CONFIDENTIAL

REPORT

ON

ELECTRIC POWER SERVICE FACILITIES

AT

[redacted]

25X1A6d

Prepared by

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OFFICE OF LOGISTICS

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INTRODUCTION

This report consists of a review of the electrical power facilities [redacted]", aimed at determining the changes required to make these facilities adequate for the purpose intended. There are two main parts, one for [redacted] and one for [redacted], followed by a summary of recommendations and an estimate of cost. 25X1A 25X1A 25X1A

Summary of report is on page 4 of Section titled "[redacted] 25X1A

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ESTIMATE OF THE SITUATION

PROBLEM: Revise present power system to provide adequate commercial power for all needs, and an emergency source for essential needs.

FACTS BEARING ON THE PROBLEM:

a. Present service consists of a 2400-volt line, connected to the power company's single-phase line at the eastern edge of the Government property and coming in to a 50 KVA transformer which, in turn, is connected by a short 240/120-volt line to the electrical load center housed in an adjacent building. See Drawing "A".

b. Power company owns above lines and transformer.

c. Emergency power is presently available from a 75 KVA single-phase diesel-driven generator, located at the load center.

d. Total connected load [redacted] is 250 KVA. Present maximum demand is approximately 70 KVA, which is approached at least once a day. Average load, based upon observations, is 55 KVA during a working day. 25X1A

e. Power company is willing to convert the present 50 KVA single-phase service to a 112½ KVA, three-phase service, utilizing the present access route. Power will be metered at low voltage.

f. Power company is also willing to furnish three-phase service at any suitable point along the east and south sides of the Government reservation. In this case, the Government would buy power at high voltage at the property line.

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g. All power is now metered at low voltage in the [redacted] load center.

h. Present load center is connected for single-phase distribution.

i. Majority of local feeders are underground. Feeder to residences, dispensary, warehouse and motor pool are overhead.

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j. In the event of an emergency necessitating operation [redacted] on a full-use basis, the average electrical load [redacted] would increase by a large amount, roughly estimated to be at least triple, and possibly more.

k. Feeder [redacted] is operating near full load and running warm.

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l. A survey of the reservation indicates that the most desirable location for the emergency generating station, is in the open area between [redacted] This is considered to be the optimum with respect to noise of operation and proximity to the existing load center. See Drawing "A".

m. Serious consideration is being given to the construction of a Records Center Building. This would be an additional load of approximately 100 KVA, based upon complete air conditioning, elevator and fluorescent lighting with some supplementary incandescent lighting.

POLICIES PERTAINING TO THE PROBLEM:

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a. The facilities at this [redacted] shall be ready for full-scale operation in event of a national emergency, involving "round-the-clock" support of existing facilities and additional temporary facilities.

b. Electrical facilities must permit reasonable expansion at any time with a minimum of basic change in installed facilities and a minimum of additional expense.

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c. [redacted] operating and maintenance personnel shall be as few as possible.

DISCUSSION: The problem divides into three main considerations:

a. Determine, as nearly as possible, the various loads obtained under full-scale, around-the-clock emergency conditions, in order to arrive at suitable transformer and emergency generator capacities.

b. Determine optimum route for the power line, and whether it should be high or low voltage.

c. Resolve corollary problems.

Regarding the various loads, there is rather little factual information or experience data available and it becomes necessary to make certain assumptions.

Reference is made to Tab 1. Accepted demand factors have been applied to each building in accordance with the type and purpose of the connected load. Based upon these computations, a maximum demand has been determined for each building, and an 25X1A apparent total maximum demand [redacted] This apparent maximum demand has been reduced by a diversity factor, since the probability is rather remote that the maximum demands for all buildings will occur at the same time. The conditions imposed by a full-use, around-the-clock, situation can be severe and it is felt that the diversity factor should not be less than 0.90. This results in a computed maximum demand, for the whole station, of 195.91 KVA for the present connected load, or a [redacted] demand 25X1A factor of 0.77.

In addition to the present connected load, certain demands will be created by temporary quarters and facilities which will be constructed in the event of a national emergency. The extent of these demands can only be approximated. However, it is considered that the amount and demand factor would not be such as to cause a sustained station load in excess of the 225 KVA transformer capacity.

In view of the foregoing discussion, the estimated total maximum demand under emergency conditions is 195.91 KVA. The nearest standard size transformer bank is 225 KVA, consisting of three (3) 75 KVA transformers. It is recommended that such capacity be installed.

Regarding the new Records Center Building, this is a substantial load which should be served independently at high-line voltage, 2400-volts, with a separate transformer bank located at the building. The 25X1A possible advent of such a building does not have any effect on determining the size of transformer bank needed for the present [redacted] load and can be disregarded at this time.

It is contemplated that three diesel-driven generators are required to provide standby power. The available generators are skid-mounted, General Motors 75 KVA, 80% Power Factor machines, self-contained, except for fuel supply. One would be sufficient

25X1A to carry the Office and Dispensary and Guard Stations, with the remainder [redacted] entirely off except for a few small lights. An additional generator would permit all refrigeration and heating and a limited use of lights and electric cooking. A third generator would provide relief for the first two on a rotational basis. At present, only two generators are available for installation [redacted]. It is recommended that a power-house be constructed to accommodate three generators and that the two available machines be installed and a third machine be procured for later installation.

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Regarding an optimum route for the power line (incoming), three possibilities have been considered and one appears as an optimum solution. Briefly, these are:

Route A - utilize route of existing pole line.

Route B - install underground cable as indicated on Drawing "A".

Route C - construct new pole line along route indicated on Drawing "A".

Analysis of Route A:

Route A has been ruled out because, as can be seen from Drawing "A", the present single-phase power line is uncomfortably close to the water tank [redacted] passing between these structures with a minimum side clearance of ten (10) feet, which is not a desirable condition. This route places the power line in close proximity with several radio antennas mounted on [redacted] thereby creating an interference problem. Also, the low voltage feeder from the transformers would pass under the roadway, necessitating expensive trenching.

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The maximum transformer capacity which the power company is willing to install is 112½ KVA, based upon current load conditions. The power company does not choose to recognize the need for providing sufficient transformer capacity as standby for all-out, full-use, operation. Further, they will not change the pole line from single to three-phase operation unless they also own the transformer bank to be served. This leaves the Government with very little option, since the [redacted] load under emergency conditions would exceed 112½ KVA by a considerable margin. As an alternative, the possibility of purchasing Route A and making necessary alterations thereto has been considered. However, the inherent faults of this route and the cost of the alterations combine to make this alternative appear impractical and not productive of the desired results.

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In view of the foregoing discussion, Route A has been eliminated from consideration.

Analysis of Route B:

Route B has been ruled out because of cost and certain inherent faults.

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Because of crowded conditions in the vicinity of the [redacted] load center, it would be necessary to locate the transformers at the property line, as shown on Drawing "A". Thus, the underground line would operate at 120/208-volts, requiring multiple cables in order to carry a load in the neighborhood of 800 amperes. This type of construction is quite expensive, and the amount of clearing and trenching would make the whole cost of the incoming line prohibitive.

In addition to the high cost, Route B has certain features of inflexibility. With this route, the emergency power change-over switch necessarily would be located at the load center instead of the diesel powerhouse, so that the procedure of changing over to diesel operation would be awkward and time-consuming. Also, the metering point for Route B is screened from the rest of the reservation by undergrowth, trees and buildings, so that the constructing of the 2400-volt line to serve the new Records Center Building would be impractical and expensive.

In view of the foregoing discussion, Route B has been eliminated from consideration.

Analysis of Route C:

Route C appears to overcome the disadvantages of A and B and to have some advantages of its own. It would be over open ground at a comfortable distance from buildings and antennas and would run through a "draw" where no future building construction is likely. This route would run directly to the proposed powerhouse and transformer station so that there need be only one short low voltage feeder running to the load center. Route C has no clearing problems and no roadways to trench across. The line would be overhead and could be tapped at any point to provide service for the Records Center Building.

In view of the foregoing advantages, it is recommended that Route C be employed.

Regardless of the route employed, however, there are certain corollary problems arising in connection with any steps 25X1A taken to correct the power situation [redacted]. As stated earlier in this report, the power company does not choose to recognize the need for providing sufficient transformer capacity at their expense as standby for all-out, full-use, operation of 25X1A [redacted]. Further, they do not wish, as a matter of policy, to have any of their lines or transformers on Government property. As a result, in order to have adequate incoming power line and 25X1A transformer capacity at [redacted], they must be Government-owned, with power being metered at the property line.

Ownership of the facilities involves a maintenance program to insure proper functioning of the service at all times. This is not a serious problem but one that nevertheless must be resolved. Poles, lines, transformers, etc., must be inspected at intervals and necessary corrective action taken. There are two ways in which this may be accomplished, namely, by contract or by Government personnel.

The preferable method is by Government personnel, since this assures prompt service and good security. One man added to the present force, with such occasional assistance as may be required, could conduct routine maintenance of power facilities at both 25X1A [redacted] and also be available for other kindred duties. It is strongly recommended that, except for major repair 25X1A work, the maintenance of electric service facilities [redacted] 25X1A [redacted] be discharged by a qualified man added to the [redacted] 25X1A maintenance group. A grade of GS-9 should be assigned.

The alternate method of providing routine maintenance on a contract basis is not feasible. In addition to the service and 25X1A6d security considerations, there is no concern in [redacted] which is considered qualified in high-line and transformer work. A Washington concern seems the most likely in this case.

CONCLUSION

It is recommended that facilities for 225 KVA of public utility 25X1A and emergency standby electric power service be installed [redacted] 25X1A [redacted] utilizing Route "C" as shown on Drawing "A". Estimated cost of this work is $16,995.00 as shown in TAB 2.

It is further recommended that one GS-9 maintenance man be 25X1A added to the station complement, for electrical maintenance at [redacted]

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ESTIMATE OF THE SITUATION

PROBLEM: Revise present power distribution system to provide emergency power to all points of usage.

FACTS BEARING ON THE PROBLEM:

a. Emergency power for the [redacted] and quarters area only is presently available from a 312 KVA, three-phase diesel-driven generator, located in Building 11 as shown on Drawing "B". 25X1A6d

b. Total connected load on station is 468 KVA. Present maximum demand is 143 KVA. Average load, based upon observations, is 85 KVA.

25X1A c. In the event of an emergency necessitating operation
25X1A [redacted] on a full-use basis, the average electrical load [redacted] would increase by a large amount, roughly estimated to be at least triple.

d. Present commercial service consists of a 12,500/7200-volt line, connected to the power company's three-phase line at the northern edge of the Government property and feeding six (6) widely separated points of usage, as shown on Drawing "B". All power is now metered at low voltage at six (6) different points on the station.

e. Approximately half of above line is jointly occupied by power line and telephone cable. Telephone company owns all poles on which their cable is carried. Power company owns all poles which are occupied only by power lines, and all power lines and equipment.

f. Power and telephone companies are willing to sell their poles, power lines and power line equipment. Power would then be metered at high voltage at the property line.

POLICIES PERTAINING TO THE PROBLEM:

a. The electrical system [redacted] shall be ready for "full-blast" operation in the event of a national emergency, involving "around-the-clock" support of expanded facilities. 25X1A

25X1A b. [redacted] operating personnel shall be adequate for maintenance of a Government-owned distribution system.

DISCUSSION: The problem divides into two main considerations:

a. Review of the connected load to determine the adequacy of the presently installed emergency generator.

b. Determine optimum distribution system for supplying the entire station from the emergency generator.

Review of Connected Load:

Regarding the adequacy of the existing generator, this machine should be sufficient to supply [redacted] on a full-use basis. Applying the same demand factor as was developed for [redacted], the maximum demand appears to be 77% of 468 KVA, or 360 KVA. By judicious use of lights, and electrical devices, the total [redacted] load can be held at or near the generator capacity of 360 KVA. Additional economy measures in the use of communications and mess hall equipment, without interfering with operations, should further reduce the load when operating on the emergency generator. The alternative is to install an additional generator, which, at the rate of $125,000.00 each, is out of proportion to the small advantage gained. It is recommended that no additional generating capacity be contemplated unless an appreciable addition is made to present [redacted] facilities.

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Determination of Optimum Method of Distribution:

In order to transmit power from the emergency generator to all points of usage, it is necessary to modify the present distribution system or build such a system.

The obvious solution is to utilize the existing lines on the [redacted] since they can be energized by the generator through the adjacent 225 KVA transformer bank. Thus, the tower, sewage plant, laboratory building and pumping station would receive high voltage service through the individual local transformer banks while the [redacted] and quarters area would receive low voltage service directly from the generator as now provided. This method is electrically sound but it involves some other considerations.

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The above method involves the use of a portion of the power company's high voltage lines. Such use is not permitted by the power company since there would be a "backfeed" into their lines which serve the area adjacent [redacted]. To overcome this situation, it is necessary that the Government own the lines which are on Government property and that a main cut-off device be installed at the point of service at the property line. When the cut-off device is open, the Government-owned lines may be energized from the emergency generator without danger of "back-feed" as described above. The expense of installing this arrangement is not inconsiderable but is offset by an advantage of metering at only one point.

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A considerable saving is realized by metering at one point instead of the present six. The power company has shown that a saving of over $3,000.00 per year can be realized in this way, [redacted], based upon 1953 actual usage. This does not include the new laboratory building, which will increase the above saving. It can be seen readily that this amount over a period of a few years will amortize in a short time the estimated $24,305.97 required to install the emergency distribution system.

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It is recommended that the emergency distribution system discussed above be installed.

CONCLUSION

It is recommended that:

a. Present 312 KVA generator [redacted] be considered adequate for all essential needs, with the [redacted] operating on a full-use basis.

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b. Power and telephone lines be purchased and necessary switching equipment be purchased and installed to provide for emergency distribution of power from the generator to all usage points and to provide for a single metering point.

The estimated cost is $24,305.97 as shown in TAB 3.

SUMMARY

The electrical power service at [redacted] should be completely rebuilt to provide 225 KVA of commercial power and a like amount from emergency generators. Estimated cost - $16,995.00. 25X1A

The electrical distribution system at [redacted] is inadequate. The amounts of available commercial and emergency power are sufficient. However, certain changes are necessary to achieve complete emergency coverage to all points. Estimated cost - $24,305.97. 25X1A

Total estimated cost of above work - $41,300.97.

25X1A One GS-9 maintenance repairman is necessary and should be added to the [redacted] complement [redacted]" to take care of [redacted] electrical systems. 25X1A 25X1A

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CALCULATION OF MAXIMUM ELECTRICAL DEMAND

[redacted], BASED UPON THE EXISTING CONNECTED LOAD

Building	Connected Load-KVA	Demand Factor	Computed Demand-KVA
1. Mess	24.12	1.00	24.12
2. Gym			
Equipment	18.00	1.00	18.00
Lights	10.73	0.75	8.04
Heating, etc.	4.64	1.00	4.64
3. Quarters			
Lights	6.35	0.60	3.81
Heating, etc.	3.76	1.00	3.76
4. Quarters			
Lights, etc.	5.10	0.50	2.55
5. [redacted] House			
Lights, etc.	5.05	0.50	2.53
Washer-Dryer	5.00	1.00	5.00
6. Residence			
Range	16.00	0.70	9.60
Lights	1.50	0.50	0.75
Heating, etc.	3.15	1.00	3.15
7. Residence			
Range	16.00	0.70	9.60
Lights	1.50	0.50	0.75
Heating, etc.	2.39	1.00	2.39
8. Laundry			
Lights	1.15	1.00	1.15
Equipment and Heating	5.68	1.00	5.68
9. Motor Pool			
Lights	1.20	1.00	3.20
Equipment	2.22	1.00	2.22
10. Warehouse			
Lights	9.31	0.80	7.45
Heating, etc.	2.52	0.80	2.01
11. Dispensary	23.16	1.00	23.16

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Building	Connected Load-KVA	Demand Factor	Computed Demand-KVA
12. Vault			
Lights	5.46	1.00	5.46
Equipment	13.64	0.90	12.25
13. Office			
Lights	25.30	0.90	22.80
Equipment	20.78	0.80	16.60
Heating, etc.	6.94	1.00	6.94
14. Shop			
Lights	4.04	1.00	4.04
Equipment	3.91	0.50	1.95
Heating	1.88	1.00	1.88
Guard Houses (2)	2.20	1.00	2.20
	252.68		217.68

$\frac{217.68}{252.68} \times 100 = 0.90$ - Apparent Demand Factor

$217.68 \times 0.90 = 195.91$ KVA - Maximum Demand based upon diversity factor of 0.90.

$\frac{195.91}{252.68} \times 100 = 0.77$ - Computed Demand Factor

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COST ESTIMATE

[redacted] - ELECTRICAL SERVICE

The cost of providing power service, utilizing Route C, is broken down as follows:

Pole line - 425 feet	$ 950.00
Transformer Sub-Station	6,000.00
Powerhouse, including ventilating	3,900.00
Powerhouse electrical work, including installation of generators.	2,000.00
Fuel System	600.00
Low Voltage Feeder	1,500.00
* Increase size of [redacted] feeder	500.00
	$ 15,450.00
Contingency Fund - 10%	1,545.00
	$ 16,995.00

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* See sub-paragraph k. under "FACTS BEARING ON THE PROBLEM". This feeder runs warm with present operation. Addition of one conductor will permit three-phase loading and increase the feeder carrying capacity by at least 50%.

COST ESTIMATE

[redacted] - ELECTRICAL SERVICE

The cost of revising the present power distribution system to provide adequate emergency power for all essential needs is broken down as follows:

Purchase of Telephone Company's poles	$ 1,000.00
Purchase of Power Company's lines, poles and equipment	11,596.34 *
Purchase of oil circuit-breaker (for use as main cut-off)	5,000.00
Installation of oil breaker and remote control	4,500.00
	$ 22,096.34
Contingency - 10%	2,209.63
	$ 24,305.97

* Firm price quoted in writing by power company.

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