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19 May 1967

MEMORANDUM FOR: Director of Central Intelligence

THROUGH : Deputy Director for Intelligence

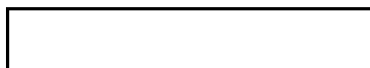
SUBJECT : Assessment of the Bomb Damage Inflicted on
North Vietnam's Electric Power Industry

1. Attached is a draft memorandum on the status of North Vietnam's electric power industry as of 15 May 1967.

2. You will recall that last week Walt Rostow expressed an interest in the extent to which the Agency was assessing the impact of the air strikes against the electric power stations. I believe the attachment indicates the extent to which we are able to evaluate the subject.

3. If you wish, it can be transmitted to Mr. Rostow or it could be given wider distribution by publication as an Intelligence Memorandum.

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WILLIAM H. MORELL, JR.
Director
Research and Reports

Attachment: a/s

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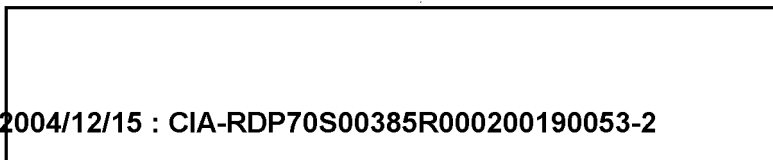
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OPR/D/T: (19 May 67)

Rewritten: OD/OPR: WMorell, (19 May 67)

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22 MAY 1967

CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
20 May 1967

INTELLIGENCE MEMORANDUM

The Status of North Vietnam's Electric Power Industry
15 May 1967*

Summary

Air strikes through 15 May 1967 against 13 of the 20 JCS-targeted electric power facilities in North Vietnam have put out of operation about 131,000 kilowatts (kw) of power-generating capacity, or 70 percent of the national total. Loss of generating facilities has created a severe shortage of power and has disrupted activities that normally depend on a central power supply, particularly those activities in the small modern industrial sector of the economy. Most of the industrial operations that are closely related to North Vietnam's support of the war in the South are of the type that can be operated by small diesel units.

The city of Hanoi is now dependent on one local powerplant that is believed capable of supplying about one-half of the city's normal needs. Haiphong is without a central power supply and must rely on available diesel-generating equipment and the limited amounts of power that may be sent along the transmission line from Hanoi.

* This memorandum was produced solely by CIA. It was prepared by the Office of Research and Reports; the estimates and conclusions represent the best judgment of the Directorate of Intelligence as of May 1967.

For all practical purposes power supply to non-essential consumers has been eliminated. Although there is a lack of positive intelligence on the impact of the power shortages, a system of rationing seems imperative. A recent report indicates that Hanoi may have inaugurated a rationing system [redacted]

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North Vietnam has had little success in restoring damaged power facilities. The slight progress made during 1966 was set back by later restrikes. The North Vietnamese seem willing to make sustained efforts to restore facilities to partial operations when limited damage permits equipment to be readily salvaged. They are willing, however, to abandon plants when a major reconstruction effort would be required. Reconstruction efforts are highly dependent on foreign technical assistance and equipment.

The major countermeasure adopted by the North Vietnamese has been the import of around 2,000 diesel-driven generating units during the past two years. These units have limited practical applications and can replace only 10-15 percent of the generating capacity currently out of operation.

With the exception of the powerplant at Hanoi, the seven remaining powerplants which have not been struck make only a small contribution to North Vietnam's modern industry or to the war effort. Three of these facilities are located within the buffer zone along the Chinese border.

Effects on the Electric Power Industry

1. Through the middle of May 1967 the Rolling Thunder program had attacked 13 of the 20 JCS-targeted electric power facilities in North Vietnam. (See the Figure) The air campaign has put out of operation 131,000 kilowatts (kw) of capacity in the main Hanoi-Haiphong power network and in two smaller power systems in the southern part of the country. (See the Table) The loss represents 70 percent of total national installed capacity of 187,000 kw. The cost of restoring these facilities is estimated at \$20.5 million.

2. The air attacks have reduced capacity in the main network from eight plants with a total capacity of 136,000 kw to a single plant at Hanoi with a capacity of 32,500 kw, or about 24 percent of the pre-strike level. Severe damage has been inflicted on powerplants at Uong Bi, Hon Gai, Haiphong East, Haiphong West, Thai Nguyen, Viet Tri, and Nam Dinh. Damage inflicted by strikes on the Dong Anh substation, the most important substation in the network, will prevent integrated operation of the network for at least 2 to 3 months.

3. An additional powerplant at Bac Giang, which is outside the main network, was put out of operation for a minimum of 3 months. In addition, central powerplants in the southern part of North Vietnam also have sustained damage. All four plants in the small power

systems around Thanh Hoa and Ben Thuy were already out of service as a consequence of damage inflicted during 1965 and 1966.

4. Loss of the generating capacity at Hon Gai, Uong Bi, Thai Nguyen, and Viet Tri has eliminated the supplementary supply of power formerly received by Hanoi and Haiphong from the main transmission network. Hanoi now is dependent on one local power-plant with a capacity of 32,500 kw that is believed capable of supplying about one-half of the city's normal needs. Haiphong is without a central power supply and must rely on available diesel-generating equipment, and the limited amounts of power that may be sent along the line from Hanoi.

Other Effects

5. The neutralization of most of North Vietnam's electric power industry is having widespread effects throughout the country. The loss of generating facilities undoubtedly has created a severe shortage of power and disrupted activities that normally depend on a reliable central power supply. The precise extent to which the supply of electric power is being curtailed is difficult to quantify. It is probable that non-essential consumption by residences and commercial establishments, and most street lighting have been eliminated. Curtailment of industrial power supply almost certainly has caused fragmentation of industrial processes in some cases, and in others has caused complete shutdowns. The few heavy or continuous-process industries, such as the Viet Tri chemical and

paper complex or the Haiphong cement plant,* probably will be forced to stop operations unless some provision for power has been made by the installation of diesel-generating units larger than those currently estimated to be available. No ready substitute for industrial process-steam is available to industries formerly dependent on steam furnished by the central powerplants. Industrial or manufacturing processes that can be divided into small segments (such as machine shops, truck repair facilities, coal mining, or port loading operations) can probably be furnished sufficient power by small diesel generating units, but not without some loss of efficiency. Most of the industrial operations that are closely related to North Vietnam's support of the war in the South are of the type that can be operated by small diesel units. Thus, the curtailment or shut-down of modern industry would have little impact on North Vietnam's ability to continue the war.

6. There are few eye-witness reports about the impact of power shortages. The first positive indication that generating capacity now falls short of meeting demands was a reported announcement that power rationing was instituted in Hanoi on 10 May 1967. A few other reports have suggested intermittent restrictions on power supply over the past year.

* This plant also sustained bomb damage in April 1967.

Restoration of Damaged Facilities

7. The electric power industry has been the major exception to North Vietnam's demonstrated ability to recuperate from the air attacks. Although complete restoration of the damaged facilities would require from 18-24 months, most of them could be restored to partial operation within a period of 2-4 months.

8. There are signs of strain and bottlenecks in North Vietnamese attempts to rebuild the damaged power facilities. Most of the reconstruction requires foreign technical and material assistance. Much of the progress made during 1966 was eliminated by later restrikes against the power facilities. There is considerable variation in the efforts put into reconstruction programs. When limited damage permits equipment to be readily salvaged, the North Vietnamese have made persistent efforts to restore facilities to partial operation. They are willing to abandon plants, however, when a major reconstruction effort would be required. Repair of the Thai Nguyen plant for example was rapidly accomplished in the latter part of 1966 after moderate damage inflicted in July. The Uong Bi plant, damaged in August 1966, showed little sign of reconstruction in January 1967 [redacted]

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[redacted] The Thanh Hoa and Ben Thuy plants which were attacked in 1965 were still unserviceable in April 1967 although reconstruction work on both now is in progress. Restoration of the Nam Dinh plant progressed steadily until late 1966, and then apparently halted before the plant was ready for service. Reconstruction of small

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plants at Co Dinh and at Ban Thach apparently has been abandoned. Construction of the large hydroelectric plant at Thac Ba, which was being built with assistance from the USSR, was halted in mid-1966 probably to forestall damage from air strikes. The status of possible reconstruction efforts at powerplants struck during the last few months is not known.

Other Countermeasures

9. Other than the measures discussed above the major countermeasure used by the North Vietnamese has been the development of alternate power-generating capacity. This has been done principally by importing diesel-driven generating units.

10. North Vietnam is estimated to have imported around 2,000 diesel-driven generating units during the past two years. The largest units imported were two from the USSR with a capacity of 600 kW each, fifteen from Czechoslovakia with a capacity of 320 kW each, and an unspecified number of 500 kW units also imported from Czechoslovakia. The remaining units imported have capacities ranging from 5 kW to 100 kW, with about 75 percent having capacities of less than 20 kW. The aggregate capacity [redacted] of equipment known to have been imported amounts to an estimated 25,000 kW to 30,000 kW.

11. Those diesel units are well-suited for supplying power to small independent consumers, but they cannot be readily operated in parallel with a transmission network, nor are they large enough to

cover the demands of heavy, continuous-process industry. Moreover, the usable capacity of these units will be substantially less than their rated capacity. When power is supplied independently to separate consumers each consumer maintains reserve capacity. Some consumers undoubtedly will be assigned generating units larger than needed. Thus the diesel generating units will not supply dispersed consumers with as much power [redacted] and will not fully compensate for the loss of an equivalent amount of central generating capacity. The diesels known to have been imported probably could not supply more than 15,000 kw to 20,000 kw of usable power. This amount is roughly 10 percent to 15 percent of the central generating capacity currently out of operation.

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12. Almost nothing is known about the location of diesel units. However, it is reasonable to assume that some units have been allocated for use in the areas of Thanh Hoa, Ben Thuy, and Hon Gai where central plants are out of operation. Some undoubtedly have been assigned to supply power for irrigation and drainage of agriculture, and some will be assigned a standby role for emergency power. Although a number of alternatives are open to the North Vietnamese in the use of diesels, it seems clear that available generating capacity falls so far short of meeting demands that some system for rationing electricity is imperative.

Unstruck Targets

13. The seven JCS-targeted electric power facilities not attacked by air strikes are shown in the following tabulation:

<u>Plant Names</u>	<u>Capacity (kilowatts)</u>
Thac Ba (incomplete)	114,000
Hanoi	32,500
Lao Cai	8,000
Na Ngan	2,000
Phu Ly	1,200
Thai Nguyen (Steel plant)	1,200
Ta Sa	1,000

If these facilities were attacked, North Vietnam would be deprived of all but 10,000 kw of its central power generating capacity. The most important target not struck as of the date of this report is, of course, Hanoi. The other targets are remote from the main power grids, and make only a small contribution to North Vietnam's modern industry or to the war effort. The largest facility, that at Thac Ba was from 18-24 months from completion when construction activity was abandoned in 1966. Three of the remaining plants -- Lao Cai, Na Ngan and Ta Sa -- are located within the buffer zone along the Chinese border. The Lao Cai plant supplies power to the apatite mining and processing facilities. The Na Ngan and Ta Sa plants serve tin mining enterprises in Cao Bang Province. The powerplant at Phu Ly serves a sugar refinery. The Thai Nguyen power facility is carried in the JCS-target list as a possible powerplant serving the Thai Nguyen iron and steel complex. Air strikes have not been directed specifically against this facility but it has been neutralized as a result of strikes directed against the iron and steel complex.