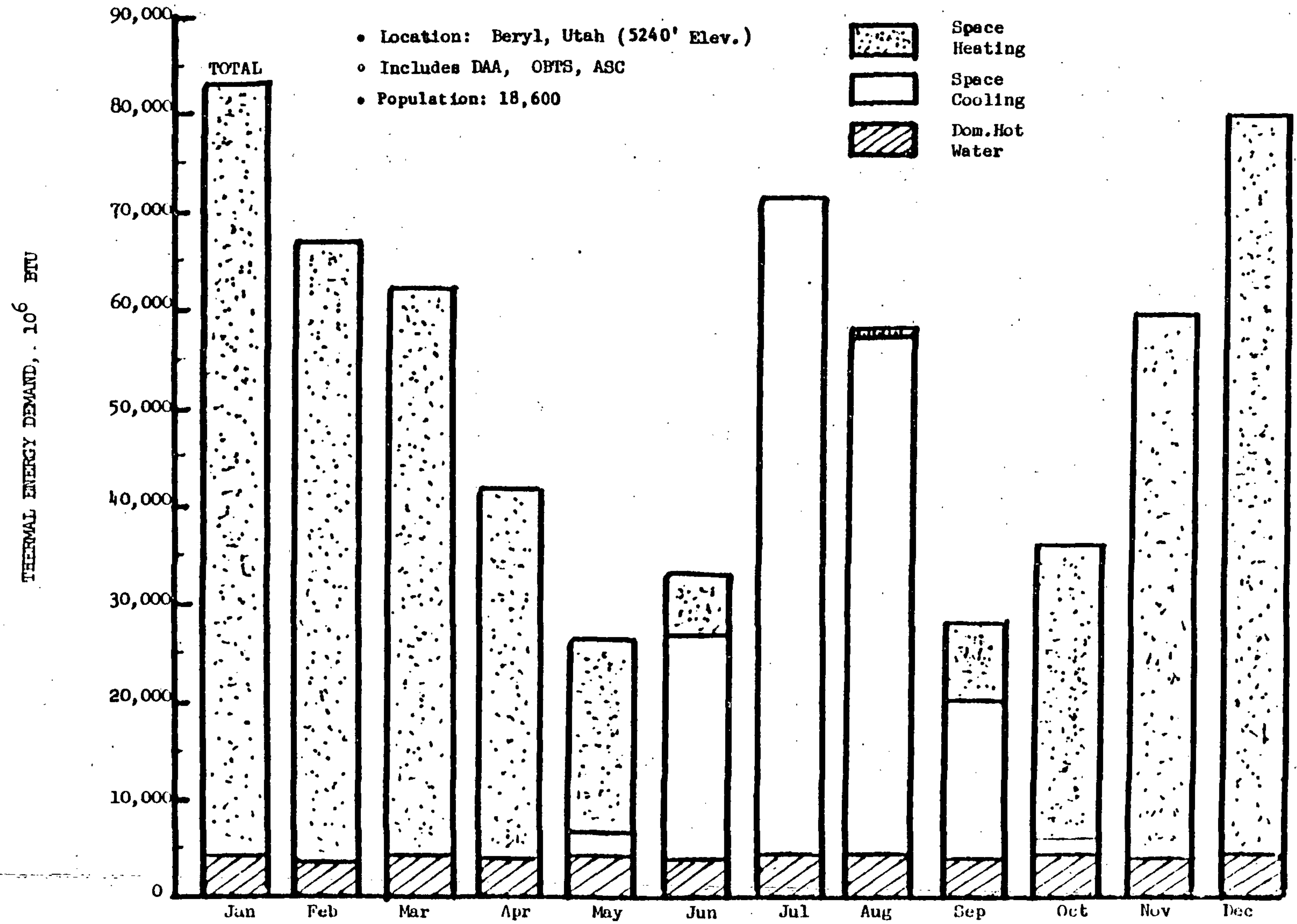


FIGURE 13

MONTHLY THERMAL DEMAND PROFILE FOR OB#2
(10^6 BTU)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Consumption
Sp.Htg.	49,500	40,145	38,635	27,470	18,110	9,355	905	2,415	10,265	22,640	35,920	46,485	301,845
Sp.Cool.	0	0	0	0	0	2,515	10,535	8,825	1,850	0	0	0	23,725
DHW	2,330	2,105	2,330	2,255	2,330	2,255	2,330	2,330	2,255	2,330	2,255	2,330	27,435
	51,830	42,250	40,965	29,725	20,440	14,125	13,770	13,570	14,370	24,970	38,175	48,815	353,005

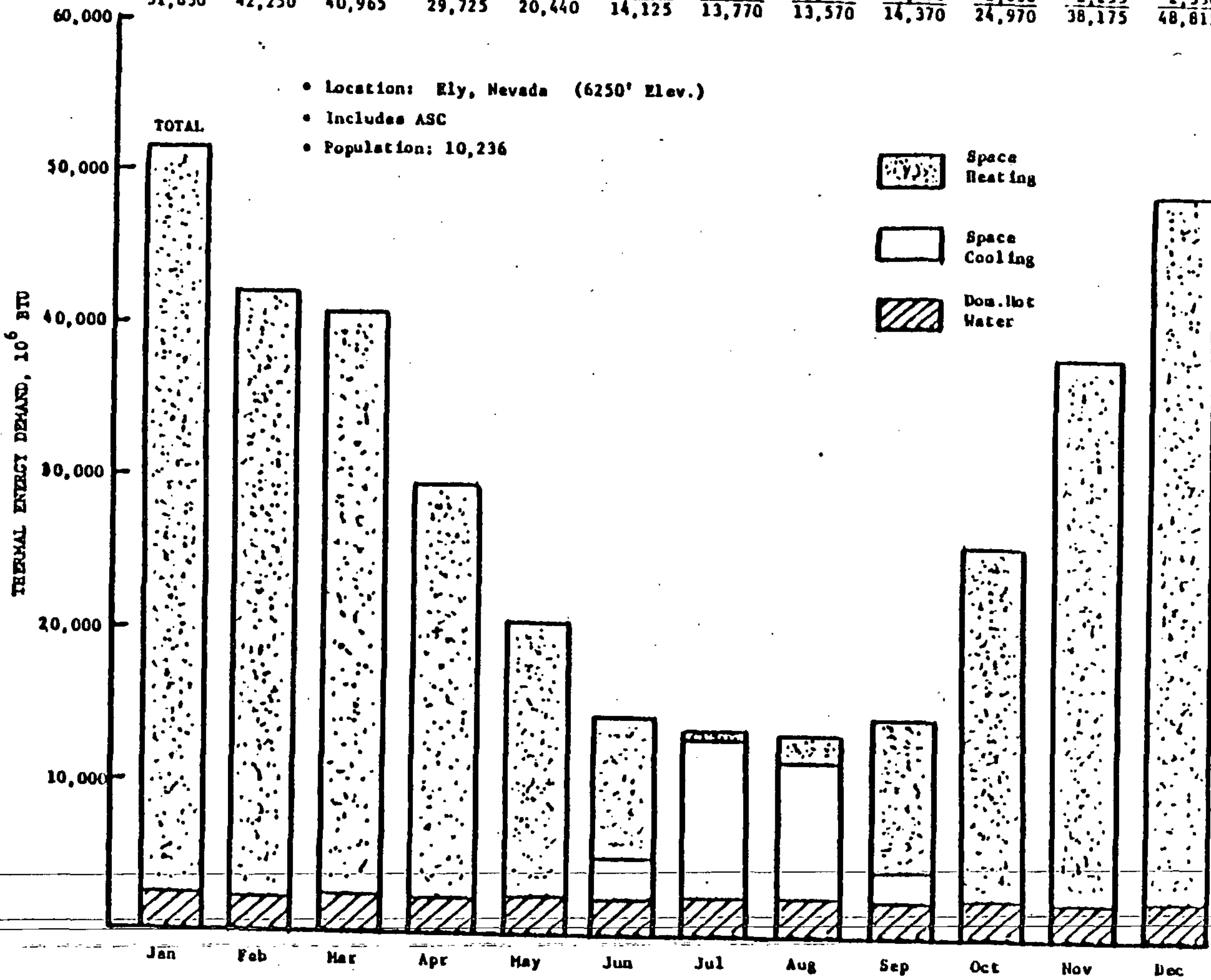


FIGURE 14

MONTHLY THERMAL DEMAND PROFILE FOR OB#1-A

(10^6 BTU)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Consumption
Sp.Htg.	132,905	106,030	97,320	63,185	33,410	10,170	0	726	13,800	50,110	92,960	125,640	726,296
Sp.Cool.	0	0	0	0	3,530	38,000	112,090	88,750	26,600	2,440	0	0	271,410
DHW	6,610	5,970	6,610	6,395	6,610	6,395	6,610	6,610	6,395	6,610	6,395	6,610	77,820
	139,515	112,000	103,930	69,570	43,550	54,565	118,700	96,086	46,795	59,160	99,355	132,250	1,075,486

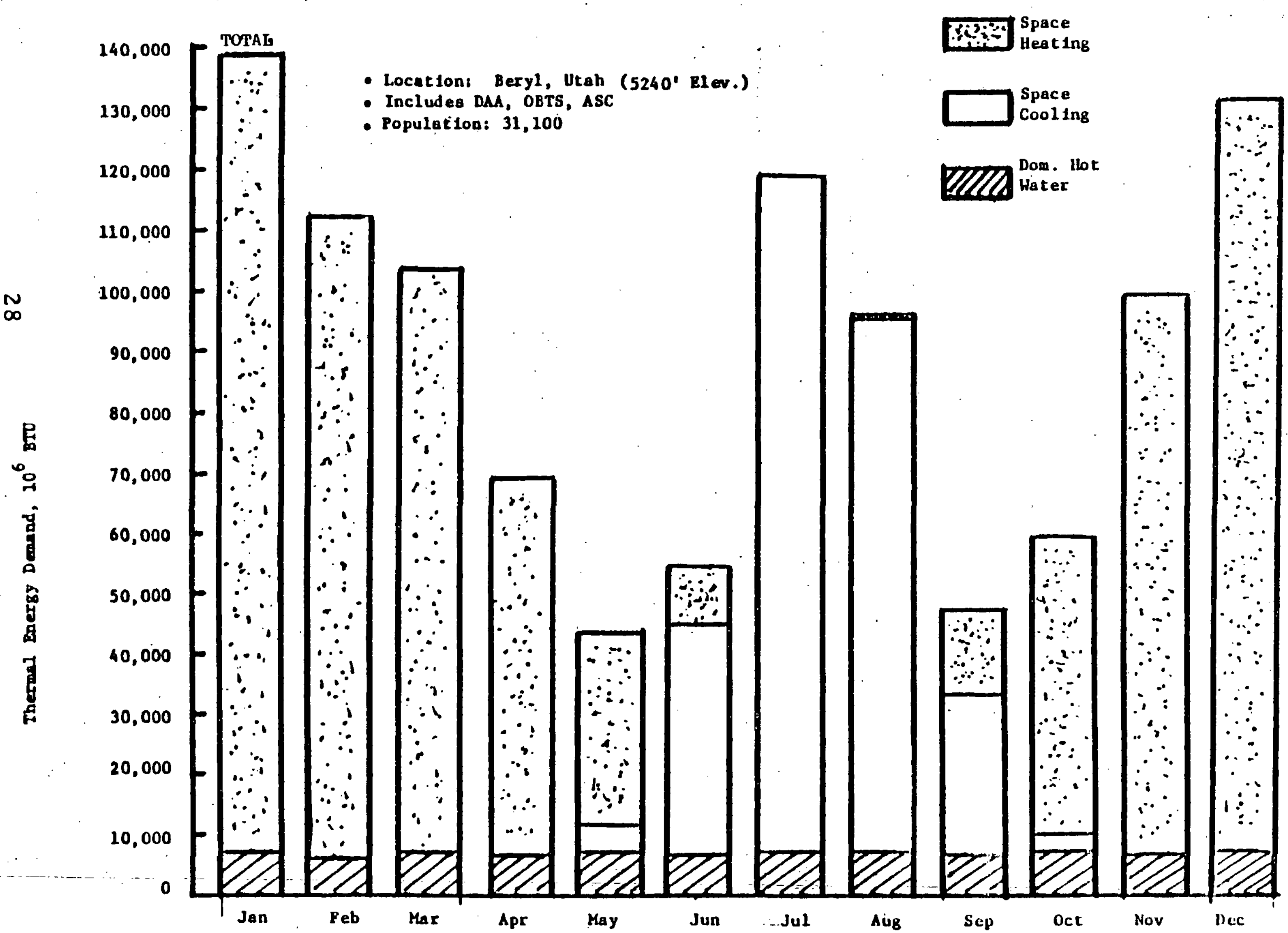


TABLE 6

COMPOSITION OF ANNUAL THERMAL ENERGY LOADS FOR OB#1, OB#2, AND OB#1-A

Facility	Annual Space Heating Consumption (BTU/Yr)	Annual Space Cooling Consumption (BTU/Yr)	Annual DHW Consumption (BTU/Yr)	Total Thermal Energy Usage (BTU/Yr)
OB#1 Base (18,600 Pop)	$435{,}540 \times 10^6$	$162{,}792 \times 10^6$	$46{,}690 \times 10^6$	$645{,}022 \times 10^6$
DAA	10×10^6	3×10^6	negligible	13×10^6
OBTS	1×10^6	negligible	negligible	1×10^6
ASC	345×10^6	87×10^6	negligible	432×10^6
Totals	$435{,}896 \times 10^6$	$162{,}882 \times 10^6$	$46{,}690 \times 10^6$	$645{,}468 \times 10^6$
OB#2 Base (10,236 Pop)	$301{,}500 \times 10^6$	$23{,}638 \times 10^6$	$27{,}443 \times 10^6$	$352{,}581 \times 10^6$
ASC	345×10^6	87×10^6	negligible	432×10^6
Totals	$301{,}845 \times 10^6$	$23{,}725 \times 10^6$	$27{,}443 \times 10^6$	$353{,}013 \times 10^6$
OB#1-A Base (31,100 Pop)	$725{,}900 \times 10^6$	$271{,}320 \times 10^6$	$77{,}817 \times 10^6$	$1{,}075{,}037 \times 10^6$
DAA	10×10^6	3×10^6	negligible	13×10^6
OBTS	1×10^6	negligible	negligible	1×10^6
ASC	345×10^6	87×10^6	negligible	432×10^6
Totals	$726{,}256 \times 10^6$	$271{,}410 \times 10^6$	$77{,}817 \times 10^6$	$1{,}075{,}483 \times 10^6$

FIGURE 15

HOURLY THERMAL DEMAND PROFILES FOR OB#1
(Beryl, Utah)

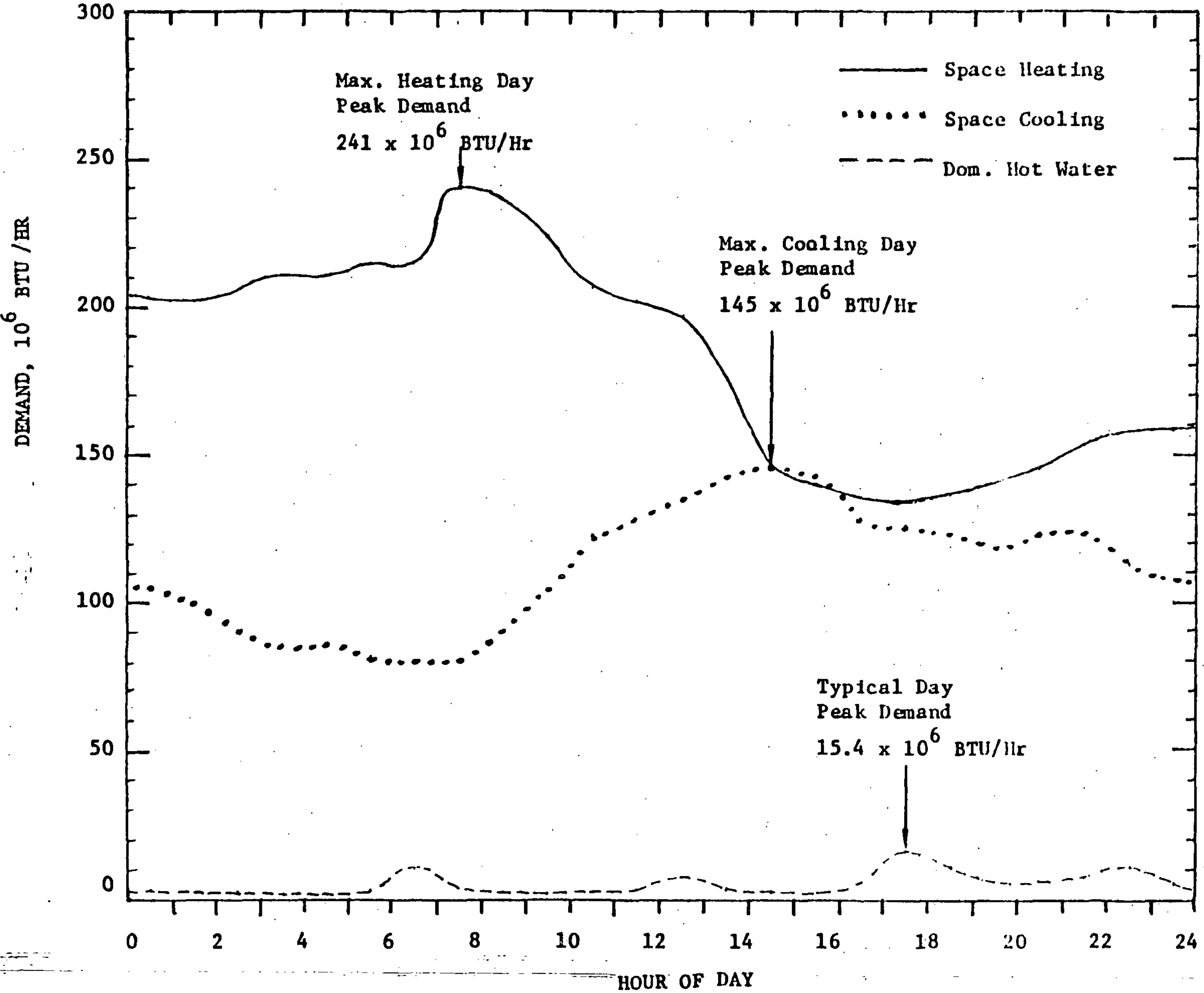


FIGURE 16

HOURLY THERMAL DEMAND PROFILES FOR OB#2

(Ely, Nevada)

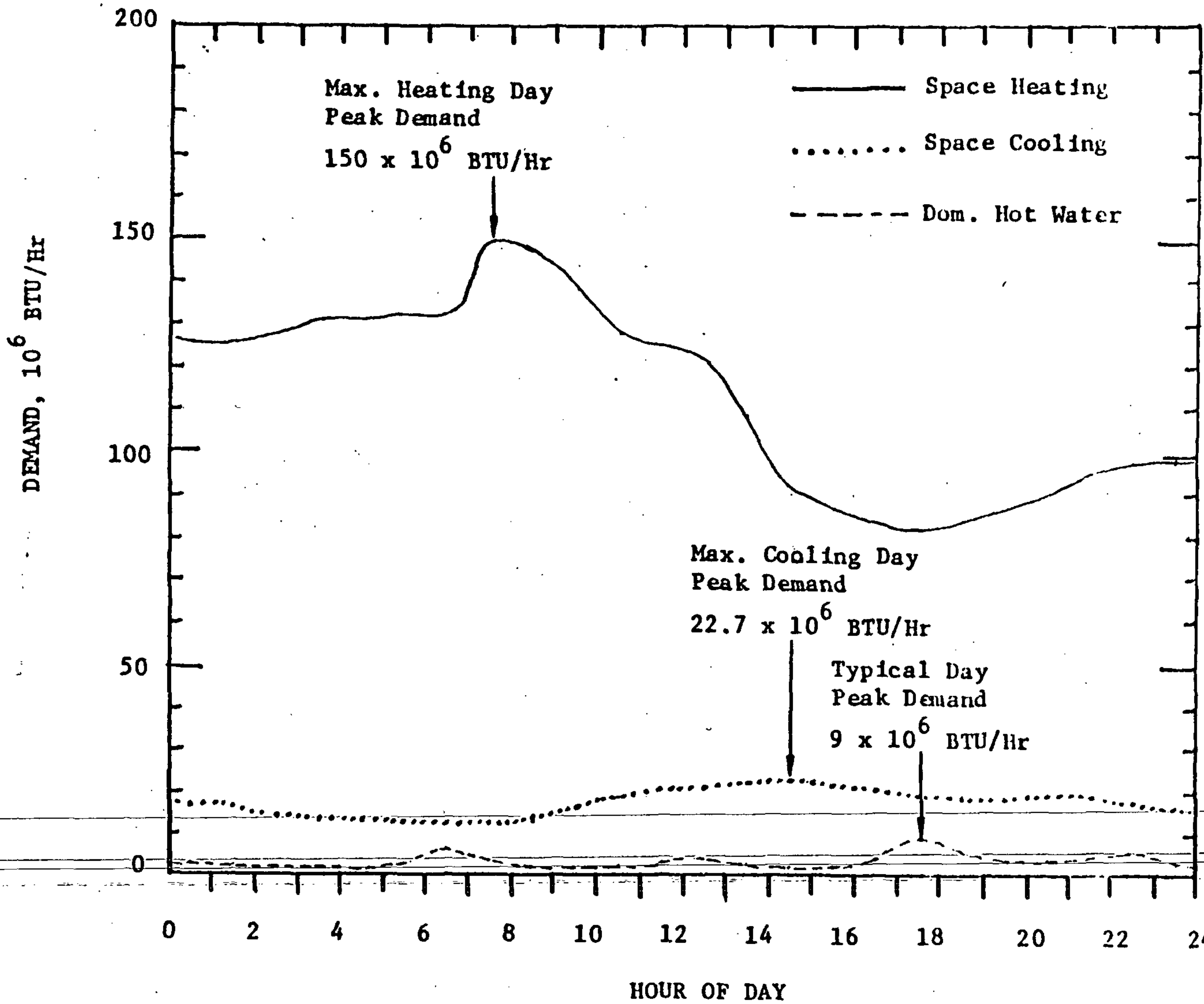


FIGURE 17

HOURLY THERMAL DEMAND PROFILES FOR OB#1-A
(Beryl, Utah)

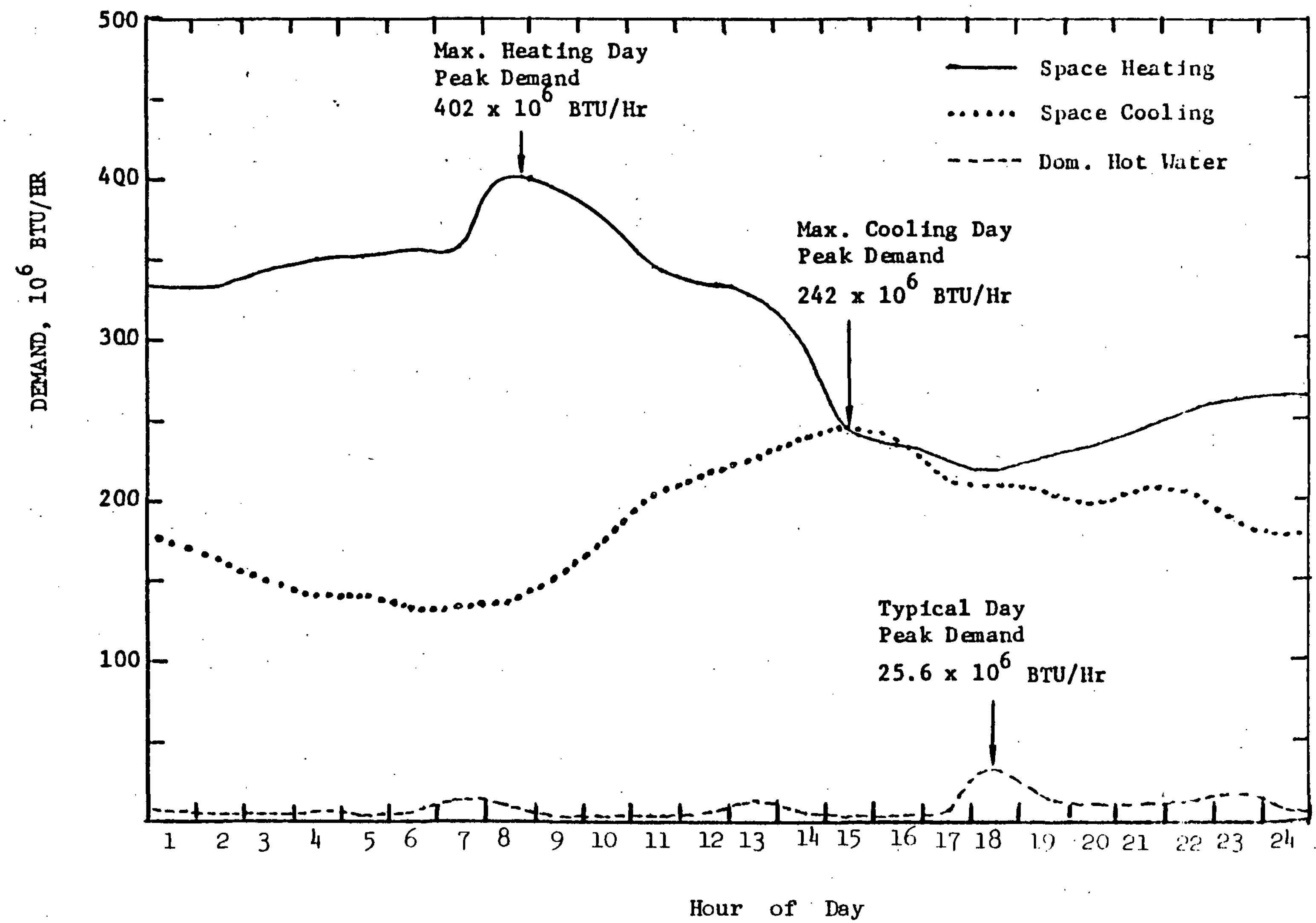


TABLE 7

HOURLY THERMAL DEMAND ESTIMATES

(10^6 BTU)

Hour of Day	Space Heating (Max. Heating Day)			Space Cooling (Max. Cooling Day)			Dom. Hot Water (Typical Day)		
	OB#1	OB#2	OB#1-A	OB#1	OB#2	OB#1-A	OB#1	OB#2	OB#1-A
1	202	125	336	105	16.4	175	3.8	2.2	6.4
2	202	125	336	100	15.6	166	3.2	1.9	5.3
3	206	128	343	91	14.3	152	2.6	1.5	4.3
4	211	131	351	86	13.5	143	1.9	1.1	3.2
5	211	131	351	86	13.5	143	1.3	0.7	2.1
6	215	133	358	81	12.6	135	3.8	2.2	6.4
7	215	133	358	81	12.6	135	10.2	6.0	17.0
8	241	150	402	81	12.6	135	6.4	3.7	10.6
9	237	147	395	91	14.3	152	2.6	1.5	4.3
10	224	139	373	105	16.4	175	2.6	1.5	4.3
11	206	128	343	124	19.4	206	2.6	1.5	4.3
12	202	125	336	129	20.2	219	3.8	2.2	6.4
13	197	122	329	135	21.0	224	7.7	6.4	12.8
14	195	109	242	143	22.3	238	3.8	2.2	6.4
15	145	90	241	145	22.7	242	2.6	1.5	4.3
16	140	87	234	143	22.3	238	2.6	1.5	4.3
17	136	84	226	129	20.2	215	5.1	3.0	8.5
18	132	82	219	126	19.8	211	15.4	9.0	25.6
19	136	84	226	124	19.4	206	10.2	6.0	17.0
20	140	87	234	118	18.5	197	6.4	3.7	10.6
21	145	90	241	124	19.4	206	6.4	3.7	10.6
22	154	95	256	124	19.4	206	7.7	4.4	12.8
23	158	98	263	113	17.7	188	10.2	6.0	17.0
24	158	98	263	108	16.8	179	5.1	3.0	8.5
TOTAL	4,387	3,722	7,310	2,691	421	4,484	128	75	213

The power availability requirement at the interface of each technical facility, i.e., each shelter and each RSS, is 0.9999. The power availability requirement at the interface of each nontechnical facility, i.e., OBs, DAAs, ASCs, OBTS, and CMFs is 0.999.

It is not to be assumed that the utility grid or MX standby diesel generators are available as backup power sources for the MX-RES system. The need for and the amount of backup power to meet the MX-RES power availability requirements are to be determined by the RES contractor. If the utility grid is used to assure RES availability for clusters and OBs, the utility power availability shall be assumed to be 0.9990 at the input to the distribution centers and at the OB substations. In the case of stand-alone MX-RES shelter design, the utility grid cannot be used and therefore the design of all power units and their availability to the shelter will be the responsibility of the RES contractor.

4.4 DESIGN LIFE

The MX-RES design life is 30 years.

5.0 ACRONYMS

5.1 GENERAL

The following is a list of acronyms commonly referred to in this document.

A&CO	-	Assembly and Checkout
ASC	-	Area Support Center
AS&I	-	Assembly, Surveillance and Inspection
BMO	-	Ballistic Missile Office
BPS	-	Baseline Power System
C^3	-	Command, Control, Communication
CA	-	Contract Award
CMF	-	Cluster Maintenance Facility
DAA	-	Designated Assembly Area
DDA	-	Designated Deployment Area
DOD	-	Department of Defense
DOE	-	Department of Energy
DSARC	-	Defense Systems Acquisition Review Council
DTN	-	Designated Transportation Network
ECS	-	Environmental Control System
EIS	-	Environmental Impact Statement
ESAAB	-	Energy Systems Acquisition Advisory Board
FSED	-	Full Scale Engineering Development
G&C	-	Guidance and Control
IOC	-	Initial Operation Capability
ISDR	-	Incremental System Design Review
MDR	-	Missile Design Review
MOSE	-	Mobile Operational Support Equipment
MSA	-	Major Systems Acquisition
MX	-	Missile X
OB	-	Operating Base
OBTS	-	Operational Base Test Site
O&S	-	Operation and Support
OSE	-	Operational Support Equipment
PLU	-	Preservation of Location Uncertainty

PS	-	Protective Structure
PSS	-	Physical Security System
QD	-	Quantity Distance
RCG	-	Representative Cluster Group
RES	-	Renewable Energy System
ROSE	-	Resident Operational Support Equipment
ROSEE	-	Resident Operational Support Equipment Enclosure
RSS	-	Remote Surveillance Site
SAC	-	Strategic Air Command
SAL	-	Strategic Arms Limitation
SCADA	-	Supervisory, Control and Data Acquisition
SDR	-	System Design Review
STML	-	Separate Transporter and Mobile Launcher
UPS	-	Uninterruptible Power Supplies
VAFB	-	Vandenberg Air Force Base
VHMPS	-	Verifiable Horizontal Multiple Protective Structure