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THE SUPPLY OF POWER TO MEET A WAR DEMAND

by

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THE SUPPLY OF POWER TO MELT A WAR DEMAND

In opening, may I say that I realize the difficulty of adding to what you must already know. To go no further back than last year, the addresses of General Markham and Major Burdick before this body afford an admirable basis for understanding our former experience and the procedure now set up for the accumulation of accurate data concerning our existing and immediately prospective power resources. They also explain the organization to be formed and the methods to be placed in effect to enable these resources to be employed to best advantage in case of war.

We are now in better condition than ever before to meet the demands that will be made in the event of war. It seems certain that we should not experience needless difficulty caused by placing orders for munitions without consideration of their effect on the powers situation. The control and coordination now planned through your College ought to result in an orderly and efficient program for the utilization of our available facilities of all kinds and for any necessary increases in them.

The maintenance of an adequate supply of electric power is, of course, merely one of the many problems, all more or less urgent, that will appear on the outbreak of a war between our country and any fairly strong opponent, and the method of handling the problem of supplying power should not differ in essentials from that which would be correct when dealing with the supply of munitions or needed materials.

Reduced to its lowest terms, the general problem of meeting the demands of war for munitions or power or other things requires answers to these, or quite similar, questions:

1. What is our present supply or manufacturing capacity? Where is it situated and in what quantities?

2. What part of this present supply is immediately available for war use? How much is required for such use?

3. To what extent can the existing supply be increased? Where can these increases best be made?

4. How long will these additions require? By whom will they be made? Who will furnish the money? What help is required to promote their completion?

These questions may call for amplification in particular cases. They would require modification to adapt them to articles or services which are not produced at all in times of peace. You have probably already reduced your problems to these or to equivalent terms.

If the supply of power for war purposes calls for no different treatment than does the supply of other things or services needed to enable war to be prosecuted satisfactorily, then the following further questions present themselves

(a) Is the present method of collecting information concerning electric power adequate?

(b) Is the general plan of control of our available output on the outbreak of war correct?

(c) Is it likely that a deficiency in the supply of power will develop immediately on the declaration of war?

(d) Is it desirable to create a reserve supply of power to be used solely during war?

Replying to (a), I feel certain that the existing method of distributing periodically to the industry an agreed questionnaire which asks for the least effort consistent with securing the fundamentally necessary information and of compiling that information so as to permit its ready use is sound. No change is necessary except a slight clarification of details as occasional difficulty may be experienced in individual cases. This difficulty will probably be due not so much to the form of the questionnaire as to the fact that the task of replying to it may fall to a different man each year. Clearly, the best remedy for such troubles is the establishment of permanent friendly relations, a matter on which I shall say a few words later.

As to (b), the plan of control on the outbreak of war is simple, logical and judicious. It leaves actual operation to those who are best qualified by training and experience while, at the same time, it affords assurance that the highest returns will be realized for the war program at the expense of minimum change in the practices of peace. Its outstanding advantage is that it recognizes the value of cordial relations and personal acquaintance in securing cooperation. In June, 1927, the then Secretary of War addressed the N.E.L.A., which was at that time the group representing the commercial power industry, on "The Electric Industry's

Part in National Preparedness", and gave an outline of the plan of control. This plan has since been elaborated in the manner described to you last year by General Markham. The Association was friendly to the plan described by the Secretary, as was natural since its representatives had assisted in its formulation. It was later succeeded by the Edison Electric Institute, a body with a different basic mission. Its membership is, however, practically the same as that of the Association and so it may be taken for granted that it has the same desire to cooperate fully in your war program.

The only suggestion I can make to improve the plan for war control of the industry is that which has already been made in another connection, namely, to establish and maintain friendly relations between the local operators of the industry and those who are charged with the collection of information in support of national preparedness. This policy and its application to each system should be initiated by the representatives of the War Department after consultation with the managers of the various power systems. Occasional meetings for discussing the common problem of the government and the industry in the emergencies created by war would be helpful. The effect would be to keep alive interest in our war program on the part of those who would be called on to participate in it. It would also be useful to ask the E.E.I. to designate a standing committee with which representatives of the government might meet, say once a year, if for no other purpose than to create and preserve acquaintance between the two agencies and to reach and perpetuate definite understandings as to this war problem.

The next question, (c), namely, the likelihood that a deficiency in the supply of power will develop immediately on the declaration of war, is probably that which is uppermost in your minds. Your interest in it is perhaps more active because of the Interim Report on the National Power Survey published last year by the Federal Power Commission.

That report is undated, but the letter of transmittal of Director Tate was dated March 15, 1935. It will be recalled that the report sounded a note of alarm as to the adequacy of the supply of power available to meet the combined demands of war and of industry when the latter is again operating at a pre-depression rate.

The report says, Foreword, pages X and XI

"2. Very little new generating capacity has been constructed by the privately owned utilities since 1930. As a result, the capacity of existing plants is 2,325,000 kilowatts less than the demand that

will exist for power upon a resumption of pre-depression industrial activity, assuming maintenance of normal reserve capacity."

"7. The critical shortage of existing generating capacity most seriously affects the great industrial districts of the East and Middle West. It would, therefore, be disastrous in case the United States, should become involved in war. The situation might be even more acute than that which existed during the World War when, in many districts, electric service had to be denied to domestic and commercial customers and non-essential industries to meet war needs for power."

It is true that practically no generating capacity has been installed since 1930, but it must be remembered that in 1928, 1929 and 1930 many of the large systems were installing additional capacity in the liberal amounts inspired by their past rapid growth and their confidence that it would be maintained in what was believed to be a "depression-proof" industry. In 1930, when the electric load began to decline, the available capacity at all important centers was sufficient to take care of the growth of load of a period of at least two or three years figured at the rate of growth of the late twenties.

Since 1930, there has developed a well marked tendency to improve load factors, mainly by inducements to customers to curtail their peak demands, and it has been pretty generally agreed that the amount of reserve capacity need not be as great a fraction of the load as was formerly insisted on by the operators in their desire to assure uninterrupted perfect service. In spite of the increases in load that have come since 1932, the commercial industry practically everywhere possesses unused capacity which can be counted on to meet the growth of several years. To me this seems the more true because I doubt whether, once the demand that was suppressed during the recent lean years has been supplied, this growth can possible be at the rate prevailing in the twenties. My reasons are

1. A rate of this kind tends ordinarily to decrease as time goes on.

2. The population of the country is increasing less rapidly now than formerly.

3. Compared with 1929 and early 1930, our output in agriculture and in industry is, speaking generally, not likely to increase very much or, at best, its opportunities for profitable expansion will be less than formerly.

4. A considerable part of the difference between the pre-depression and the existing activity of business and industry that makes the standard indices of activity lower than they were six years ago is due to the diminished output of the iron and steel industry which ordinarily generates its own power and of the building industry whose product runs to large figures expressed in money but calls for relatively little power.

For these reasons, I do not believe that we need be excessively anxious about the sufficiency of our available electrical capacity to meet the growing demands of business and industry during the next two or three years. Moreover, it is so well known as hardly to warrant mention that the power industry has, in the past, (except during the war when difficulties were limited to a few localities and to a comparatively short time) proved itself amply able to foresee and meet the needs of the public. Unless it is prevented from doing so by new causes, there is no reason to doubt that it will be able to answer the future demands of its customers and to meet the initial needs of a war.

But these are generalities. It will be more convincing to scrutinize the predicted shortage in generating capacity recorded in Table B on page 28 of the Power Commission's report. Table B shows an impending national deficit of 2,325,000kw. based on an estimated installed dependable capacity of 27,300,000, a reserve capacity of 6,222,000 which must be deducted from the preceding figure (leaving a usable dependable capacity of 21,078,000 kw.) and an estimated sum of system peaks of 23,039,000 kw. It should be remarked that the same table shows an excess of 364,000 kw. of generating capacity in six of the seven zones into which the Commission divides the country and that the Commission ignores this excess in arriving at its total shortage of 2,325,000 kw. presumably for the reason that transmission facilities do not exist for delivering the excess in the regions where the shortages are found.

It is not, however, shown that most, if not all, of the surpluses could not readily be made usable by the construction of transmission lines. Our experience is that, even in the heavily forested, mountainous country, transmission lines can be

built in much less time than generating units of equal capacity can be installed. For example, The California Oregon Power Company in 1929 built about 65 miles of 110 kv. line over the Coast Range in seven months. Again, the Louisville Gas and Electric Company built about 82 miles of 138 kv. steel tower line between Louisville and Cincinnati between March 3, 1930, when surveys were started, and October 15, 1930, when the line went into service. Part of this line is in a very rough, hilly country, distant from railroads, and the highways are bad, rendering construction correspondingly difficult. The former line transmits 12,000 kw., but it would have been possible to build one of twice that capacity or more in the same time. The second line handles 50,000 kw. in either direction. Obviously, longer lines might be built in about the same time by working simultaneously at a sufficient number of intermediate points. So, in a clearly indicated approaching emergency, wise planning would bring into timely use probably all of the neglected excess, thereby reducing the asserted shortage correspondingly.

But, even so, a shortage of 1,961,000 kw. or more, if it really exists, is not to be taken lightly, so let us consider it further.

First, its occurrence is predicted on the resumption of the pre-depression rate of growth of industrial activity. I have already given my reasons for believing that this rate is likely to be lower than before. Moreover, in the present state of our foreign trade, who is there who seriously believes that our pre-depression activity, due as it was largely to the money which we loaned to foreigners with a liberality that is the scorn of the critics of the pre-depression order, will be resumed? Indeed, does not the Johnson Act prohibit loans to delinquent borrowers and is not most of the world delinquent in this sense? In short, there is good ground to believe that, once the slack is taken up, the load will grow at a rate less than in pre-depression days and that, because of improvement in the load and capacity factors, it will be carried with relatively less capacity.

Next, the probable future load is assumed to be the sum of the predicted system peaks. It is difficult to determine the extent to which consideration was given to the diversity factor, the variation in the incidence of individual peak demands. Also, no account appears to have been taken of the possibility of inducing customers to reduce or completely abandon the use of power during system peak periods. This second device alone would probably more than cancel the predicted deficiency.

Finally, the Commission throws suspicion on some 2,000,000 kw of existing capacity as obsolescent. Operable old units are today with entire safety and propriety employed to serve peak loads. Such loads are of short duration and consume relatively few kilowatt-hours. Since the cost of the installation of these old units has usually been largely written off, the cost of their output for peak service is relieved of most of the corresponding fixed charges and their inefficiency is to that extent compensated. Certainly they constitute dependable capacity for peak service as long as they remain in good physical condition. This is emphatically true in war time.

Most of these comments on the Commission's prediction of an impending power shortage must be qualified by uncertainties in interpreting the report, but there can be no uncertainty as to the location of the red areas on the map of shortages preceding the "Foreword", and similarly the map between pages 28 and 29 of the text affords positive evidence as to the extent of these shortages.

EXHIBIT #I For your convenience, I have had the map reproduced. See Exhibit I attached

You will observe that a deficiency of 5 to 10% is indicated for the state of Minnesota excepting a small area in the northwest, while the entire state of Wisconsin is said to have a shortage which for most of the state is shown as over 10%, also that the entire state of Pennsylvania is charged with a threatened shortage of 10%.

The Duquesne Light Company operating in and around Pittsburgh, the Northern States Power Company of Wisconsin covering most of Wisconsin north of an east and west line through LaCrosse, and the Northern States Power Company of Minnesota supplying all of Minnesota from its south boundary to an east and west line through St. Cloud are units of the Standard Gas and Electric Company with which I am connected so that I am in a position to produce authoritative information regarding them. The areas in Pennsylvania, Wisconsin and Minnesota in which these companies operate have been indicated on the Commission's map.

EXHIBIT #II The interconnected Northern States Power Companies of Wisconsin and Minnesota are shown on the map to have a predicted shortage of 5 to 10%. To spare you a detailed discussion of this prediction, I ask your attention to the chart which shows the installed prime capacity and the load duration curve of the

interconnected system for its peak year, 1931. It will be seen that the peak load was under 215,000 kw., while the capacity reached 350,000. We have here a margin of 115,000 kw. Though the area contains the large cities of Minneapolis and St. Paul, there is little ground to believe that the load will grow much more than 10,000 to 15,000 kw. per year so that, in place of a shortage, we have, over and above the necessary reserve, a large surplus in a region where war demand is not likely to be heavy. It seems improbable that any deficiency will arise in this area on the outbreak of war or for some time thereafter.

Leaving this point, it may interest you to observe that the peak load on this system, say the upper 10% or 21,000 kw., exists for only about 1% of the time, an average of fifteen minutes daily. It is here that old and perhaps inefficient units may with propriety be employed and, as previously said, they are then almost as economical as new ones. This being true, is it not questionable wisdom to disregard these old units in any serious appraisal of our resources in power generating equipment?

EXHIBIT #III

Dealing now with the Pittsburgh area, I call your attention to the chart which shows the load curves of the Duquesne Light Company on the days of maximum load in 1929, the pre-depression peak, and in 1935 when the post-depression peak was experienced. Against an absolute peak of 309,500 kw., there is available, as shown, 435,000 kw. of capacity. The capacity in excess of the 1935 peak is 140,000 kw. The 1935 peak, 295,000 kw., includes the accretions in the load that, in Pittsburgh and elsewhere, have been produced since 1929 by intensive campaigns to introduce refrigerators and other domestic load-building appliances as well as installations for conditioning air, and this peak is 15,000 kw. less than that of 1929.

The total growth of the residential and air conditioning load since 1929 has been on the order of 20,000 kw. Adding this to the 1929 peak, at the 1929 rate of activity, the company's load would now be on the order of 330,000 kw., leaving a surplus capacity of 105,000 kw. This is certainly enough to provide needed reserve and to take care of the normal growth of three to four years. To put it otherwise, if war should occur at any time in the next two years, the company could readily take care of the immediate demands of war industry, protect its service with the customary amount of reserve, and, since some of the facilities for installing another 60,000 kw. unit in its Reed station are

already in place, it could increase its output probably more quickly than war industry could put additional machinery in place and secure and train the requisite personnel.

If we also take into consideration the gain in prime capacity that might be had by taking all load possible off the system peak, it seems clear that, far from having a 10% deficiency to face under the premises laid down by the Commission, this part of the west Pennsylvania area has and would have a liberal surplus. Further, I take no note of the capacity of the interconnections between the Duquesne Light Company and its neighbors which, during the recent flood, furnished over 50,000 kw. for distribution in Pittsburgh. Certainly these interconnections will help to diminish the amount of reserve to be carried during a war.

In confirmation of the preceding, I invite your attention to the following statement by the company.

> "* * * we have examined our load and sales records during the war period and found it rather difficult to definitely put our finger on what might be termed 'war load'. As you know, this was a period of rapid growth for the Duquesne Light Company and it is hard to distinguish normal increase from that brought about due to the war. However, indications were to the effect that approximately 15,000 kilowatts in peak and 15,000,000 kilowatt-hours in generation per month during 1917 and 1918 might be attributable to the increase occasioned by the war."
>
> "Beginning some time in 1915, there was a definite increase in the rate of growth which apparently was brought about by increased load resulting from war orders. During 1917 and 1918, peak load and generation were definitely higher by the above mentioned amounts than in previous years and in the summer of 1919 there was a sudden drop in load to the projected levels of previous years, indicating that the 1917 and 1918 higher loads were probably war loads. On the other hand, the rapid recovery in 1920, to even higher levels than those of 1917 and 1918, makes the determination of war load more or less doubtful. The attached graph showing peak loads and generation by months from 1914 to 1920 inclusive is submitted in substantiation of the above opinions."

EXHIBIT IV

The graph to which reference is made has been enlarged and I now place it before you. The space between the two lines drawn on each of the load curves is a fair measure of the load created by our war requirements between 1917 and 1919 and is the basis of the figure given in the above quotation.

This further extract from the company's statement may interest you.

> " * * * the Duquesne Light system was considerably overloaded during the war period and it was often necessary to dump certain loads in order to maintain proper frequency and voltages, and you probably recall the various restrictions to the use of electricity for non-essential purposes.
>
> "Relative to the practice of cutting our normal customers off in future wars to make available a larger power supply to industry, I am afraid serious complications might develop among our residential and commercial customers. The relatively high degrees of saturation in this territory for electric clocks and refrigerators and the growing use of air conditioning would make continuity of service to all customers practically a necessity."

This indicates an interesting development in the power business that will have to be dealt with in another war, but the change in character of use will not prevent the exercise of considerable discretion in regard to the peak demands of other classes of users.

To discuss this situation more broadly, your Power District #4 covers western Pennsylvania and Maryland and all of the states of Ohio, West Virginia and Kentucky.

The map of the Power Commission predicts for this entire area a deficiency of 10% or more. The last Power Survey shows that this area has an assured peak generating capacity in the driest year of 2,905,000 kw., and a peak load of 2,084,000, leaving a net surplus of 821,000 kw. over and above the reserve required for maintenance, repair and normal operation.

Even though there is an extreme concentration of industry in this area, it is hardly credible that, with a surplus of over 800,000 kw., any real shortage will develop in the next three or four years, war or no war.

The West Penn Company adjoins the Duquesne territory on the east around to the south and southwest. The last Power Survey shows that this company, which has some hydro, estimated that it had for a dry fall in 1935 an assured peak generating capacity of 306,000 kw., and that its peak load would be 264,000 kw. It therefore, estimated a surplus of 42,000 kw. This would be enough to take care of restored load and of normal growth for say two years, but it should be noted that this company figured on retaining 75,000 kw. for maintenance, repair and spinning reserve. This amount of reserve seems unduly large, especially in view of the interconnections previously referred to. In a war emergency, at least 30,000 kw. of this capacity would undoubtedly become available, and in a year of normal rainfall at least 15,000 kw. more hydro power could be counted on.

Another neighbor of the Duquesne Light Company is the Appalachian Power Company. This had an assured net generating capacity in the driest season of about 268,000 kw. (The company has a little water power.) Its peak system load for the same conditions was about 220,000 kw. and seemingly at that time there was ample capacity for growth of load. However, since then this company has received a large electro-chemical load and its generating capacity is fully loaded. It could not now be counted on to help carry an emergency load and it must soon, I understand, install additional capacity.

As against this condition, let me in conclusion cite the figures for the Ohio Edison Company which adjoins the Duquesne Light Company on the west and the northwest and shows for its Akron and Youngstown Division an assured net generating capacity (no hydro) of 212,000 kw., and a maximum system load of 140,000 kw., thus leaving 72,000 kw. for future growth. I think that we may safely look at this as sufficient for three to four years accretions to the system.

A somewhat similar condition exists in the nearby Ohio Power Company where we have a reserve of over 50,000 kw., which is large, and, in addition, unused capacity of over 40,000 kw.

Thus, in western Pennsylvania and eastern Ohio there is irrefutable evidence that there is no good ground for believing that within the next three years a shortage will occur. This takes no account of the existing interconnections which, because of the experience in the recent flood, will probably be enlarged considerably.

Answering my question (c), the conditions in the western Pennsylvania area and in the territory of the Northern States system are, I believe, fairly representative of those throughout the country. It follows that, within the next three years or so,

a declaration of war would find us amply supplied with power even though an appreciable war demand should coincide with its declaration.

This conclusion is reinforced by the Power Survey which shows that on January 1, 1935, there was a net surplus of power of nearly 5,800,000 kw. available on the part of the reporting public utility companies, hydro power being figured under conditions of minimum rainfall. This surplus is enough for three years growth of load and it does not include the plants now being completed with public funds nor the municipal plants actually in existence.

Orders for war materials would probably go either to manufacturers who would discontinue their peace time business and employ their equipment and personnel on war orders, thereby calling for little if any increase in peak demands, or to others who would have to install equipment and organize personnel. The second class of manufacturers would need but little power for some time after they had received their war orders so that time would be afforded to enable the agency exercising war control of the power supply to take steps, first, to allocate the available supply efficiently, and, second, to provide additional capacity where it would best serve our program.

Of course, my conclusions assume that war orders will not be placed without giving due weight to their effect on the supply of power.

It is interesting and pertinent to what I have said to quote from a statement by the Buffalo, Niagara and Eastern Power Corporation in reply to questions asked by me. This corporation controls all the water power plants at Niagara Falls, New York, another in Canada, a large steam station at Buffalo, and many other steam and hydro plants in northern, central and western New York.

Here is the quotation:

> "The Niagara Hudson system, like most other systems that have water power developments, is dependent upon the run-off from year to year and there is quite a variation in the amount of power which can be obtained from the plants - about 100 in number - which we own in the Adirondacks. This situation makes it necessary for us to maintain steam capacity for low water years, and we are keeping our old plants in shape for this purpose.

Under normal conditions some of the plants will operate at about five year intervals, and then perhaps for only two or three months on peak. Outside of those periods of operation, the plants would be available to meet war-time load. We normally keep some spare capacity to take care of repairs and temporary outages, and all of our steam plants can be run at 10 per cent overload, over peak periods, if necessary. In a system the size of Niagara Hudson, even though we should be loaded to normal capacity and a war came on, we could take on a considerable amount of overload during the period necessary to provide additional steam capacity. At the same time it would certainly be possible to drop a certain amount of load which is non-essential for war purposes, as was done under your administration at Niagara Falls during the war. For instance, we have a very considerable amount of power being sold to the pulp and paper industry which might be diverted for war purposes, by properly compensating the companies from whom the power was taken."

"Experience in furnishing power to war industries during the World War, here on the Niagara frontier, may be some guide as to what can be done. So far as I am aware, the development of industry in this locality (and this probably applies to the entire United States) had no reference to an expectation of supplying war materials. The War demand for power came upon industries designed to supply peace-time demands. When this demand for energy came in the spring of 1917, I can recall no instance in which the industries capable of manufacturing war materials did not immediately give preference to the government demands, and many of them changed over their plants to manufacture materials not before supplied. I mention this to show that in a war emergency considerable power would be immediately available even at sacrifice of normal peace-time products. This substitution of war materials for regular product continued at increasing rate throughout 1917 and 1918 until the Armistice."

"I have found a statement prepared by Mr. Shepard during the War, entitled 'Use of Electrical Energy as produced during typical period in winter of 1917-1918 (in per cent of total output'."

"The statement slightly condensed is as follows:

	The Niagara Falls Power Company	Hydraulic Power Company	Niagara, Lockport & Ontario Power Co.	Buffalo General Electric Company
War Industries	73.5	97.0	58.3	50.3
Transportation	11.5	0.0	21.2	21.5
Residence & Commercial Lighting	7.8	2.0	7.6	14.0
Other Uses	7.2	1.0	12.9	14.2

EXHIBIT #5

"From this it appears that about 70% of the 300,000 average kw. capacity on the Niagara frontier was available for and used by war industries. At the present time, there is about 900,000 kw. capacity available in steam and hydro and contract power in this area. On the same basis as before, about 630,000 kw. would be available almost immediately for supply of war industries. I have no idea that this percentage would hold for the entire country as the industrial demand here at Niagara Falls including abrasives, alloys, electrodes and various chemicals is more adapted to war uses than the industrial load of the average public utility."

"(c) From what I have observed in supply of energy for war purposes this supply can be changed frequently without material detriment. It may even be used to fill in the valley of the utility load at night time and over holidays and Sundays. This is probably not true with all war supplies but it is largely true in manufacture of alloys, abrasives, electrodes and most chemicals. Of course, some losses would occur on account of these interruptions and variations in load, but nevertheless it makes possible use of reserve capacity and also of plants that usually and under normal conditions could not be operated economically."

Confirmation of my opinion that your adopted system for control of the war power supply and the existing amount of generating capacity afford full assurance that no extraordinary emergency is likely to occur even though a war were to descend on us in the next year or two is found in the following extracts from a letter from the Commonwealth Edison Company of Chicago.

"A survey of the load of the Commonwealth Edison Company during the last World War indicates that the total demand for power in the early period of the war did not increase any more than would be expected under otherwise normal conditions. In fact there was apparently an actual decrease from the normal rate of growth, as shown by the following figures.

Year	System Max. Demand K.W.	Per Cent Increase	Kw-hrs. - In Thousands	Per Cent Increase
1913	276,050	18.5	929,247	16.3
1914	306,200	10 9	1,114,130	19.9
1915	337,900	10.4	1,198,637	7.6
1916	369,740	9.4	1,341,964	12.0
1917	392,530	5.75	1,488,080	10.9
1918	400,010	1.95	1,508,070	1.3
1919	432,950	8.2	1,628,341	8.0

"Several factors may account for this failure to experience a sudden increase in demand.

(a) Some factories were converted to produce war materials instead of other materials without any increase in total equipment.

(b) Many factories worked continuous shifts to increase production but without any increase in maximum demand for power.

(c) Some decrease in the use of both light and power may have occurred because of the transfer of activities nearer to army concentration camps and the taking of men out of factories to go to war.

(d) A considerable number of factories were already manufacturing munitions for the Allies before our government entered the war.

(e) A coal shortage occurred from November 1917 to November 1918 which compelled special emergency measures to reduce the use of electric power. A blanket order was issued that all electric signs

and other unnecessary uses for electric light be discontinued during the emergency. From January 17, to February 13, 1918, a more severe shortage compelled a number of forced holidays for factories. Special crews of the company employes were delegated to see that these orders were enforced."

The coal shortage just referred to would probably not be permitted to occur in a future war. Certainly your program contemplates adequate control of coal, while oil and natural gas should also help to relieve the strain on the supply of coal.

Passing now to my (d), the question whether it is desirable to create power generating facilities in anticipation of this possible war demand, it is obvious that the commercial power industry cannot do so and equally clear that the government should not. No one could possibly foresee the proper places for such war reserves nor the capacities to be installed. To repeat what I have already said, war power should be regarded as merely one of a number of essentially similar elements entering into the proper organization, utilization and expansion of the resources of our nation to meet the demands suddenly thrown on it by war. This being so, deal with power as you deal with munitions, clothing, shoes, food, etc. In other words, make the best possible use of what you have. Add to it in orderly fashion as your needs dictate.

In closing, let me add that, given the same freedom of action that it has had in the past, you may rely on the power industry, equally with all other industries, to cooperate with you ably, unselfishly, and, I know, efficiently, in the solution of the problems which will arise with the advent of war.

DISCUSSION FOLLOWING LECTURE ON

"THE SUPPLY OF POWER TO MEET A WAR DEMAND"

By

Brig. General Charles Keller, Ret.

April 27, 1936

Q - In the first part of your talk you spoke of the plan of control. I presume you mean transition of the present organization of the Engineers being expanded into a war organization for operating and controlling. Under that organization do you think control should be decentralized to the various districts or through the War Industries Administration in Washington?

A - The plan contemplates division of the country into seven zones and they have twelve districts. I think decentralization first ~~xx~~ to the zone should be tried and, if favorable, then other decentralization. The control should not rest here in Washington. My own experence was that the more we succeeded in getting our ~~people~~ representatives into very close daily touch with the power people themselves, the better able were we to get results that the Government desired ~~and~~ In my own case, these men whom we delegated to have this relation with the power people were given every authority. They were merely required to report to us in emergencies which they could not ~~possibly~~ themselves handle; when they needed backing up or definite orders from the War Department to gain their objectives.

Q - In the event war is declared do you think the Chief of Engineers should be the power administrator or would it be better to have some prominent civilian in the electrical world?

A - I can answer that question by going back to my own experience. My associate in ~~attempting to~~ administer my power was the Assistant

Vice President of Westinghouse Electric Company - Mr. Darlington, who knew more about the power business than I will ever know, but when it came to actually making ~~hard~~ decisions and executing them in a hurry he looked to me and in that way I was actually the chief. He was actually the boss but when he needed the authority of the Government I was the man who took up the question ~~and to~~ by whom that action should be had and issued the order regarding it. Either the Chief of Engineers or some one of his assistants should head the power administration ~~set up~~ - someone who is accustomed to the ways of the Government and who is not afraid of red tape. - Private business is afraid of the kind of red tape with which it is not familiar ~~they don't know~~. ~~As a matter of fact, they have~~ It actually has just as much of it as the Government has

Q - Would it be better to have an Army officer or a civilian who could probably have little friendly relations with the industry and who knew the electrical situation?

A - As the set-up is now, there will be representatives of the industry and their technical advice will be ~~highly~~ respected and followed as far as feasible.

Q - You spoke of strengthening the system by further interconnections Has there been a comprehensive plan worked out on that and what are the factors that limit these interconnections?

A - There is no law that limits them, the limitation is cost. Some years ago, the West Penn Company and Duquesne Company had an agreement under which the West Penn Company was to install capacity somewhat in excess of its needs for the immediate future and ~~to help on the cost the agreement was that~~ the Duquesne Light Company was agreed to would take part of the excess output until the new unit was loaded ~~the generated electricity~~. Now the reason they are talking about

Duquesne Co was to install a new unit & the West Penn Co was to share in its output This program of course called for interconnection between the two companies and this interconnection proved very useful during the recent flood.

more interconnections is that the flood was ten feet higher than ~~was regarded as~~ the official danger level and it has shown ~~them~~ that much of ~~that area~~ Eastern Ohio, Western Pennsylvania, and Northern West Virginia, is likely to be drowned out, ~~and may go down with its entire capacity.~~ In that case ~~we should have~~ interconnections to ~~furnish~~ carry a much larger portion of ~~its~~ total load of the area might be of great value, ~~than was done on this occasion.~~ Such interconnections will mean added fixed charges on all these companies with no way of imposing higher rates on the public. They will merely be in the nature of insurance ~~and an expense that most of us~~ that we think we can well afford to pay. Duquesne ~~Co~~ lost ~~about a half million dollars in business~~ hundreds of thousands of dollars during the recent flood much of which might have been saved by more liberal and damage. ~~They might have saved a great deal of the business lost and~~ interconnections. The carrying charges on the added interconnections constitute ~~I think that is a fair premium on the~~ no more than a fair premium on the insurance supplied in this ~~taken out in these interconnections.~~ manner

Q - How far can you transmit power? Could you use Tennessee Valley power in Pittsburgh?

A - I don't think it is economical to transmit it that distance. The longest ~~contemplated~~ transmission I know about is from Boulder Dam to Los Angeles - and it calls for very expensive construction between 280 and 290 miles ~~- and I doubt whether that character of line will pay for itself.~~ which might not be economical elsewhere. ~~On the other hand~~, however, in cases of ~~absolute~~ need, the ~~length~~ distance of transmission is not ~~much of a~~ an absolute bar ~~provided step-by-step interconnections exist.~~ During the flood the Commonwealth Edison Company from Chicago relayed power to companies nearer the scene of the flood. It transmitted power to carry part of the load of a company in Indiana What was actually done was that ~~a company in Indiana with 25,000 kilowatts~~ In turn, the Indiana company was thus enabled to transmit part ~~transferred it into Ohio and then they were able to spare 25,000 kilowatts~~ of its output into Ohio where the process released power which could ~~for Pittsburgh.~~ then be delivered to Pittsburgh. It should be remarked, however, that this step by step transfer is productive of abnormal electrical losses and is too expensive except in emergencies

Q - During the war they had a system in regard to the distribution of power and it was based on the preference list of essential industries. Do you remember it and how did it work out?

A - I had nothing ~~to do with that.~~ directly to do with the final preference list which was promulgated after I had gone to ~~France~~ France.

Q - Some of the published reports indicate that the 1929 consumption of electric power was some ninety billion kilowatt hours as against some thirty-three billion for 1918, and in 1935 the total consumption other than public utilities was again over ninety billion. It is not clear to me what the cause is. You spoke of the campaign to increase the use of electrical appliances, etc. There must be some other causes and I wonder what they are - I mean causes for the recovery

A - ~~It was the result of the distribution among industries operating only part time and only a part of their then existing installed capacity. You know that~~ Many of the large industries have come back and their production today is almost as great as it was in 1929. I take issue with your implied conclusion, the use of ~~the~~ domestic electric refrigeration is a constant use; it is on and off during the entire twenty-four hours. ~~That is increased domestic use.~~ Also The use of artificial refrigeration in apartment houses & hotels & restaurants has spread ~~to an enormous extent; such use has grown and is continuing to grow and all of these things tend toward a more liberal use of energy.~~ But correspondingly. Our peaks have not grown; ~~our~~ peak today is not as high as in 1929 but the kilowatt hour use is ~~very much greater~~ → back again, to about the 1929 figure. I know as ~~a result of~~ that ~~appliances~~ in my own house ~~that~~ our monthly use has grown from something on the order of 75 kilowatt hours to well over 200, all because we use more motor driven appliances. ~~That has happened in a great many cases. I don't know how many domestic refrigerators are in use -~~

as a result not only of greater residential consumption but ~~the house demand~~ increased use in other directions

~~maybe five million~~. Air conditioning is spreading fast and all of these things help. A more intelligent knowledge of rates and rate schedules has induced many industrial consumers to ~~get peak rates~~ turn to off peak uses & off peak rates. When ~~it means added capacity~~ however, capacity must be added we can't afford to supply consumers ~~at lower rates.~~ it is not possible to do so at rates lower than those now in effect

Q - Is that due to power being diverted to private installations? Due to the centralization of these power units we are not cutting down on the available source of power?

A- ~~I can answer indirectly by saying that there is a develop-~~ You refer to the possibility that central station energy will displace industrial plants & thereby serve to diminish our total ~~ment taking place that will reassure you as to the danger of central station energy~~. available capacity. Such displacement has ~~taken place~~ occurred but I do not In the last ~~three or four~~ few years the Diesel engine has been remarkably improved and it is now often more economical for a manufacturer ~~the user~~ to install a Diesel plant and make his own than to buy energy from a central station. ~~It is something~~ This is a development that we are taking into very serious consideration.

Another point that has been stressed ~~in late years and~~ in these depression years when manufacturers ~~were~~ are looking for means to reduce costs ~~the question~~ is the possibility of installing a steam driven electric generating plant and using part ~~of the output in the process of manufacture~~. ~~An analysis of that particular problem for~~ of the steam as process steam for manufacturing Classes of business that formerly did not resort to this combination of ~~using the~~ generating electric energy to drive their machinery and ~~uses has shown that a great many industries might profit by installing~~ using part of the steam as for heating & for manufacturing processes ~~their own plants, thereby making available inexpensively steam for heating processes and the like~~. are now finding it profitable to do so. On the whole, I think you will have fully as much independent generating capacity in the future as you have had in the past.

Q - If this rural electrification project is carried through what effect will that have?

A - The Northern States Power Company of Minnesota was probably think it has created any serious change in conditions and I believe the tendency is now changing

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the pioneer in the central part of the country in rural electrification When that company Minnesota put in a model line people came from all over the United States to see it - to see what could be ~~was being~~ done to supply ~~distribute~~ electrical energy to the farmers. It is not economically possible unless you have two or three customers per mile ~~within a few miles~~, however, the difficulty is even when the farmer is liberal in his use. Ordinarily ~~even a liberal farmer would not use more than 25 kilowatts~~ that few farmers can afford to install all current using appliances to the extent that would justify the cost of building the transmission lines.

Q - I thought this rural electrification was more or less compulsory. That seems to be a misunderstanding No company can be

A - ~~I don't know about that~~. I think the Government will on rural electrification spend a great deal of money where it won't pay either the Government or anybody else.

Q - Is electrification in individual companies completed at this time?

A - ~~I think now that Westinghouse has electrified its own factory, it must be~~. Factories are being modernized ~~enlarged~~ all the time Some of them are not completely electrified as they stand today The thing is growing as the owners of these plants find they have money that it takes to convert them

Q - From the picture as you see it, do you think it would be beneficial or harmful to have a system of priorities? Is it practical and what would be the most useful method of preplanning to set up a system of priorities?

A - ~~I find that difficult to answer~~. I had little or nothing to do with setting up the system of priorities and yet I had some idea of what was being done in the War Industries Board. It seems to me that a

forced to furnish service unless there is a fair prospect that its investment will bring a reasonable return

well-conceived system of priorities ready for use in case ~~you find~~ of necessity ~~no other resource~~ will enable you to get the ~~production you need.~~ results you desire Certainly ~~It depends upon the magnitude of the war and the character of the supplies.~~ such advance preparation can do no harm

Q - Do you believe power alone is sufficient to move an industrial area? It is being considered In connection with these hydro plants, is power alone sufficient to move them?

A - I think the answer is no. In most ~~operations~~ manufacturing processes, power is a small part of the total ~~bill and~~ cost of the product while the expense of moving ~~would be a considerable one in~~ would be relatively great a plant already in existence ~~and involving a large amount of capital~~. The labor situation is the important thing. In congested areas the labor unions are strong and ~~disorderly.~~ ~~A great~~ some of them are inclined to be unreasonable Many manufacturers have found that in the long run, even in the face of the expense of building new plants, it ~~would~~ pays them to get away from ~~the~~ these heavily congested ~~union~~ and unionized areas. So they are moving ~~They take their labor with them - select that they like and leave the rest behind to live on the dole.~~ to less densely settled regions where the labor & other condition seems to be more favorable but I repeat that the cost of power is not an important cause for such changes

Q - In connection with the development of lines and systems, did not Wisconsin at one time have a state law that kept Illinois companies out of the state and which made it difficult for them to operate?

A - I think most states have a law which requires foreign corporations to have state licenses or state charters. ~~I don't think there is any other difficulty than the one I tried to describe.~~ I have lived in Illinois Chicago for twelve years and I don't recall any ~~such~~ law ~~directed specifically against the Insull cases. It may have related to securities.~~ such as you describe. If there was one, it must have related to the sale of securities or some such matter It certainly did not relate to the transmission & sale of electric energy.