THE POWER INDUSTRY OF THE UNITED STATES

12 April 1950

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Washington, D. C.

RESTRICTED

Mr. E. Robert de Luccia was born in Brighton, Massachusetts, in 1904. He received his B. S. degree in Civil Engineering from Massachusetts Institute of Technology in 1927, with hydroelectric as major option. He served as surveyman with the Metropolitan Water Supply Commission, 1927-29; engineer-designer, Stone & Webster, 1929-33; engineer inspection, U. S. Engineers, Charleston, W. Va., 1931-33; Chief, Design Division, U. S. Engineers, Huntington District, W. Va., 1933-38; Federal Power Commission 1938-42 as consultant on hydroelectric plants, Assistant Director, National Defense Power Staff and Assistant Chief, Bureau of Electrical Engineering; consultant on power for OPM and WPB. Being a reserve officer he was called to activ duty in March 1942 in the Chief of Engineers Office and was placed in charge of the aircraft factory and modification center construction program and later became operations officer, Engineering Division, SHAEF in the European Theater. Lieutenant Colonel de Luccia was awarded the Legion of Merit. He returned to the Federal Power Commission in 1945. He was a member of the Technical Industrial Disarmament Committee for German Electric Power Industry and consulted concerning problems of Japanese electric power systems. He is a consultant on Electric Power to the National Security Resources Board. He was U. S. Delegate to International Conference on Large Dams at Stockholm, Sweden, 1948; U. S. Delegate to International Conference on Large Electric High Tension Systems at Paris, France, 1948; and consultant to Economic Cooperation Administration. He is Chairman, U. S. Section, International Passamaquoddy Engineering Board, and a member of Official U. S. Delegation to Negotiate an International Treaty with Canada regarding use of Niagara Falls for additional power. At present, Mr. de Luccia is Chief, Bureau of power, Federal Power Commission, the position he has held since 1945.

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MR. SWAREN: In suggesting to the Commandant the name of our speaker of the morning, I made a departure from my philosophy of instruction for the students.

In case of war, the materials for its conduct will be produced by industry and not by that evil some of us term "bureaucrats," of which I am one.

But I have two reasons today for departing from this philosophy: First, in many years' acquaintance and knowledge of our speaker one factor has always been foremost in the scintillating scalpeling of his intellect. Whether he be probing the good flesh of industry or laying bare an insidious infection, there always has been a continuing suture of concern for the defense of our Nation running through and binding together his work.

Second, is his worldwide knowledge of the power industry. This industry, as you know, is largely a natural monopoly. Its executives necessarily take a localized view of its problems. Rare indeed is the utility executive who has a national approach to his problem. But our speaker has always had the welfare of the Nation as his objective. As you have observed further from his biography, he has not stopped with national affairs but has a wide experience in international affairs as these affect the power industry.

Frequently, he and I have disagreed violently as to method, but never as to objective--the welfare of the Nation. It is a great pleasure to introduce to you E. Robert de Luccia, Lieutenant Colonel, Engineers, (Reserve), Chief, Bureau of Power, Federal Power Commission. Colonel de Luccia.

MR. de Luccia: General Holman and members of the Industrial College:

My talk this morning, I think, will indicate that the matter of electric power, in so far as mobilization is concerned, is a very important aspect of our total economy. And I think it will also bear out Mr. Swaren's remarks that it is directed solely toward giving you information and material which may assist you in your studies of industrial mobilization.

Several times since the war I have had the pleasant privilege of coming to the Industrial College of the Armed Forces and discussing various aspects of the electric power industry--generally one phase at a time. This morning my assigned subject "The Power Industry of the United States" involves all phases, and I find the subject too large to dispose of completely in one short lecture. Therefore, I have chosen for discussion the following aspects of the industry which I trust that you as military students of industrial mobilization will find useful and interesting:

First, our existing generating facilities--are they adequate? What is being done to meet loads and to provide reserves? What is our ability to manufacture generating equipment?

Second, status of interconnections--- What are the trends in regional and interregional interconnections? What about those "giant" power grids you have heard about?

Third, plant dispersal.--How do we look to a possible enemy strategic bombing planner? What is the status of our protective measures?

Fourth, can we mobilize large amounts of low-cost, high-load factor electric power? Are there important opportunities available?

Fifth, how do we compare with other nations individually and in combinations?

Sixth, Federal power policies and practices particularly from the military interest. Anyone of the aspects just mentioned is a large subject in itself. Therefore, I can give you only the highlights--and I will try to do so with as few figures as possible.

Existing Situation

At the end of 1949 the installed capacity in central stations in the United States was about 63 million kilowatts, and these plants generated during the year over 291 billion kilowatt-hours. This is more than twice as much energy as was generated in 1940. If to this we add generating capacity in industrial plants, we find that the total installed capacity is 76 million kilowatts and an approximate total of 345 billion kilowatt-hours was generated in 1949.

Chart 1, page 15, shows the amount of electric energy generated per week by electric utilities. You can see that in the space of 10 years we have enormously increased our use of electric energy, and the requirements continue to mount. Notice that in spite of the coal and steel strikes of 1949 and early 1950, the energy used in 1949 was greater than that in 1948 and so far in 1950 it is greater than in

1949. This is important to note because it means that if power is to be available not only for peacetime, but for possible wartime needs, we must continue to expand our electric facilities by all available means.

In 1947 and 1948 electric load curtailments were fairly general throughout the country due to lack of generating capacity. In 1949 there were only a few load curtailments from this cause. As a national average, our reserve margins were about 10 percent at the end of 1949. This is a national average and, of course, the reserve availability in various parts of the country will vary widely. For example, in the Pacific Northwest serious shortages will probably continue. In the Southeast power supply will be tight with TVA in particularly short supply until its new steam plants are in operation. However, interconnections between TVA to the north and northeast can make available power which can assist in alleviating the shortage in the interim period.

Manufacturers are now able to produce nearly 8 million kilowatts of new generating capacity per year against which orders have been placed for about 7 million kilowatts. However, the indicated open capacity of about one million kilowatts includes a fairly large proportion of small units not suitable for central station use on large systems. By 1953 manufacturing capacity will be capable of producing 10 million kilowatts of generating capacity annually.

What is Planned for the Future

In addition to the generating capacity now installed, there is under construction or planned for installation by the end of 1952 an additional 16 million kilowatts. Present estimates of load for 1952 indicate that this amount of installation will provide reserves of about 15 percent, except in the Northwest. This percentage for large interconnected systems is considered by the industry as a suitable amount to insure adequacy of service and proper maintenance schedules. Insolated systems will require a larger percentage of reserves. However, it is questionable if this margin is adequate for war mobilization purposes.

In the Northwest it is expected that there will continue to be difficulty in meeting the loads for several years after 1952. This phenomenon is explained most probably by the relatively low rates at which power in the Northwest can be obtained, as compared with the other parts of the country and the fact that it requires four to five years to construct its large projects. On this basis it would seem that a serious shortage condition could exist in the Northwest almost indefinitely, assuming a continuance of present high industrial and business activities.

The possibilities for generation of electric power from the wind, the sun, the tides and by use of atomic energy are all receiving active consideration but, as yet, none of these have assumed any commercial stature.

The possibilities of using the wind should be of particular interest to those concerned with maintaining military bases in remote regions since fuel transportation is not required.

Interconnections

During the period up to 1920, the original small isolated electric properties were consolidated to form connected operating units we now call electric systems. Generally speaking up through 1940, electric power systems operated on the principle of self-efficiency providing, through construction or purchases, their full reserve requirements of generating capacity. Such connections as existed between electric systems were usually of relatively small capacity and were used chiefly for delivery of contracted amounts of firm power and sometimes for emergency stand-by purposes and energy exchanges in nominal amounts. Except for several isolated instances, it was uncommon for an electric system to consider the operations and problems of its neighboring system. Consequently, each system carried on according to its local customs and practices.

With the growth of holding companies in the 1920 era, adjacent properties in certain areas came under common top control. This brought about interconnections between associated system properties, the adoption of common transmission voltages, and the utilization of generating facilities on combined rather than separate system loads. Thus, except for adjacent systems under common control, the electric utilities generally operated individually until 1941.

During the summer and fall of 1941, a serious power shortage developed in the southeastern region of the United States. Following recommendations initiated by the engineering staff of the Federal Power Commission, the electric systems operating in Virginia, Florida, Ohio, Indiana, Arkansas, and Texas voluntarily cooperated to supply energy to the shortage area embracing, generally, Tennessee, North Carolina, South Carolina, Georgia, and Alabama. This was the first time that different electric utilities serving such a large region of our country had operated interconnected with common dispatchers over so wide an area. Many problems of operation, previously considered as limitations on region-wide pooling of power, were satisfactorily solved. Confidence and know-how were gained from this experience until now many power pools operate on a regional basis throughout the Nation. This was an invaluable asset in the supply of electric power during World War II.

The development of tie-line and other equipment for providing better control of power flow between systems, and the scheduling of generating capacity for loads and for maintenance outages is, in many places, now on a pool rather than a system basis. Such regional power pooling makes possible wide sharing of reserves, lower-cost energy production and greater reliability of service--for example, before the war system reserves were carried at from 20 percent to 25 percent.

Today an over-all average of 15 percent has been generally adopted; however, this situation has the disadvantage that if world war III occurs, we no longer have as great a cushion for providing additional capacity by further pooling as was available in World War II.

The trend in transmission interconnections is definitely toward higher voltage lines and lines of greater capacity than are now in use. At Brilliant, Ohio, the American Gas and Electric system, in cooperation with the manufacturers of electrical equipment, has been conducting high voltage transmission experiments over the past two years. Voltages up to 500,000 volts have been investigated. As a result, this company is considering construction of backbone ultra-high voltage transmission lines which will extend over 200 miles from its present Philip Sporn plant and a projected new steam-electric plant in the coal fields of West Virginia to load centers in Indiana. The Bonneville Power Administration, in cooperation with the manufacturers, has developed high voltage, high interrupting capacity oil circuit breakers capable of operating at very high speeds. Bonneville is also investigating direct current transmission--success in this field will make it possible to expand transmission distances up to 1,000 miles or nearly three times present practice.

But we find others ahead of us! In Sweden it has been decided to construct a 100,000-volt direct current submarine cable from the mainland to the Island of Gotland, a distance of 58 miles. The Swedes are completing construction of a line about 600 miles long at 380,000 volts tying in the northern and central Swedish hydro plants with the southern loads. This line is planned ultimately to cross the Skagerrak into Denmark and thence into the coal fields of the Ruhr and Belgium.

The establishment of marketing administrations by the Federal Government will increase the number of transmission interconnections and result in the establishment of new high capacity transmission grids. Today, the Federal agencies distributing electric power include Bonneville Power Administration in the Northwest, the Bureau of Reclamation in California, the Pacific Southwest, and the Missouri Valley, the Southwestern Power Administration covering the Southwest, and the recently established

Southeastern Power Administration covering all the Southeastern States as far north as Kentucky and Virginia and west to the Mississippi River. In addition to the transmission networks which are resulting from the operation of these marketing agencies, there is increasing establishment under the Rural Electrification Administration of generating and transmission cooperatives. These cooperatives are now constructing steam stations with individual plant capacities as high as 45,000 kilowatts and transmission systems operating at high voltages and covering large areas. These transmission systems are being interconnected with the Federal power systems and in most cases interconnections are in existence, or being made with the privately owned transmission lines and the public non-Federal systems.

Now a word about the "giant" power grids. This intriguing name was given to projected transmission systems studied and considered about 30 years ago. The areas then studied included principally the Northeastern States. The general idea was to be able to transmit large blocks of power between large load centers; and thus enjoy the advantage of load diversity, share reserves and utilize the cheapest generating sources. These studies had vision which susequent events have endorsed although the particular transmission interconnections studied were found not to be economically feasible at the time. Today, we have transmission networks covering tremendously large areas and with the advent of supervoltage lines there is no doubt but that the dream of "giant" power will come true--even beyond the expectations of those who originally appreciated the possibilities.

Plant Dispersal

We have achieved a fair amount of power dispersal in the United States, which may be a tribute to the effectiveness of our way of doing things. I think it may be said without fear of contradiction that if the Federal Government had not constructed multiple-purpose hydroelectric projects that we would not today have such projects as Hoover Dam, Grand Coulee, Shasta Dam, and many others. On the other hand, municipalities and state agencies have built a great number of hydroelectric power plants including some very large structures such as the Ross Dam on the Skagit River and the Cushman Dam on the Nisqually River, Kingsley Dam and Reservoir in Nebraska, Pensacola Dam in Oklahoma, and many other plants including large numbers of fuel-electric plants. The private utilities have contributed enormously in the matter of plant construction and, although making their principal contribution in the field of steam-electric plants, have constructed a very large total of hydroelectric plants.

The result of the activity by all who were willing and able has been to provide the country with a very large number of electric power plants fairly well scattered as to location. We have in the United States today over 550 hydroelectric plants of 5,000 kilowatt capacity or more

and 1,450 fuel-electric plants of 5,000 kilowatts or over. The majority of these plants are connected into systems which are interconnected with other systems.

It is true that we have not all the interconnections that we would like to have, nor is our plant dispersal quite so complete as it might be; but on the whole I believe we offer a very difficult problem with respect to seriously crippling our electric power production on a nation-wide basis.

However, it is unrealistic to think only of the electric power systems without also keeping in mind the industries and activities served by these systems, since one way to impede a war effort would be to attempt to interrupt that electric supply associated with essential industries and activities. A critical examination should be made from this viewpoint to determine any deficiencies in power plant dispersal and interconnected supply.

With respect to protective measures, active study is now underway by the National Security Resources Board and interested government agencies and the electric power industry to consider ways in which protection can be provided within the limits of economic feasibility. As yet no over-all directive has been given.

Mobilization of Electric Power

At the beginning of the last war we were fortunate in having under construction, and not fully utilized, several large hydroelectric projects including among others Grand Coulee, plants in the Tennessee Valley, and Shasta in California. The availability of this capacity enabled us to mobilize large quantities of electric power which probably meant the difference between a successful aluminum, light metals electro-chemical, and so forth, output and a greatly curtailed availability of such basic materials. The TVA power also made it possible to proceed simultaneously with the atomic energy program. If these hydro plants had not been under construction, the atomic program might not have been possible.

I understand that one of the reasons leading to the abandonment of atomic bomb work by the Germans was their inability to mobilize the necessary electric power on top of their war material needs, in spite of the fact that allied air forces did not make direct attempts to cripple the German electric power supply.

There is in progress today a very large expansion of hydroelectric facilities by the Federal Government, the public, non-Federal, industrial, and the private industry. Chart 2, page 16, shows the growth in hydroelectric power development in the United States by the various classes of ownership just mentioned from 1920 through 1948. First note that the total has

grown from over 5 million kilowatts in 1920 to nearly 17 million kilowatts at the end of 1948.

A marked development within recent years has been the increasing activity of the Federal Government in the construction of hydroelectric plants in conjunction with the improvements for flood control, navigation, irrigation, and other purposes. At the end of 1948, as you will see on the Chart, Federal installations aggregated 5 million kilowatts or nearly a third of the total hydro capacity installed. There has also been a large increase in non-Federal plants, private and public. For example, installations in private utility plants since 1920 increased over 5.5 million kilowatts and in non-Federal public plants nearly 1.5 million kilowatts. It is of interest to note that industrial hydro plant installations actually decreased from about 1.1 million to 983,000 kilowatts.

At the present time there is under construction by the Federal Government 30 hydroelectric plants whose ultimate capacities will be 6.2 million kilowatts, and Congress has authorized an additional 61 plants totaling 4.1 million kilowatts. However, most of this capacity will produce relatively low-load factor power and generally speaking is not suitable for mobilization or for high-load such as needed for aluminum, electrochemical and similar industries. I caution that this statement is very general and certain individual projects are suitable for fairly high-load factor operation. However, the total amount of energy available therefrom in consideration of the demands of the region will make it improbable that any great amount will be available for the high-load factor industry except in the Northwest and to a more limited extent in the Missouri Valley.

There are two splendid opportunities in the Northeast which offer ideal possibilities for mobilization of large amounts of high-load factor low-cost power--these are the St. Lawrence project and the redevelopment of Niagara Falls. The history of the St. Lawrence development is too well known for any particular comment thereon, except that it seems as though we are not getting any place with it in this Congress. With respect to Nigara Falls, a treaty was recently signed with Canada which would permit enormous further development of hydroelectric power with full protection for scenic values. This will make it possible to double the power installation on the Canadian side and multiply by almost four the installation on the American side. You might be interested to know that redevelopment at Nigara Falls, consistent with full and adequate protection of scenery, would produce about 23 billion kilowatt-hours each year with an installed capacity of about 3.2 million kilowatts, half of which would be available to each country. At present the Canadians have installed around 850,000 kilowatts and on our side we have installed about 440,000 kilowatts. Some of these installations are in inefficient plants. The following table compares possibilities of Niagara Falls and St. Lawrence with other well-known power producers in the United States.

Name of Plants	Ultimate installed capacity: Kilowatts	Ultimate installed capacity: Average annual Energy--Billion Kwh
Niagara Falls	3,200,000*	22.9*
TVA Hydro	2,600,000	12.5
Grand Coulee	1,944,000	12.5
St. Lawrence	1,880,000*	12.6*
Hoover	1,317,500	5.3
Bonneville	518,400	4.1
Shasta	375,000	1.6

* Total for U. S. and Canada--each country to get half.

It should be borne in mind that like Nigara Falls the amounts shown for St. Lawrence have to be divided equally between Canada and the United States. The other projects shown are wholly within the United States.

Of the capacity which I have just shown you in the foregoing table TVA, Grand Coulee, Hoover, Bonneville, and Shasta are already integrated into power systems and are not available to provide additional power for emergency purposes. Niagra Falls and St. Lawrence remain to be constructed. The State of New York has asked the Federal Power Commission for a license to construct the power features of the St. Lawrence project which application has not been acted upon as yet. In addition to Federal Power Commission approval, it is necessary to get the approval of the International Joint Commission and the submission of the application to the International Joint Commission is being held up by the State Department.

Before any construction can take place at Niagara Falls it will be necessary to ratify the treaty which I have just referred to. I may say parenthetically I was one of the three negotiators for the United States with respect to this treaty and I believe that we have received a very fair deal from the Canadians. In my mind it stands as a monument to successful negotiations between upstanding, honest nations.

As part of this subject I would like to call your attention to an interesting view of the aluminum industry. As you know this industry requires huge quantities of low-cost power. It found that when it went to the then relatively remote sources as, for example, the Saguenay in Canada or the early days on the Tennessee, at Niagara Falls and along the St. Lawrence River and established its reduction plants, it contributed to the development of the surrounding region. Along with the development there were created demands for power by industries not necessarily needing such low-cost power and employing

more labor per kilowatt-hour used than the aluminum industry. Since the power producers can get a better price for their power from other industries, and the general public wants to enjoy as low rates as possible, the aluminum industry finds it increasingly difficult not only to get additional power but also to keep the power which it has. Many of the aluminum industry power contracts are on an interruptible basis and one of the first things done in the Northwest and TVA to meet loads which are in excess of available generating capacity is to dump the aluminum load.

This could result eventually in the actual migration of the aluminum reduction industry, and other high-load factor industrial users, to other regions and countries. Serious consideration is being given now to locating in South America, British Guiana, British Columbia, Alaska, and Africa. My point in mentioning this is that from a military standpoint it would seem well to examine the phenomena which I have briefly indicated and assess its possible impact on industrial mobilization.

There are two thoughts I would like to leave with you in respect to mobilization of electric power for war purposes:

First, it was because TVA, Grand Coulee, Shasta, and other Federal hydro projects were under construction and not committed to any load that the power from these projects could be taken without difficulty and directed into war channels. After projects are hooked up to system loads and the output integrated into the region such power can only be withdrawn by instituting curtailments. Hence, a continuing construction program of Federal hydroelectric projects is a military asset, including also, of course, construction of capacity by public non-Federal and private utilities.

Second, serious consideration must be given to reservation of large blocks of low-cost, high-load factor power for use by the electrochemical and electrometallurgical industries and with positive encouragement to such industries to stay within the continental limits of the United States.

Comparisons with other Countries

It is always interesting to compare ourselves with others, and with respect to industrial mobilization comparisons are often revealing. Chart 3, page 17, compares our electrical generating capacity with other countries and groups of countries.

You will notice that our position in the matter of electric power supply as compared with any other single country is overwhelming. The Russian capacity today is estimated at about 20 million kilowatts and in comparison we have a most favorable balance. The Russians are increasing their capacity as rapidly as they can produce and install equipment. However, it is probably safe to say that their present amount of new installation is not any greater than ours and probably a great deal less. All of the Iron Curtain countries together have a total of 35 million kilowatts as compared to the Marshall Plan countries' total of 57 million kilowatts.

Europe and Asia together, but excluding the United Kingdom, total 93 million kilowatts as compared with a total of 87 million kilowatts in Canada, Mexico, and the United States. On this basis the United Kingdom's total of 14 million kilowatts holds the balance.

Thus it appears, on the basis of present alignments in the cold war, that our position is favorable. The loss of Europe and the United Kingdom would give an edge with respect to electric energy generating capacity to a possible enemy.

Somewhat evening up this score is the fact that integrated transmission systems between the countries of Europe do not compare with our large regional pools--present indications, despite all the dollars we pour in, are that each nation will follow its present nationalistic policy of self-sufficiency. However, in the Iron Curtain countries, indications are that important regional interconnections, regardless of boundaries, are contemplated--and it requires only a few months to a year to construct important interconnection lines.

In comparing relative strengths it should be kept in mind that a much larger percentage of electric energy is used today in production for war in the Iron Curtain countries than in the Marshall Plan countries. Therefore, it would appear that we have a greater resiliency since curtailment of civilian nonessential activities will yield a much larger amount of electrical energy than would a similar program if put into effect on the already rationed civilian population in the Iron Curtain countries. Another way to look at this is that these countries are storing more electricity in their war machines than we are. During this period we are using ours for peaceful purposes.

Military Interest in Federal Power Policies and Practices

From the standpoint of availability of material and equipment to support military operations, the interest of the military services in the supply of electric power is definite and direct. Assured supplies of electric power at the places and in the amounts needed is essential to production of all war material. The military interest also includes protection of power sources and transmission lines from possible enemy action of all types.

Power policies expressed by Congress and the interpretation of those policies by the Federal agencies is assuming increasing importance with respect to responsibilities for provision of generating capacity, construction and location of transmission lines, rates to which power is sold, and the methods of marketing of power.

As mentioned earlier, the original electric properties were small and isolated with some of them joining together to form small systems. Later some of these systems joined to form somewhat larger systems under the influence of the holding companies; and still later, following the breakup of the holding companies, many of these systems became regrouped. Meanwhile, as a result of war preparation and later actual war, large regional pools were formed--generally on a voluntary basis. These regional pools, urged and encouraged by the Federal Government, were essentially an association of electric utilities, public and private, drawn together by a common need to meet unprecedented load requirements. Most of these pools continue today.

Certain changes are occurring in some areas due principally to construction by the Federal Government or to construction financed by the Federal Government. For example, construction by the Federal Government has created a situation in the Northwest with the result that private utilities have joined with public utilities in advising the Congress that the matter of the development of additional power generating capacity is now a responsibility of the Federal Government. In the Tennessee Valley, it has been the responsibility of the Federal Government to provide needed power facilities since the inception of the Tennessee Valley Authority program; this responsibility was reaffirmed when Congress approved the construction of the New Johnsonville steam plant in Tennessee.

In the Missouri Valley, construction of hydroelectric plants on the main stem of the Missouri by the Army Engineers, and at the headwater streams tributary to the Missouri generally by the Bureau of Reclamation, will provide power supply tremendously in excess of existing power supply in this valley. This, together with the Transmission system by the Bureau of Reclamation, will far exceed existing facilities particularly in the central Missouri Valley. Thus the Federal Government will find that it has assumed the responsibility for power supply in much of the Missouri Valley.

In the Southwest the Federal hydroelectric power available, or which might become available, will not be proportionately so large as that made available from other sources as it is in the case of TVA, the Northwest, and the Missouri Valley; and similarly, in the Southeast and in the Northeast, New England, and the North Central States. In California it is probable that the relative relationships between Federal power, non-Federal public power and private power are fairly well stabilized--at least at the moment.

Another development which is accelerating is the creation of REA financed generating and transmission cooperatives. In the Southwest, for example, one of the great difficulties in marketing Federal hydroelectric power as a separate self-contained system is the lack of base load steam plants. Recently the REA announced the construction by cooperatives of two large steam plants in northern Missouri with backbone transmission lines running south to connect with the projects and system of the Southwestern Power Administration and to be operated as a unit by SPA. In North Dakota a similar generating and transmission cooperative has been established, and there are others.

Recently the Department of the Interior has challenged the jurisdiction of the Federal Power Commission in two important cases--one on the Kings River in California and the other on the Roanoke River in Virginia. One of the important findings by the Federal Power Commission in the case of the Kings River, and by the Examiner in the case of Roanoke (upon which case the Commission has not yet acted), has been that the applicant for a license is ready and able to commence construction at once whereas possible construction by the Federal Government is far distant in the future. Should the views of the Department of the Interior prevail, construction of the majority of projects as provided in the Federal Power Act would not be available to non-Federal public or private agencies. The effect would be to delay construction of hydroelectric projects until such time as the Federal Government might get around to constructing them. Today there are authorized multiple-purpose projects totaling over 50 billion dollars. The present rate of appropriation for this work by Congress is about 750 million dollars annually. Thus it will take over 60 years to construct projects now authorized.

The result of this will be loss of opportunities for further plant dispersal and a slowing down of hydroelectric development since there is no assurance or even probability that Congress will step up its authorizations for construction--I believe it to be in the military interest as well as beneficial to our peacetime economy to continue to permit and encourage non-Federal public or private agencies to construct hydroelectric facilities whenever they are willing and able as is now provided and encouraged under the Federal Power Act.

Preparation for defense, leading to successful mobilization of our industry and resources in time of national emergency, can only be achieved by expecting and permitting the combined and coordinated efforts of all the people, all groups and all agencies.

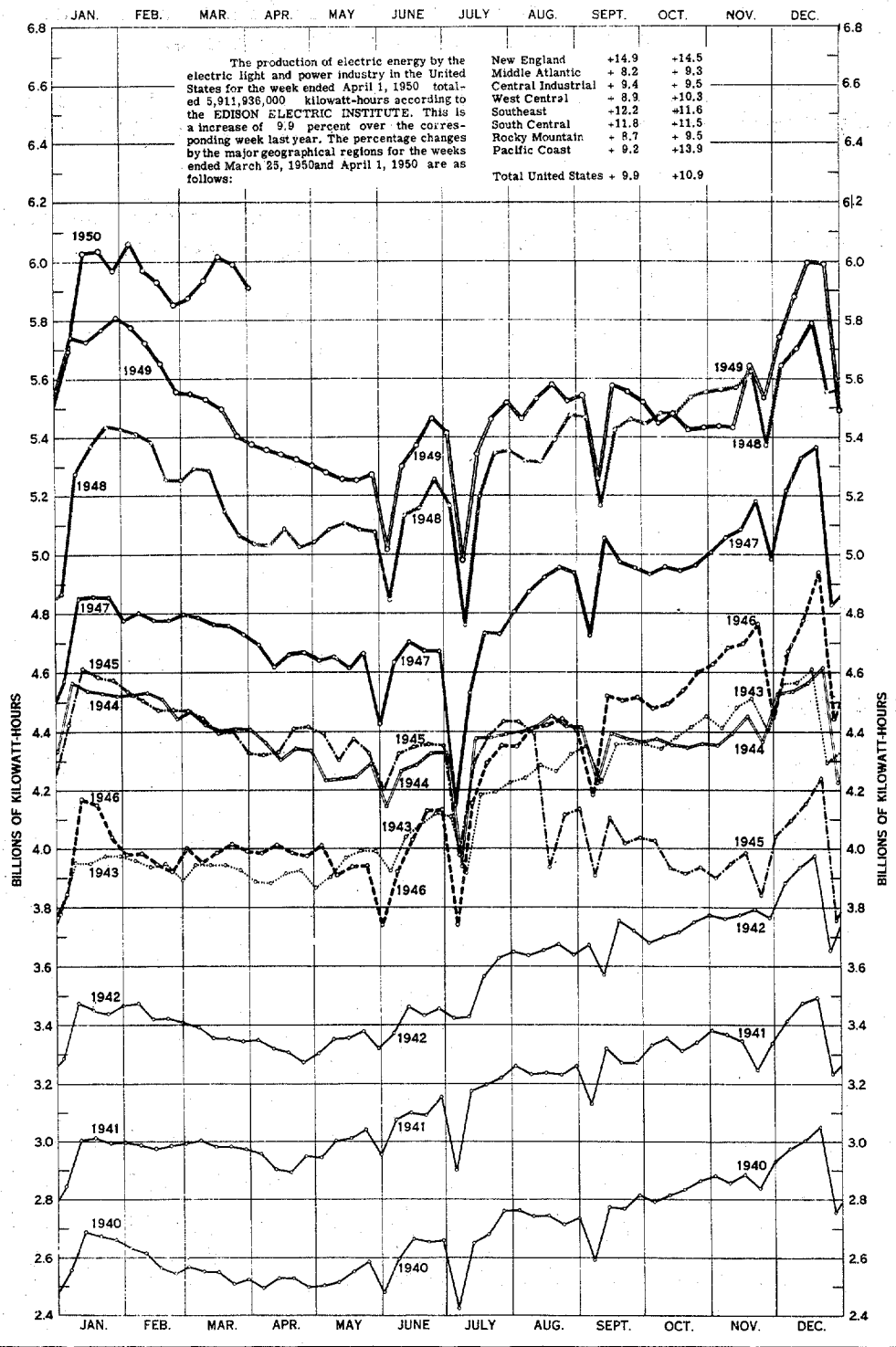
COLONEL MEETZE: There will not be time for a discussion period this morning. By anyone having a question is invited to attend the seminar on power, to be held this afternoon.

Colonel de Luccia on behalf of the Commandant and the student body, I thank you for a very fine and informative discussion.

(7 July 1950--350)S.

Chart 1

FEDERAL POWER COMMISSION
WEEKLY ELECTRIC OUTPUT
UNITED STATES
AS OF APRIL 1, 1950



The production of electric energy by the electric light and power industry in the United States for the week ended April 1, 1950 totaled 5,911,936,000 kilowatt-hours according to the EDISON ELECTRIC INSTITUTE. This is a increase of 9.9 percent over the corresponding week last year. The percentage changes by the major geographical regions for the weeks ended March 25, 1950and April 1, 1950 are as follows:

New England	+14.9	+14.5
Middle Atlantic	+ 8.2	+ 9.3
Central Industrial	+ 9.4	+ 9.5
West Central	+ 8.9	+10.3
Southeast	+12.2	+11.6
South Central	+11.8	+11.5
Rocky Mountain	+ 8.7	+ 9.5
Pacific Coast	+ 9.2	+13.9
Total United States	+ 9.9	+10.9

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Chart 2

Growth in Hydroelectric Power Development in the United States

By Classes of Ownership

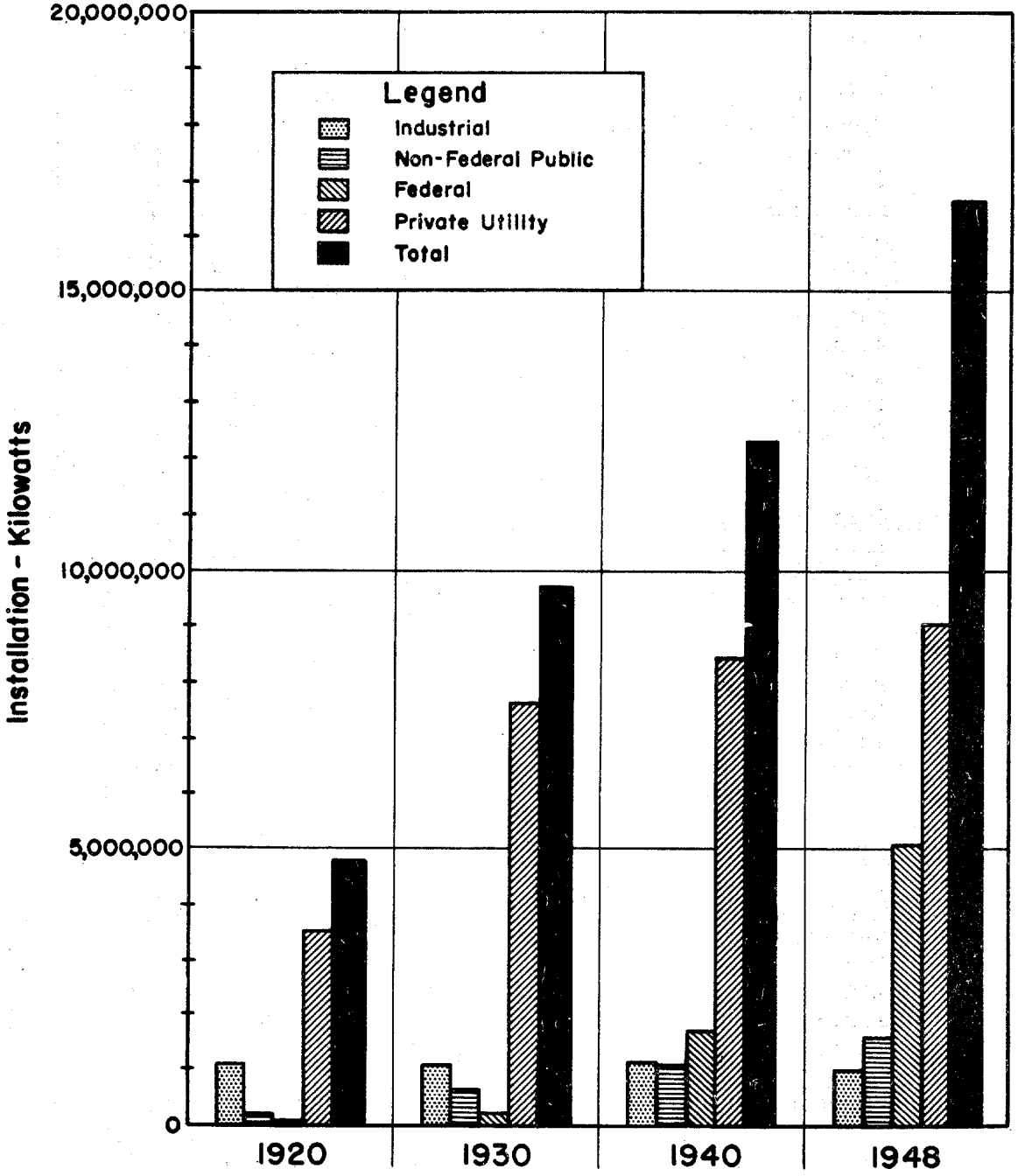

Chart 3

Country	Installed generating capacity as of 1949--Million KW	
United States		76.1
Marshall Plan Group		
Austria	1.2	
Belgium	2.8	
Denmark	0.7	
France	11.3	
West Germany	7.5	
Great Britain (U.K.)	14.1	
Greece	0.2	
Italy	6.5	
Luxembourg	0.2	
Netherlands	2.1	
Norway	3.0	
Portugal	0.4	
Switzerland	2.6	
Sweden	3.9	
Turkey	0.4	
Ireland	0.3	
Iceland	0.1	
Total		57.3
Iron Curtain Group		
Russia (U.S.S.R.)	20.0	
Bulgaria	2.8	
Czechoslovakia	2.2	
East Germany	4.8	
Hungary	0.9	
Poland	2.3	
Romania	0.7	
Yugoslavia	0.8	
China	0.7	
Total		35.2
Remainder of Asia		15.0
Total for World		
Western Hemisphere	93.8	
Europe	91.5	
Asia	15.6	
Africa	3.6	
Australia and New Zealand	3.2	
Indonesia	0.2	
Other Islands	0.3	
World Total		208.2

APPENDIX

I would like to call your attention now to an interesting view of the aluminum industry. As you know, the aluminum industry--the reduction industry--requires enormous amounts of power; and it requires low-cost power. That always requires going into what are relatively remote sources. A year or so ago, the Saguenay in Canada, the St. Lawrence, the Messani, Niagara Falls, and areas of that kind were relatively remote, at least with respect to being heavily populated.

Well, that situation changed. The aluminum company people--this would apply equally well to the chemical facilities (abrasives, and so forth) --have all felt this same thing; namely, the power they use at very low cost is demanded by other people who will pay a higher price for it. So they gradually turned away from them; or else they had to renew their contracts at a higher price. So, they go out and create an industrial area. The very creation of that industrial area drives them out to more remote places.

But I think we might well ask: What does that have to do with military or industrial mobilization? Well, simply this: Those companies today are prospecting in far-away places. The Upper Yukon, for example, has separate hydroelectric sources, as have British Guiana, Africa, and other places. But they are outside the continental limits of the United States.

There is one matter that has to be kept in mind and, I think, given serious consideration. We may find ourselves with all kinds of electric power, and the means available to make aluminum and everything we want, but find that we have to actually bring the aluminum in from Africa, South America, or some other places.

Now, I will admit we bring in bauxite and things of that kind, but we reduce it in the United States. And we do have supplies or raw material in this country which are used not only in time of peace but can be used in wartime; but we may not have the plants in which to do that.

In the Northwest today, they have a shortage. What is the first thing they do? They cut off the aluminum industry. In fact, they cut off the abrasives industry. They have interruptible contracts. Those people are called up and given a two-week notice: "You're being cut off in three months." So, they are unable to continue. As I say, they are continually looking for new places. We may find that some of our supplies of needed materials are being produced off-ground. That may prove to be awkward some day.

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Very briefly, I would like to compare our situation with other countries in the world. Our position with respect to any other single country in the world is overwhelming. There isn't any question about that. Russian capacity today, for example, is probably in the neighborhood of 20 million kilowatts installed. As I pointed out earlier, we have 76 million. The Russians are, of course, doing all they can to increase their supply; so are we. On the whole we are doing a finer job of it.

In a comparison with Russia and its so-called Iron Curtain countries we find that if you add the Iron Curtain countries together--Russia, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, Jugoslavia--I suppose we have to add China also, but it doesn't make any difference in these figures--you find all these countries combined have about 35 million kilowatts of installed capacity. This, against our 76 million, looks pretty comfortable.

The installed capacity for those countries in the Marshall Plan group--I won't name them all; you know most of them--runs about 57 million kilowatts, including Great Britain. If you add our 76 million and this 57 million together and compare it with the Iron Curtain countries with their 35 million, you will see we are getting along all right.

But suppose we have a little tough luck. Let's add the Marshall Plan group and the Iron Curtain group together and see what we get. Now, if we exclude the United Kingdom and add these other two together, and include the capacity in the northeast of Asia, we get 93 million kilowatts, compared to a total for Canada, Mexico, and the United States of 87 million kilowatts. So that they have a little edge on us. And if you add the 14 million kilowatts in the British Isles to the 93 million kilowatts in the Marshall Plan countries and the Iron Curtain countries, why, of course, there is a definite balance against the Western Hemisphere, not including South America.

I admit that is possibly a pretty pessimistic picture. But I thought it would not hurt to put a few of these figures together so that you can realize we are not going to be able to beat anybody with one hand tied behind our back.

Now the score is evened up a little bit by the fact that we have a pretty good integrated transmission system; in Europe, they do not. In spite of all the dollars we exported--and Europe won't always be self-sufficient in the matter of electric power (or, I guess, anything else) --we have not been able to overcome that. But in some of the Iron Curtain countries they have instituted transmission interconnections between countries, the plan to be operated on a truly policy basis. For example, the coal fields of Poland with the water power of Austria and Czechoslovakia.

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So, initially, we can mobilize our power a little easier than they can in Europe or in the Iron Curtain countries, or in Soviet Russia. Those transmission lines could be erected--certainly in the space of a year--so that as time went on that condition could be overcome, provided all of Europe is under one control.

Another thing we might remember is that a greater percentage of electric production in the Iron Curtain countries today is going for war purposes; a much greater percentage certainly than in our own country. So we have a greater balance than they have. We can curtail nonessential matters and have more available for production, on top of the production we have now, for military purposes.

But another way of looking at it is these countries are storing more electricity in their war machines than we are at the present time. We are making ours for peace purposes. So, again, a critical study of the whole matter indicates that while we have a good position relative to any single country, or to any selected group of countries, like the Iron Curtain countries, we have no reason for complacency in the face of possible reverses upon the outbreak of any "unpleasantness."