

FIRST ANNUAL REPORT OF THE
BONNEVILLE ADMINISTRATOR

LETTER

FROM

THE SECRETARY OF THE INTERIOR

TRANSMITTING

THE FIRST ANNUAL REPORT OF THE
BONNEVILLE ADMINISTRATOR

MAY 14 1939

U.S. Bonneville project



Department of the Interior

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LETTER OF SUBMITTAL

DEPARTMENT OF THE INTERIOR,
Washington, December 30, 1938.

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to submit herewith, for the consideration of the Congress, the first annual report of the Bonneville administrator, made under the provisions of section 9 (c) of the Bonneville Act (Public, No. 329, 75th Cong., approved Aug. 20, 1937).

Respectfully,

HAROLD L. ICKES,
Secretary of the Interior.

LETTER OF TRANSMITTAL

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE ADMINISTRATOR,
THE BONNEVILLE PROJECT,
Portland, Oreg., December 31, 1938.

HON. HAROLD L. ICKES,
Secretary of the Interior,
Washington, D. C.

MY DEAR MR. SECRETARY: Pursuant to section 9 (a) of the Bonneville Act (Public, No. 329, 75th Cong., approved August 20, 1937), there is transmitted herewith the first annual report of the Bonneville administrator, dated December 1, 1938.

This report covers only 8 months of the fiscal year 1938, as the organization had its inception after the beginning of the governmental fiscal year.

Inasmuch as funds for the construction of transmission lines were not made available until after the commencement of the present fiscal year, this report is devoted primarily to the plans and progress of the Bonneville project.

This report presents the fact covering the administration of the Bonneville project during the first fiscal year of its history, and the activities of the project in carrying out the policies and program as directed by the Bonneville Act.

Sincerely yours,

J. D. Ross, *Administrator.*

FIRST ANNUAL REPORT OF THE BONNEVILLE PROJECT
DEPARTMENT OF THE INTERIOR
FISCAL YEAR ENDING JUNE 30, 1934

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FIRST ANNUAL REPORT OF THE BONNEVILLE PROJECT— DEPARTMENT OF THE INTERIOR

FISCAL YEAR ENDED JUNE 30, 1938

I. THE BONNEVILLE PROJECT

LEGISLATIVE HISTORY

In 1914 the Department of the Interior, through the Bureau of Reclamation, investigated the possibilities of developing the Columbia River. Thousands of arid but potentially fertile acres needed only water to become the Imperial Valley of the Northwest. Locked in the mountain ranges were valuable ores awaiting electricity to turn them into needed metals.

Two years later the State engineer of Oregon urged the development of the Bonneville site as a national-defense measure: he saw in the proposed power project a source of fertilizer in time of peace and nitrates in time of war. The dam also would completely drown out the Cascade Rapids and extend slack-water navigation some 40 miles eastward to The Dalles.

The Rivers and Harbors Act of 1925 (Public, No. 585, 68th Cong., approved March 3, 1925) directed the Secretary of War, through the Corps of Engineers, United States Army, to prepare and submit to the Congress an estimate of the cost of surveys, examinations, and investigations of all navigable streams and their tributaries where power development appeared feasible. The major purpose of this act was to formulate general plans for the combined improvement of such streams for navigation, flood control, irrigation, and the economic development of water power.

As a result of this authorization the Secretary of War, on April 12, 1926, submitted to the Congress his report, which was printed as House Document No. 308, first session, Sixty-ninth Congress. This report listed and described the navigable streams of the United States where power development appeared feasible and practicable.

Among the streams listed was the Columbia River and its principal tributaries.

The Rivers and Harbors Act of 1927 (Public, No. 560, 69th Cong., approved January 21, 1927) directed the Secretary of War to make the necessary surveys in accordance with the recommendations of House Document No. 308.

Under this authorization the Secretary of War, through the Corps of Engineers, United States Army, proceeded with the requisite surveys, examinations, and investigations to formulate "the general plans for the most effective improvement of the Columbia River for the purposes of navigation, and the prosecution of such improvement

in combination with the most efficient development of the potential water power, the control of floods, and the needs of irrigation."

The report of the Secretary of War, covering the general purposes of the previous legislation, was submitted to the Congress on March 29, 1932, and was printed as House Document No. 103, first session, Seventy-third Congress.

This comprehensive report stated that the Columbia River and its tributaries were capable of being developed into the greatest system of low-cost hydroelectric power in the United States. The report laid the foundation for the development of the Columbia system, and cited the benefits to be derived from a proposed unified improvement. The plan outlined in this report consisted of a series of 10 dams from the Canadian border to tidewater located as follows: (1) Grand Coulee, (2) Foster Creek, (3) Chelan, (4) Rocky Reach, (5) Rock Island, (6) Priest Rapids, (7) Umatilla Rapids, (8) John Day Rapids, (9) The Dalles, and (10) Bonneville.

The plan contemplated the integrated development of the Columbia Basin through the improvement of a major waterway from the sea to the interior of Oregon, Washington, and Idaho, the irrigation of potentially fertile lands, and the generation of power. The great amounts of potential water power in the area are important not only because they offer plentiful surplus low-cost electricity to farm, home, and industry but because the energy can help finance the construction and maintenance of navigation and reclamation projects vital to the economic development of the Northwest.

In accordance with the recommendations of the Secretary of War, contained in House Document No. 103, construction of the first Federal dam on the Columbia River, at Bonneville, was begun on September 30, 1933, under the direction and supervision of the Corps of Engineers, United States Army, as Public Works project No. 28. The dam, locks, fishways, and power plant were designed and constructed under the direction and supervision of the Corps of Engineers, United States Army. This project was formally authorized by Congress in the Rivers and Harbors Act of 1935 (Public, No. 409, 74th Cong., approved August 30, 1935).

Authorization for the completion of the Bonneville project was carried in an act of Congress (Public, No. 329, 75th Cong., approved August 20, 1937). This act provided—

That for the purpose of improving navigation on the Columbia River, and for other purposes incidental thereto, the dam, locks, power plant, and appurtenant works now under construction at Bonneville, Oreg., and North Bonneville, Wash. (hereinafter called Bonneville project), shall be completed, maintained, and operated under the direction of the Secretary of War and the supervision of the Chief of Engineers, subject to the provisions of this act relating to the powers and duties of the Bonneville power administrator * * *

NAVIGATION

Truly, in the construction of this dam, we have had our eyes on the future of the Nation. Its cost will be returned to the people of the United States many times over in the improvement of navigation and transportation, the cheapening of electric power, and the distribution of the power to hundreds of small communities within a great radius (President F. D. Roosevelt, Bonneville Dam, September 29, 1937).

From its earliest history, the Columbia River has been the geographical and economic center of the Pacific Northwest. Since the days of Lewis and Clark the River of the West has played a key

part in the development of the "Oregon Country." It opened the fertile valleys and vast forests to the pioneers who sought a livelihood on the western frontier.

A century and a quarter ago Thomas Jefferson envisaged a "great, free, and independent empire on the Columbia River." He had heard that the Columbia was the only major stream in the Nation that ran from east to west, that channeled its way through a mountain barrier thousands of feet in height. He sent forth his personal amanuensis, Capt. Meriwether Lewis, to claim the Oregon country for America.

At Bonneville, the Columbia River almost turns on edge, running knifelike between the precipitous gorge of the Cascade Range. For more than a century, a 5-mile rapids—known as La Cascade—offered defiance to intrepid adventurers who traveled down America's "North-west Passage." Scores of pioneer barges were swept to destruction in the boiling waters of the Cascades. Families who had endured the privations of the overland journey faced another heartbreaking peril at the very end of their journey. A monument on the Oregon shore today pays tribute to the pioneer men and women who lost their lives in the treacherous stretches of the Rapids. Even steamships for many years were unable to navigate the swirling waters of the river just above the site of the Bonneville Dam. Stern-wheelers plied the upper river far into the interior, but 5 miles of churning water and jagged rocks were too much for most of them, necessitating them to transfer their cargoes around the rapids on rough portage roads, often menaced by hostile Indian tribes.

Today the very power of the river which blocked navigation for a century is being used to open the Columbia to ocean-going vessels.

Bonneville Dam is situated on the Columbia River between Oregon and Washington, 41 miles east of Portland, Oreg. It is composed of two major structures, separated by Bradford Island, a historic Indian burial ground. The spillway dam stretches 1,090 feet across the main channel of the river at the east end of the Island. To the south, on the Oregon side of the river, are the powerhouse and the navigation lock.

The navigation lock, 500 feet in length and 76 feet in width, is the largest single-lift lock yet built and accommodates full-sized ocean freighters. This permits the passage of these vessels for a distance of 187 miles from the mouth of the Columbia River to The Dalles.¹ From The Dalles to the upper portions of the river and its major tributary—the Snake—barge navigation is feasible. The construction of dams proposed by the Corps of Engineers, United States Army, will open a large part of the river to safe and reliable navigation. At present the Corps of Engineers is dredging an all-year 27-foot channel from Vancouver to the dam, a distance of 39 miles.

The fish ladders and elevators at the dam are designed to permit the passage of salmon and trout on their upstream migration to spawning grounds in the headwaters. Likewise, these facilities will provide for the downstream passage of the fingerlings. As the Columbia River and its tributaries are the principal spawning grounds for the salmon of

¹ The first ocean vessel to navigate the Columbia River above Bonneville was the *Charles L. Wheeler, Jr.*, which sailed through the lock on July 9, 1938.

the entire Pacific Northwest area, the successful operation of the fishways is essential to the perpetuation of this major industry.²

A dam for navigation alone would have been prohibitively expensive, but half-a-million kilowatts of electricity can be generated at the site to help bear the cost burden of the large dam. When the development is completed, power will bear over 50 percent of the entire cost. Power not only pays its way, but helps make possible the navigation program which will open a vast inland empire to ocean vessels through this unsurpassed inland seaway.

The high ranges of the Cascades offer but one easy passage to the coastal valleys of the Pacific Northwest. The Columbia Gorge is the only water-level route for the commerce of the entire section—fruit from the Wenatchee and Hood River Valleys, grain from the plateaus of eastern Oregon and Washington, cattle and wool from the inland ranges, ores and timber from the Idaho country, and produce from the irrigated fields of Yakima.

POWER

In order to encourage the widest possible use of all electric energy that can be generated and marketed * * * (sec. 2, pa. (b), Public, 329, 75th Cong., 1st sess., approved Aug. 20, 1937).

On September 28, 1937, President Roosevelt formally dedicated Bonneville Dam. He said:

The more we study the water resources of the Nation, the more we accept the fact that their use is a matter of national concern, and that in our plans for their use, one line of thinking must include great regions as well as narrower localities. * * * In developing electricity from this Bonneville Dam, from the Grand Coulee Dam, and from other dams to be built on the Columbia River and its tributaries, the policy of the widest use ought to prevail.

Although the past decades have witnessed the vanishing of our physical frontiers, the Pacific Northwest is still a land of opportunity, outstandingly favored by nature. Many of its resources are latent and undeveloped.

(The harnessing of Columbia River power for the sound utilization of the region's natural resources offers the promise of a richer standard of living to the people of the Pacific Northwest as well as to the people of the Nation. (In its ability to solve the social and economic problems of the area rests the enduring value of the vast hydroelectric servant so long dormant in the waters of the Columbia.) Like rivers, whose uses are many, electric power, stretching into many fields, can help our Government assure opportunity and security to a large percentage of our people.

The act cited above directs that—

The Secretary of War shall provide, construct, operate, maintain, and improve at Bonneville project such machinery, equipment, and facilities for the generation of electric energy as rapidly as markets may be found therefor. The electric energy thus generated and not required for the operation of the dam and locks at such project and the facilities employed in connection therewith shall be delivered to the administrator, for disposition as provided in this act.

The powerhouse, located on the Oregon side of Bradford Island and serving as a dam for the south channel of the river, was designed by

² The total counts of fish ascending the fishways for the period from May 1 to September 10, 1938, as determined and reported by the Corps of Engineers, U. S. Army, are as follows: Chinook salmon, 194,541; steelheads, 85,635; blue back salmon, 74,876; silver salmon, 11,965. This indicates the successful operations of these facilities.

the Corps of Engineers, United States Army, and built for six hydroelectric generating units, with space for four additional units.

The first section of the powerhouse, comprising two generator units, was completed in the late summer of 1938. This section includes the headwalls, substructure for six generating units, powerhouse superstructure for two units, and two generating units complete with all auxiliary equipment. These two generating units are in operation with a capacity of 86,400 kilowatts. The ultimate capacity of the completed station will be 504,000 kilowatts, generated by propeller type turbines. These turbines, revolving at 75 revolutions per minute, have been selected as most effective for the available head of water which ranges from 30 to 66 feet. On top of the powerhouse is the switching and transforming equipment to step up the generated voltage to that required for transmission.

The second step involves the completion of powerhouse superstructure for units 3, 4, 5, and 6, the manufacture and installation of units 3 and 4 with auxiliaries, and the placing of the embedded parts of units 5 and 6. Shop manufacture of equipment will not be completed until the early spring of 1940. Field erection cannot be completed until the early spring of 1941. When this step is completed, the plant capacity will be 190,000 kilowatts.

Funds for the completion of the second step were carried in the War Department Civil Appropriations Act, 1939 (Public, No. 591, 75th Cong., approved June 11, 1938) under the lump sum appropriated in the Rivers and Harbors section of the act.

Funds for the succeeding steps, 3, 4, and 5 have not yet been appropriated.

Step 3 involves erection of units 5 and 6 complete. To place these units through manufacturers' shops will take 18 months, and the erection will require an additional 12 months. If funds are appropriated within a year, the earliest date for completion of step 3 would be the spring of 1942.

Step 4 involves the superstructures for units 7, 8, 9, and 10, installation of units 7 and 8 complete with auxiliaries, the embedded parts of units 9 and 10 and the excavation of head and tail race. The earliest completion date for step 4 would be the spring of 1943.

Step 5 would complete the ultimate development with the installation of units 9 and 10, complete with auxiliaries. The earliest completion date would be the spring of 1944.

Following completion of each of the steps described above the erection of the adjacent transmission facilities would take another 12 months; therefore, the earliest date of delivery of the ultimate capacity of 504,000 kilowatts would be 1945.

GROWTH OF CONSUMPTION AND OF INSTALLED CAPACITY

Power surveys forecast that twice the present electrical capacity will be required to supply Northwest needs by the time the Bonneville plant is completed.

TABLE 1.—*Electric energy consumption*

Class of consumer	Washington		Oregon		Idaho	
	Percent of total energy	Percent of total revenue	Percent of total energy	Percent of total revenue	Percent of total energy	Percent of total revenue
Farms.....	4	6	4	6	6	10
Residential.....	20	33	22	35	17	31
Commercial.....	24	32	35	38	18	33
Wholesale.....	52	29	39	21	59	26
Total.....	100	100	100	100	100	100

Quite naturally the demand for electrical energy in the Northwest has closely coincided with the distribution of population (fig. 1). It is probable that this relation will continue, modified perhaps by large industrial developments in specific regions. Planning a major generating and transmission system consequently involves the consideration of numerous factors including the growth of population, the increase of utilization, and the resulting increase in total energy consumed.

The past 37 years represent five distinct periods of growth in electric consumption in the Pacific Northwest. This is shown in figure 2 which also indicates the general agreement in trends between the United States and the region. Figure 3 details the trend in consumption for the three States for the period 1920-36, and its relationship to the trend of installed capacities.

From 1920 to 1929, there was a steady increase in the yearly amount of electrical energy generated for consumption. The average rate of growth for the entire region was equivalent to a doubling every 8½ years, under rates of a higher level than at present. In this period, the consumption from public plants increased at a much greater rate. Eugene, Oreg., for example, doubling in 4¼ years—or more than twice as rapidly as the rest of the region. This is attributable to the lower cost of energy from these plants. Although the depression years, 1929 to 1932-33, brought about a dip in the growth curve, the past 4 years, 1933-37, are remarkable for the sharp upturn in the curve with an average growth rate doubling consumption every 5½ years. The trend is decidedly upward, and it is forecast by the Federal Power Commission³ that the energy consumption in the Bonneville area alone will double every 6 years. These forecasts are given in figures 4, 5, and 6 for the area bounded by a line including Aberdeen, Centralia, Yakima, and Walla Walla, Wash., and Pendleton and Eugene, Oreg., reaching the Pacific Ocean above Aberdeen and west of Eugene. The rate of growth in this area probably will follow closely, or exceed, that of the rest of the Northwest.

³ Supplement to Electric Rate and Market Analysis of the Bonneville Area, Sept. 20, 1937.

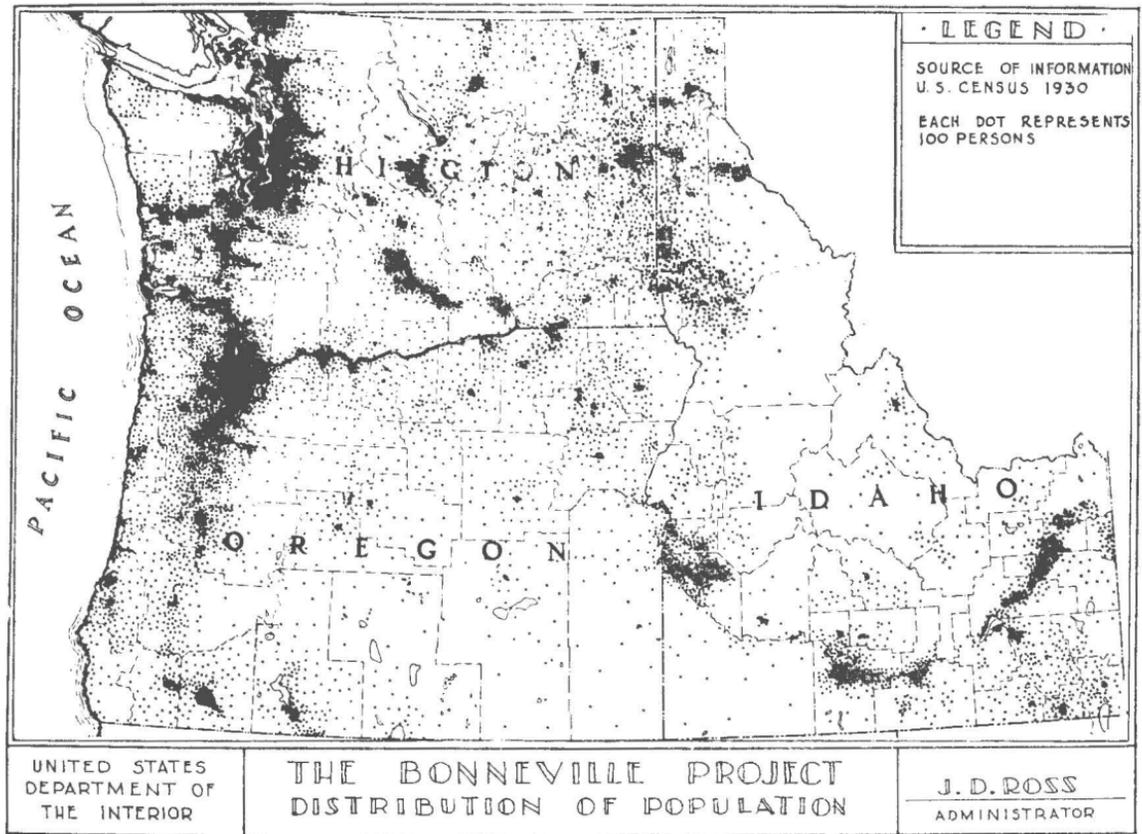


FIGURE 1.

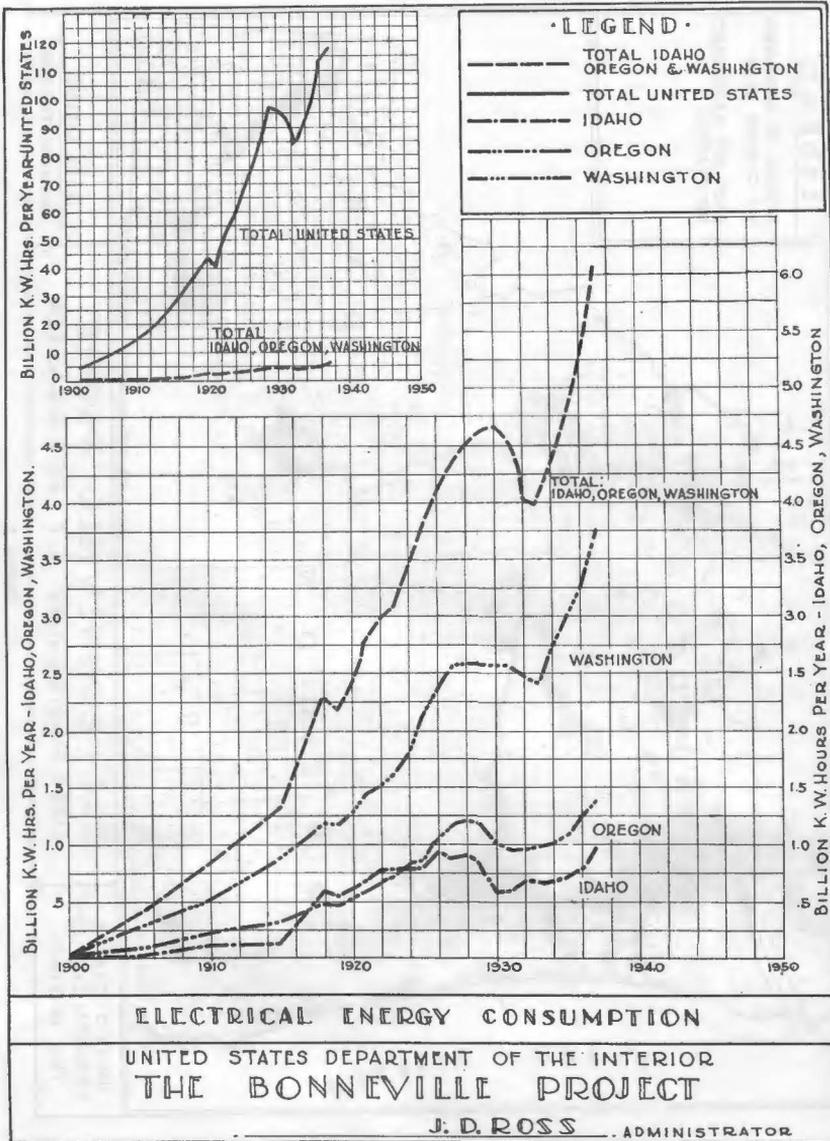


FIGURE 2

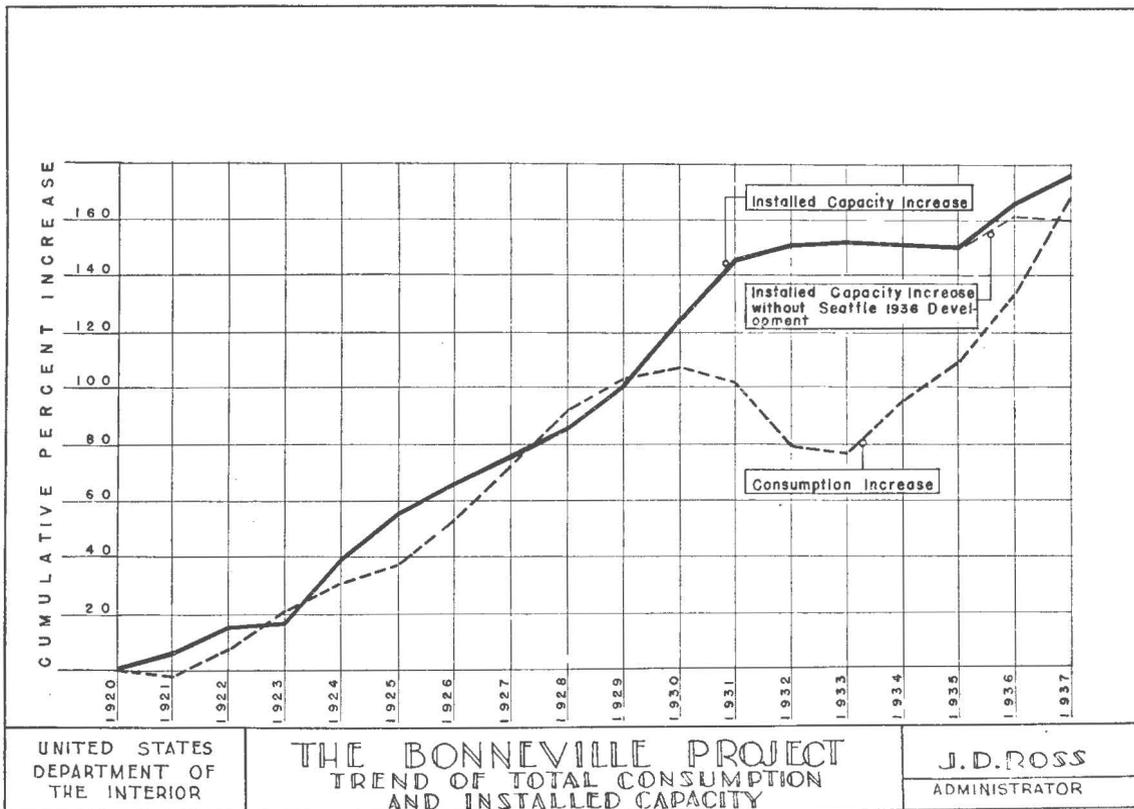
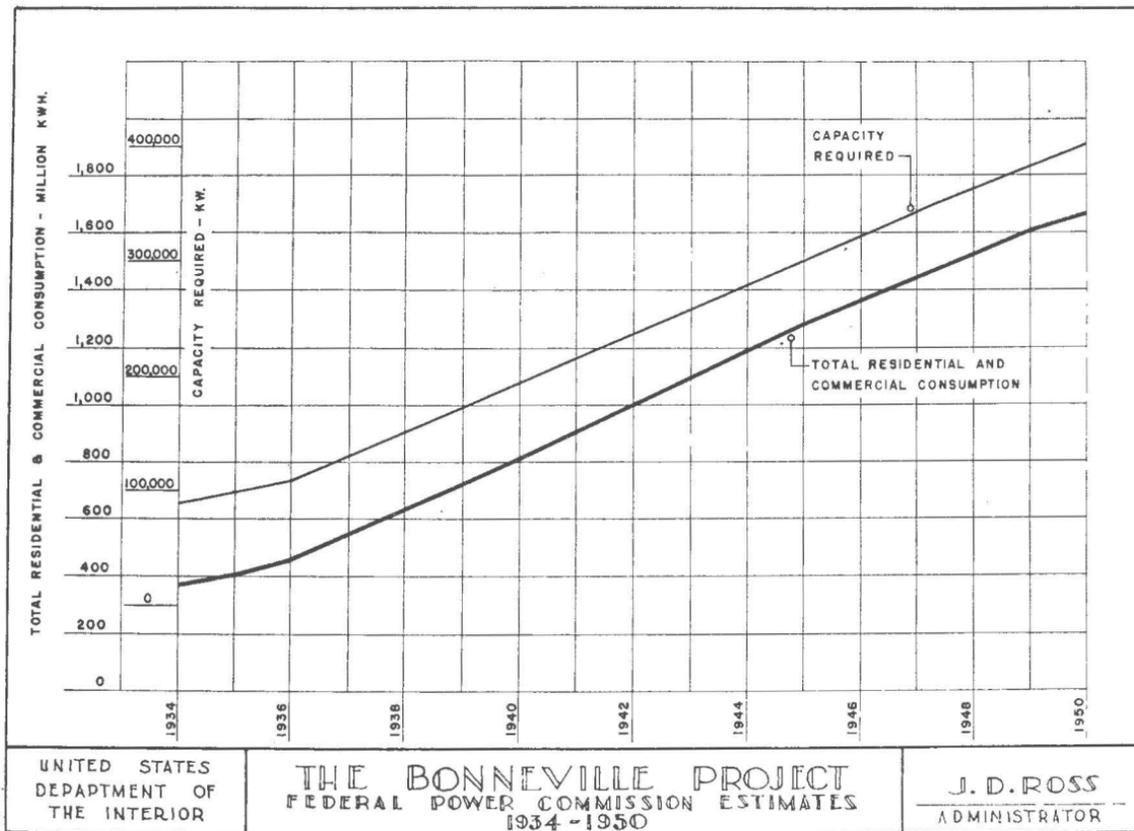


FIGURE 3.

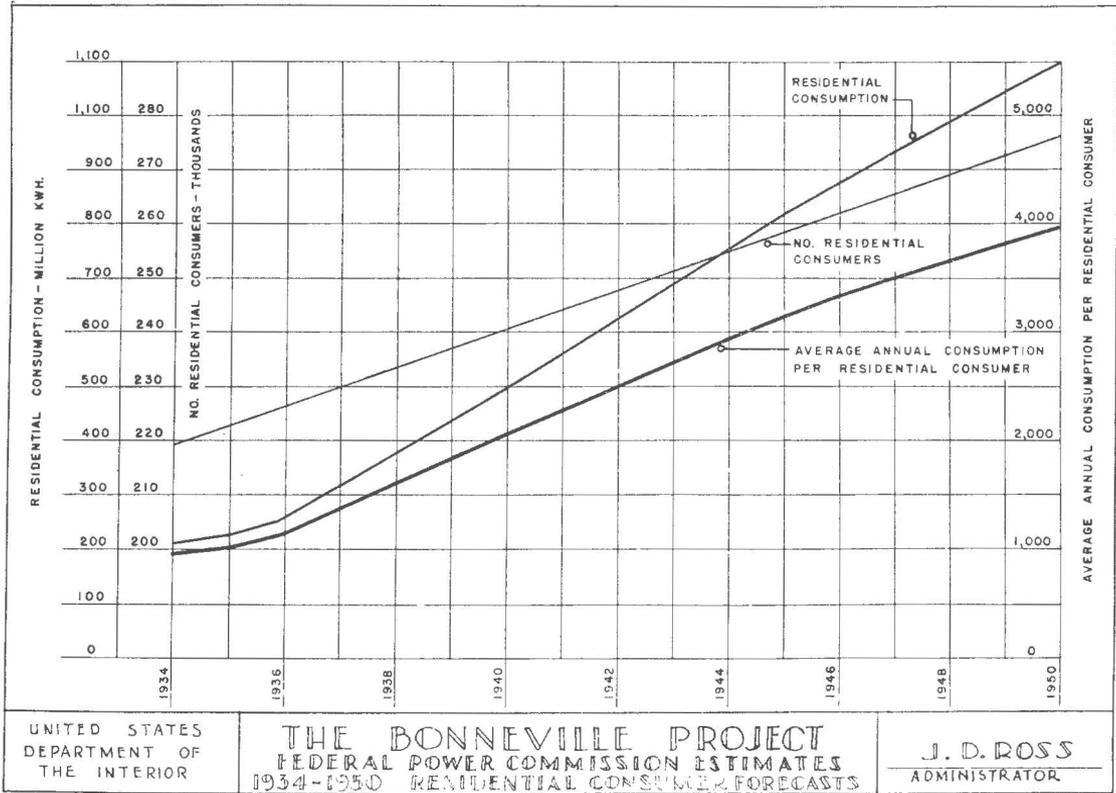


UNITED STATES
DEPARTMENT OF
THE INTERIOR

THE BONNEVILLE PROJECT
FEDERAL POWER COMMISSION ESTIMATES
1934 - 1950

J. D. ROSS
ADMINISTRATOR

FIGURE 4.



UNITED STATES
DEPARTMENT OF
THE INTERIOR

THE BONNEVILLE PROJECT
FEDERAL POWER COMMISSION ESTIMATES
1934-1950 RESIDENTIAL CONSUMER FORECASTS

J. D. ROSS
ADMINISTRATOR

FIGURE 5.

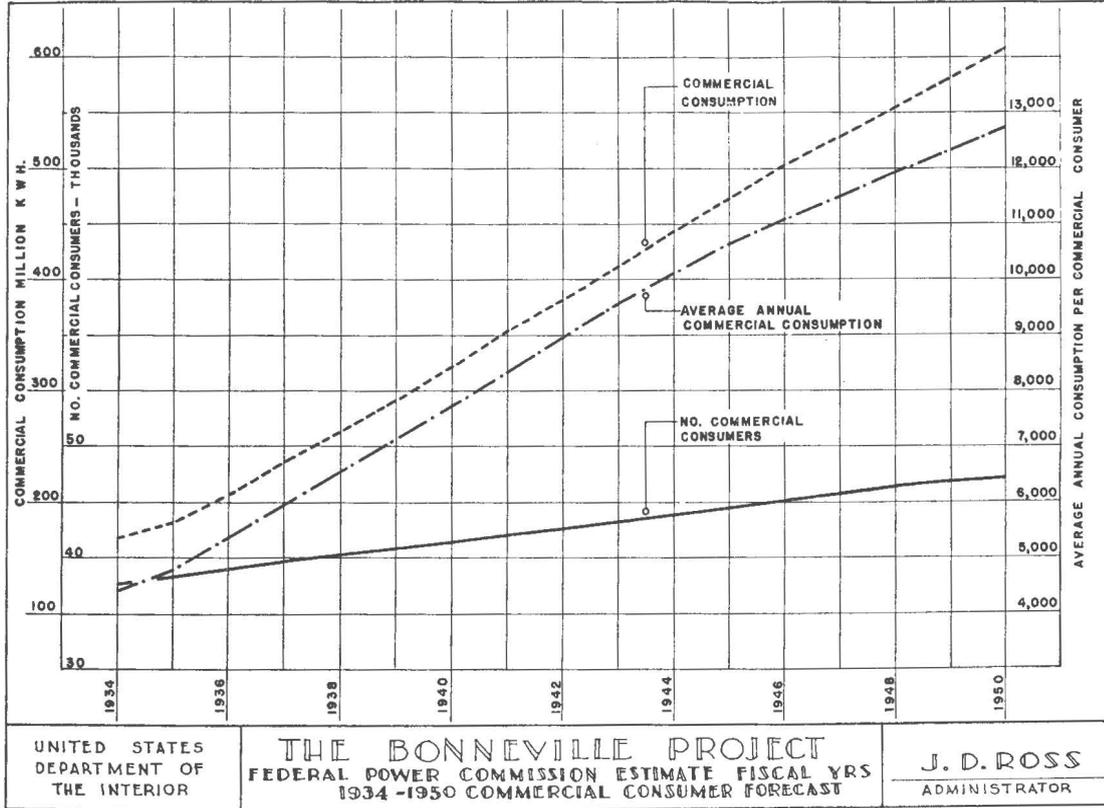


FIGURE 6.

Pending the development of the Bonneville project, the growth of installed capacity has lagged behind consumption at what may be termed an alarming rate. From 1933 to date, no new major installations have been made, with the exception of the Skagit development for the city of Seattle. Even including this important installation, the average rate of growth of installed capacity since 1932 has only doubled every 20 years. (Note: This does not take into consideration the very recent addition of the two units at Bonneville.)

Under present conditions the growth in consumption is far outstripping that of installed capacity. The addition of the two units at Bonneville, generating 86,400 kilowatts, will change the picture only to a slight extent. Furthermore, it must be remembered that the growth in the consumption in the Northwest has been accomplished at rates much higher than those proposed for Bonneville. Past experience, based on incontrovertible evidence, discloses that consumption is largely governed by the cost per unit of electrical energy. (Fig. 7.)

Residential consumption always increases whenever energy is offered at more attractive rates. If the rate is reduced, the consumer will increase his consumption. This is illustrated in table 2.

TABLE 2.—Residential electric energy sales in selected rate areas, 1934

Locality	Average number of kilowatt-hours per customer	Average revenue per customer	Average revenue per kilowatt-hour
			<i>Cents</i>
Province of Manitoba.....	3, 835	\$37. 83	0. 99
City of Tacoma.....	1, 554	26. 46	1. 70
Province of Ontario.....	1, 619	27. 75	1. 71
City light—Seattle.....	1, 050	29. 88	2. 84
Private utility—Seattle.....	933	30. 99	3. 12
Bonneville area.....	1, 001	31. 72	3. 17
United States.....	675	33. 12	4. 91

The unit use of residential electricity increased throughout the entire depression. At the end of 1937, the average use of electricity in the home was 59 percent higher than in 1929. The consumption curve mounted steadily during the depression, except for a slight dip of 1½ percent of a short period at the end of 1933.

Figure 8, compiled from records of the Public Utility Commission of Oregon, indicates the trends in consumption resulting from variations in the cost per kilowatt-hour. It is interesting to note that, in spite of lowered revenues per unit of power sold, the total revenues increased as a result of greater consumption. It is also probable that many families in the lower-income brackets were attracted by the reduced monthly cost of energy.

Based on past experience, numerous agencies, including the Federal Power Commission, have forecasted the growth of residential consumption for the next 5 to 12 years in the Northwest. The accuracy of these predictions has been confirmed by the actual records of the past few years (figs. 4, 5, and 6).

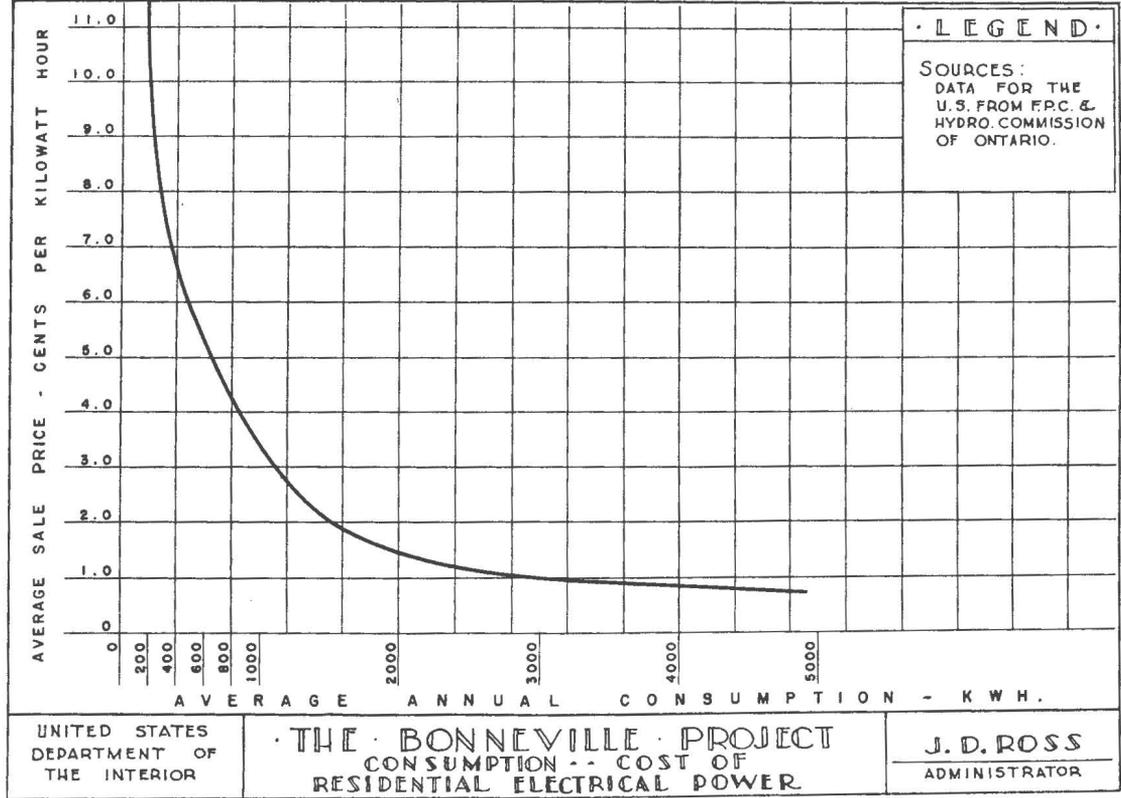


FIGURE 7.

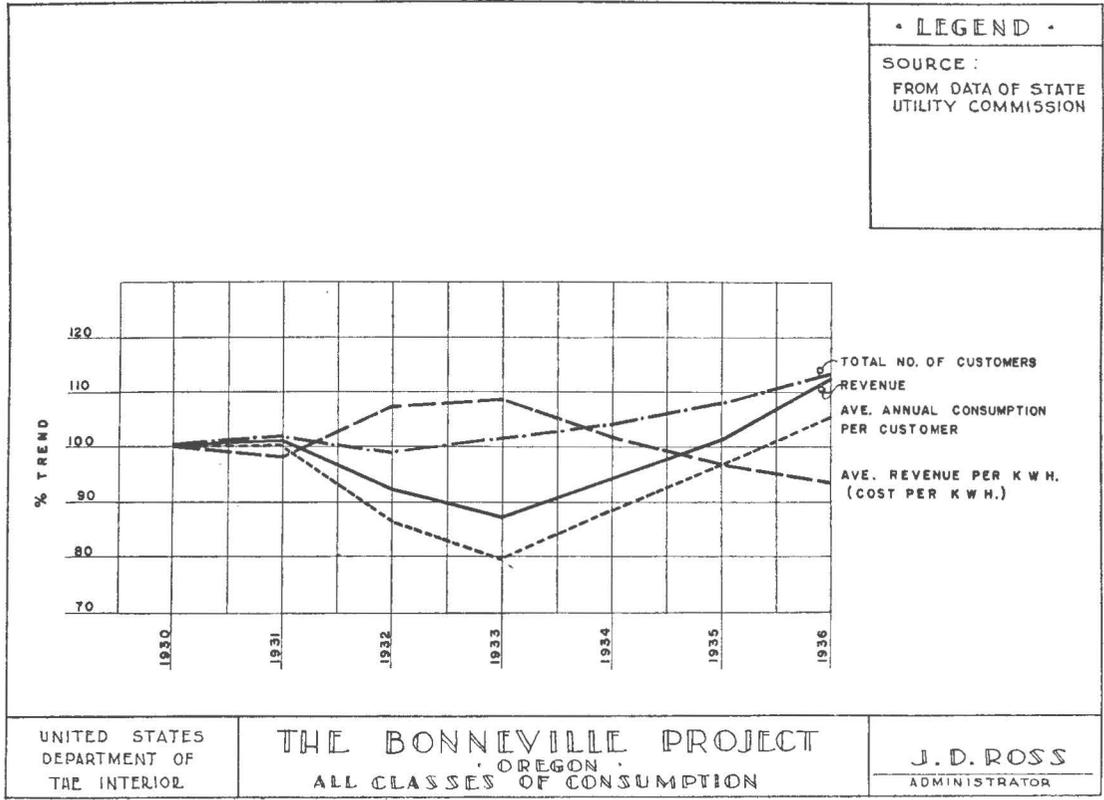


FIGURE 8.

The forecasts for the next 7 years indicate increases in consumption from 800 to 2,800 kilowatt-hours per meter, and in the number of consumers from 10 to 20 percent. Therefore, an 11 percent increase in the number of domestic consumers, with a conservative estimate of 1,300 kilowatt-hours per meter, will require 275,000 kilowatts of additional capacity (under present load factors for residential service only). This represents 55 percent of the ultimate capacity of the Bonneville plant. Consequently, the normal increase in domestic use alone will require more than the capacity of five Bonneville generators by the time all of the units are completed. The same growth is probable in the next succeeding period.

Reduced rates, resulting from low-cost Bonneville power, will be reflected in increased domestic consumption. The residents of the Pacific Northwest have been conscious of the benefits of electricity to a greater extent than most of the people of the United States. They have not been content with the common, every-day use of this form of energy. A large proportion of domestic duties are performed by electric ranges, refrigerators, and many other types of electrical equipment. In the city of Seattle, for example, there are more electric ranges in use than in any city in the world regardless of size. This may be attributed in part to the fact that the domestic schedule of the municipal system drops to a low block of three-fourths of a cent per kilowatt-hour. This "electric-consciousness" is definitely a result of the zone of influence of low-cost public plants such as Tacoma, Seattle, and Eugene. Electric water heaters are widely used throughout the Northwest to provide a convenient and continuous supply of hot water. Special rate schedules and progressive sales methods are encouraging the use of these appliances by families with moderate incomes. Inasmuch as each water heater uses more than 2,000 kilowatt-hours a year (or nearly twice the average domestic consumption for the region), the trend in this direction can absorb a large supply of Bonneville power.

The entire Northwest is looking to the completion of the Bonneville transmission network to furnish additional energy for supplementary heating. Throughout Oregon and Washington the sales of portable electric heating devices have risen rapidly in the past few years. Intensive merchandising campaigns have popularized the thousand-watt convection-radiant type heater for household use. Considerable sales of such heaters have been made in Oregon despite the fact that the lowest unit cost of energy charged by private utilities for this type of appliance is 1.8 cents per kilowatt-hour. The reduction of this rate to one-half the present scale, or less, will stimulate tremendously the use of supplementary heating devices for residences.

The rapid growth of space heating in Tennessee and California areas offers considerable promise for the development of similar trends in the Northwest. The residents of the region are definitely interested in such usage and numerous inquiries have been received regarding the possibility of heating homes with Bonneville power.

One of the greatest possibilities in this field is the development of complete electric house heating. The winter climate in the valley regions—where the concentrations of population are found—is moderate.

The temperature rarely drops below the freezing point. It is a territory ideally suited for this type of house heating if the cost of power is comparable with that of prevailing fuels. House-heating loads occur at periods when irrigation loads have dropped to a minimum. They will help to equalize the seasonal load; they will iron out costly "valleys and peaks", which ordinarily raise the cost of irrigation pumping. A combination of water pumping and house heating will make an exceptionally well-balanced load. This is especially desirable in stream-flow plants, like Bonneville, where there is little storage available and the water must be used as it flows to the sea or it is lost forever.

However, most homes are unable to gain the advantages of this clean, efficient and willing servant because the electric energy bill at the end of each month for adequate service is prohibitive. With lower rates, nearly everyone will be able to make use of electricity for cooking, refrigeration, and other domestic duties.

Paraphrasing, this will help create a demand for electrical equipment which will be felt, not only on the Pacific coast, but in all other parts of the United States. As the Pacific Northwest aids in demonstrating that abundant electricity in the home and on the farm can be achieved, it will tend to standardize the use of electrical household appliances, which may prove to be the required stimulus to an unprecedented expansion in the electrical appliance industry.

The home and farm offer an immediate market for large amounts of Bonneville power. Introduction of lower rates instantly will result in the release of this tremendous potential demand—the satisfying of which promises the greatest immediate benefits to the largest number of persons. Population increases mean new homes and farms that must be served with mounting quantities of energy.

Rural service in the Pacific Northwest offers immediate opportunity for marketing large quantities of Bonneville energy. In this region there is a higher percentage of farm service than in any other part of the country. Whereas the national percentage of farms using this service is but 16.8 percent (1937), the Pacific Northwest percentage is 48 percent. This represents almost 22,000 miles of rural lines serving approximately 210,000 consumers. Most of these lines are comparatively lightly loaded. Existing facilities can be used to deliver increased amounts of electricity at little additional first cost. Lines erected at high costs can render more economic service by greater utilization. Half of the area, however, is still without electric service, and the Rural Electrification Administration is furnishing assistance in financing projects for private and cooperative groups. It is necessary for these rural customers to have available a source of low-cost electricity. Extension of Bonneville's transmission network will provide a source of wholesale power for hundreds of miles of cooperative systems.

An indication of the possibilities of development of agricultural power demands may be found in an analysis of the present consumption of energy by farm customers in California. The comparatively enormous consumption of energy on California farms is set forth in table 3.

Department of the Interior

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TABLE 3.—Average annual energy sales to farm customers, 1933

Geographic division	Average annual kilowatt-hours per customer	Average annual revenue per customer
East North Central States.....	682	\$43. 12
East South Central States.....	694	45. 76
New England States.....	717	43. 94
West North Central States.....	777	59. 26
Middle Atlantic States.....	870	50. 64
South Atlantic States.....	917	48. 98
Pacific States (excluding California).....	1, 635	43. 35
Mountain States.....	1, 713	55. 46
West South Central States.....	2, 000	81. 42
California.....	16, 745	234. 75

Irrigation loads principally are responsible for the large energy demand on the California farms.

POWER MARKETS FOR INDUSTRIAL USE

The evident need for increased industrial development in the Pacific Northwest will result in large demands for low-cost power.

To provide sustenance for the growing population, new industries must be developed. Cheap power can fill this important need by making possible commercial development of the region's native resources.

From an economic standpoint the Pacific Northwest has been primarily a producer of raw materials and semi-manufactured goods. The stability and well-being of the region consequently has depended to a large extent upon a few basic and specialized activities of an agrarian character. The absence of industrial development is reflected in the importation in major quantities of products such as machinery, manufactured goods, clothing, and automobiles. The distances and mountain barriers which isolate the Pacific Northwest from the centers of industry in the Middle West and on the eastern seaboard exact a toll of transportation charges which must be added to the terminal sales price of inflow goods.

In recent years, however, there has been a tendency toward an increasing industrial self-sufficiency. The availability of power throughout the region is encouraging the practice of manufacturing closer to the markets and to the sources of raw materials.

The necessity for regional industries to meet the growing local demands, as well as the specialized needs of the Nation, is calculated to hasten industrial development in the Pacific Northwest. The strategic position which the region occupies in relation to the markets of the Orient will help accelerate the expansion of manufacturing. The presence of cheap and plentiful electric power coupled with the availability of an abundance of raw materials, of efficient and high-grade labor, of excellent industrial locations and ample transportation facilities are all factors that lend themselves to the prospect of early development of industrial enterprises.

Generally speaking, industries fall into two categories; i. e., those in which the cost of power is a determining factor and those in which it is but a minor part in the price of the finished product. The industries which are included in the first classification are of an electrochemical and electrometallurgical nature, including those for the manufacture of aluminum, ferro-alloys, steel, copper, zinc, light metals,

carbides, fertilizers, and ammonia where the cost of power ranges from 10 percent to as high as 40 percent of the total.

TABLE 4.—*Relation of industrial power costs to total manufacturing costs—major power using industries**

Industry	Power cost per kilowatt-hour cents	Power cost in percent of total operating cost
Aluminum from Alumina.....	0.2	18.0
Synthetic Ammonia.....	0.2	19.0
Phosphoric Acid.....	0.3	37.0
Copper leaching and electrolysis.....	0.3	20.0
Electrolytic zinc.....	0.3	12.5
Ferro-silicon.....	0.23	19.0
Calcium Carbide.....	0.3	30.0

* H. Rept. No. 308—69th Cong., 1st sess.

Among the other industries are those for the processing and manufacture of goods particularly derived from agriculture, lumber, and mineral materials, such as food products, wood products (including rayon, plastics, cellulose-base goods) textiles, clothing; and metal products, including the manufacture of machinery. These activities involve the use of power at costs varying between one-fourth of 1 percent to 8 percent of the cost of the finished product.

TABLE 5.—*Relation power costs for minor power using industries—Oregon*

[Oregon State Planning Board—1936]

Industry	Employees, 1930	Power cost percent of total operating cost
Timber and lumber.....	35,000	6.3
Food products (except packing).....	6,000	2.4
Canning and packing.....	4,400	0.23
Textile and clothing.....	3,000	1.1
Metal products.....	3,000	1.0
Paper and paper products.....	3,400	6.5
Furniture.....	2,100	1.0
Flour and milling.....	500	8.2

It is obvious that in the development of the industry of a region the establishment of one large plant for the processing of a basic raw material, such as steel, leads to the location of related enterprises in the surrounding territory.

Listed in appendix D are the approximate power requirements of a number of electrometallurgical and electrochemical processes, which in many cases by virtue of the availability of raw materials, cheap power and demand can develop in this region. This table is not intended to be an exhaustive list of all the processes making use of power but merely to indicate the magnitude of some of the power demands which may arise in a relatively few years.

For example, to supply local demands there is need for a steel plant in the Pacific Northwest. Such a plant might have an annual production capacity of 260,000 long tons of basic steel ingots or 180,000 long tons of finished steel products. Iron ore is available near Portland, Oreg. Limestone of suitable grade may be transported

from southwestern and northeastern Oregon. Such a steel plant would require some 414,000,000 kilowatt-hours per year with an annual demand of 33,000 kilowatts of firm power and 33,000 kilowatts of secondary power for 9 months. This represents over 10 percent of the entire output of the completed power installation at the dam.

It is evident that the consumer class "Wholesale and miscellaneous"⁴ which includes the consumption required by industrial processes, is one of major importance. This is true despite the fact that industrial development in the Pacific Northwest has not progressed at a rapid rate. It is true that the cost of energy for many industries is a minor consideration. But the industries which the Pacific Northwest needs most for its development are those requiring large quantities of electrical energy, and here the cost per unit is of major importance. In a number of instances price differentials due to high freight rates can be equalized through production savings effected by use of cheap power.

Most of the large productive industries in the area are included under "Wholesale" in table 1. A comparatively small percentage of increase in the consumption of this class of customers will result in demands for large additional blocks of energy, since this class of customer uses about half the total output generated in the three States.

The relative importance of the four leading classes of productive activity in the Bonneville area in 1929 were as follows: Manufacturing (value added) 57 percent; agriculture (cash income) 40 percent; fisheries (value of products) 2 percent; and mining (value of products) 1 percent. In 1936, lumber and wood products and pulp and paper products accounted for 78 percent of the industrial power sales by utilities operating in the area.

It is logical to expect these industries to make increasing demands upon the installed capacity of the Pacific Northwest. Bonneville's output will therefore stand as a safeguard against acute power shortage.

The existence of all these circumstances makes it inevitable that the growth in consumption will outstrip installed capacity. As a result, the Bonneville installation of 10 units, with a total generating capacity of 504,000 kilowatts, will barely meet the urgent need for power.

Shortly before the end of the World War the country was gripped by a most serious power shortage. The generators of the Nation were taxed to their utmost capacity. Power for a time was the "bottle neck" that threatened the necessary expansion of industrial production. Manufacture of sorely needed materials was threatened by the grave power shortage. This Nation wants peace and it must be prepared to maintain it. Modern warfare is fought in the factory as much as in the air or trenches. America must be ready to meet not only peacetime needs of power for home, farm, and industry, but must be assured of her ability to cope with emergency demands for large blocks of electricity. In the hydroelectric streams of the Pacific Northwest is potential power far in excess of that available in other regions of the Nation. It should be developed at an economic rate to meet mounting peacetime needs and the equally important possibilities of emergency drains.

Preparedness requires foresight.

⁴ See table 1, p. 6.

IRRIGATION AND POWER—THE EMPIRE BUILDER

Irrigation with its supplementary induced consumption could utilize one-half of the ultimate Bonneville output.

Irrigation represents a load of primary importance in the Pacific Northwest. There is no part of this great territory which cannot make use of irrigation, either entirely or supplementary. Such developments not only use large blocks of power for pumping, but bring an influx of farming population, which constitutes a new class of consumer whose energy requirements must be satisfied. The distribution of consumption in the Pacific Northwest is shown in table 1 (p. 12).

Agriculture as a whole must look upon land as a capital asset to be considered and protected from the ravages of man and nature. No land, however fertile, can withstand the drain upon its soil nutrient content through constant cropping. The Pacific Northwest is a very small user of fertilizer. As a consumer group, the Western States use but 2.8 percent of the total United States consumption of phosphate fertilizer. This is primarily due to two factors: The land usage is relatively new, so that the need for replenishing soil nutrients has not been readily apparent; also, due to the small local production of fertilizers, the prices of such products include the high cost of transportation from the eastern manufacturing centers. The immense phosphate deposits of Idaho can furnish the farmers of the Northwest, at low cost, fertilizers that are widely needed. The manufacture of these fertilizers requires large quantities of cheap electrical power and will supply the large latent markets of the region. Estimates of the Department of Agriculture reveal that 200,000,000 farm acres have been ruined or hopelessly impoverished by soil erosion. The productivity of another 100,000,000 acres has been permanently injured by the same cause. One hundred thousand families have been driven from their farm homes on the Great Plains.

The recent droughts in States east of the Rocky Mountains have had repercussions in the Pacific Northwest. Many of the people who settled on the Great Plains and who remained there through dry years have been gradually forced to leave. Their goal has been the region of abundant water—to the West. The past few years have seen a steady influx into Washington, Oregon, and Idaho, consisting largely of families of low resources. The drought has taken from many of these people almost everything that human beings possess in the form of tangible property. Battered cars, a few pieces of furniture, and faith in a bountiful Northwest is all these twentieth-century pioneers have. Without cash or credit, they seek security for themselves and opportunity for their children in a promised land of fulfillment.

In the 18 months prior to July 1937 nearly 20,000 farm families have migrated into the three States.^{4a} Approximately 60 percent of them have settled temporarily or permanently in the rural areas. Comparing this with a total migration of 36,000 families in the drought areas in the 1930-37 period, it is obvious that the rate of migration is mounting rapidly. The movement into urban areas has likewise been an increasing one. Records in Oregon show that some 82,000 people migrated in the years 1930-36. In the last 2 years, for Oregon, this increase rose about 500 percent over the preceding 4 years.

^{4a} "Recent Migration Into the Pacific Northwest"—Pacific Northwest Regional Planning Commission, May 1938.

Irrigation can support more people per kilowatt of electrical energy consumed than any other type of power-using activity. Electrical pumping of water will enable lands long idle to furnish a livelihood for the farmers burned out by dust and drought.

No justifiable criticism can be made or sustained by other agricultural sections of western irrigation. The products of irrigated lands are, in the main, specialized crops not of sufficient quantities to be competitive with the staple crops raised by farmers east of the one-hundredth meridian.

In his testimony before the House Committee on Appropriations⁵ John C. Page, Commissioner of the Bureau of Reclamation, stated:

* * * There are 700,000,000 acres in 11 Western States which are arid or semiarid. Of that 700,000,000 acres, only about 30,000,000 acres can be cultivated because of the lack of water supply.

In other words, if all the Western States are developed to the fullest extent possible from the water supply available, the total cultivated area will never equal the area of the State of Iowa. For that reason, it is essential to the welfare of these States to develop all possible projects that may be placed under irrigation in order that some agricultural background may be provided for the cities in that territory.

The mountains of the Continental Divide serve as a barrier which is about as effective as the tariff wall against the importation of products from West to East.

Commissioner Page then proceeded to explain that the products of irrigated western projects must be of such a nature that they can stand the tariff of higher freight rates, for which reason the irrigated projects have gone largely into specialty crops.

Commissioner Page in his statement, "The Purposes of Federal Reclamation," comments—

East of the one-hundredth meridian the lands normally receive sufficient rainfall for crops. West of it they do not. Except for high mountains and a narrow strip along the Pacific coast north of San Francisco, nowhere west of the one-hundredth meridian can more than 20 inches of rain be expected in a year. Twenty inches is not sufficient for most tilled crops. Over a vast area of the West less than 15 inches is the normal, and in some places only 3 inches are received annually. Three inches will not support life.

Many have a misconception of the extent of irrigation. Few realize that in all of the arid and semiarid region there are less than 20,000,000 acres of irrigated lands and that this very small percentage of the total 700,000,000 acres provides the principal support for 12,000,000 or more people. The grand total of western lands which are now irrigated and which can be irrigated by the available water supply will be only about 30,000,000 acres.

The Department of Agriculture says that soil erosion has impoverished or ruined 200,000,000 acres of once productive farm lands. That is 10 times the amount of land now irrigated in the West. It says further that an additional 100,000,000 acres of useful farm land is actively affected by erosion and that its productivity is threatened. That is 10 times the amount of land which may in the future be irrigated in the West. The Nation is engaged in an earnest attempt to remove from cultivation a part of its submarginal lands; thus to free from a peonage wrought by nature and misuse of the soil a section of our population. Recently a 7-year drought, as yet unbroken, has driven 100,000 families from the Great Plains. Where are these people to go?

Many of them go west looking for new opportunities; hoping to find homes on irrigated lands. If these people are to resume their lifework, many of them must find irrigated farms.

Farmers in other areas need have no fear of irrigation. Irrigated agriculture has complementary relationships rather than competitive relationships with the agriculture of humid areas. The staple crops of which there are exportable surpluses in other regions are produced only in inconsequential amounts on the irrigated lands of the West. Two types of crops dominate on irrigated lands, and neither is competitive with those of other regions. First, from the stand-

⁵ Interior Department 1938 Appropriations Hearings.

point of acreage, are the forage and fodder crops which provide half the feed for the livestock industry of the West; the most important industry of the region. First from the standpoint of returns to the farmer are the specialty crops, sugar beets, vegetables, melons, and fruits. These crops are not competitive generally with those of any other area in the United States.

The livestock industry of the West makes use of the vast pastures provided by nature there. Great expanses of these ranges could not be used except for the comparatively small irrigated patches scattered through them. These irrigated dots on the map of the West produce hay for winter feeding, without which the cattle and sheep could not be kept on the ranges at all. These western ranges and irrigated fields produce the large part of all the feeder stock finished out in the feed lots of other areas. In the feed lots of the Midwest, the farmer in that region who produces corn finds a major outlet for his crop. Obviously, this segment of the agriculture of the irrigated lands of the West complements the agriculture of the humid States. It is not competitive.

The specialty crops, and nearly every irrigated area in the West has a different one, also complement the production of other areas. The sugar beets of irrigated fields in the Rocky Mountain region glut no market upon which the midwestern, eastern, or southern farmer relies. The lettuce and cantaloups, the tomatoes and pears of the irrigated fields in California, Arizona, Utah, or Colorado have served only to balance the winter diet of the great cities from New York and Boston westward. Introduction of these crops in the irrigated sections, which have long growing seasons, has been of distinct service in the improvement of the health of the Nation. Only those who could afford to pay for hothouse vegetables could eat salads the year around 30 years ago. Now it is difficult to find a market from Maine to California that does not carry fresh vegetables, priced reasonably enough for all, throughout the year. The irrigated West is responsible.

No one ships lettuce, or any other vegetable, from California to Chicago when it can be produced near at hand. The cost of transportation takes care of that. There is, therefore, no competition with the truck farmer of other areas. When they can fill the demand, the freights hauling iced cars stop running out of the West.

What has been said of vegetables is true in large part of the fruits grown on irrigated lands in the West. The citrus fruits of California and Arizona are known the world over. Every spring in Washington, D. C., before the frost is out of the ground, big, red cherries appear in the markets. The label of a shipper from a western irrigated section appears on every box. As the season progresses these western cherries are displaced by those grown near at hand. So it is with every other fruit. Fresh fruits are now available at reasonable prices the year round, thanks to irrigation in these western valleys, where a warm sun compensates in part for a deficient water supply. When the advancing season ripens the fruit on the trees in the East, the remainder of the western crop is canned. Again we find the irrigated orchards complementing those of the other regions * * *

Development of all the remaining western irrigable lands from the water supply available will only give an acreage slightly above that represented by the State of Maryland, or one-third of the State of Indiana. These developments are necessary to provide a sustaining base for the cities of the western section.

Irrigable lands generally may be segregated into four classifications:

1. Small areas where water can be diverted from adjacent streams. Lands falling in this class were all taken up years ago.

2. Low bench lands irrigated from adjacent streams by small-capacity canals. This type of land is susceptible of local organized effort. All of the low-cost larger irrigation developments have fallen within this classification. Most of this land has already been developed.

3. Large areas which can be utilized profitably under Federal Reclamation aid. Enterprises embracing practically two-thirds of such areas have already been undertaken.

4. Land susceptible of pump irrigation. A conservative estimate places less than 2 to 2½ million acres within this classification.

Preliminary surveys and estimates of irrigable possibilities have been made on 1,935,000 acres in the States of Oregon and Washington by the Corps of Engineers.⁶

In Oregon soil surveys of the Willamette Valley disclose that more than 1,000,000 acres are adapted to supplemental irrigation for raising diversified crops. In addition 400,000 acres are suitable for irrigated forage crops. In this same valley there are also 873,000 acres of wet land with inadequate or imperfect drainage.

Twenty-five years of study by the State Agricultural Experimental Station have shown that the yield and quality of practically all the farm products raised in the Willamette Valley can be increased by supplemental irrigation. Although the average rainfall is 40 inches annually, generally only 5 inches occur during the growing season between May 1 and October 1. The condition in the Willamette Valley was especially pronounced this year (1938) when only about 2½ inches fell during the growing season. The study by the experimental station demonstrates that the necessary water duty in the growing season in the Willamette Valley is only about 18 acre-inches or less. This area presents a splendid opportunity for the profitable utilization of Bonneville power through the two transmission lines which are being constructed down the valley by the Bonneville project. Low-cost power will extend irrigation opportunities throughout the Willamette Valley.

Experience has demonstrated that irrigation enterprises in the Pacific Northwest are profitable not only to the region but to the entire Nation. For example, the Yakima Valley distributed to other sections products valued at 41 millions of dollars and brought in goods estimated at more than 6½ millions of dollars, of which some 4 millions came from States outside of the Pacific Northwest. This does not include sums expended for transportation. The total commerce in the Yakima Valley represented in the above example is equal to 20 percent of the total expenditure of the United States Bureau of Reclamation for irrigation since 1902.

Practically all the western land that can be used profitably without irrigation is already occupied. The Bureau of Reclamation has developed the major proportion of the acreage which may be irrigated by gravity systems. It remains for electricity—cheap and abundant kilowatts—to complete the irrigation job.

The cheapest form of irrigation per unit of land is found in direct individual irrigation by electric power. Where water is within a reasonable distance, electricity can be used to pump water into a canal for distribution to the individual land units. Naturally, both the gravity and the pumping systems have their limit in cost per acre for overhead, interest, depreciation, and operation.

In the marketing of Columbia River hydropower there is an excellent opportunity for the Bonneville project to encourage economic irrigation processes and to assist in minimizing the blunders which in the past have penalized such development. Engineering advice and supervision must, of course, be given to these pumping irrigation projects to assure the highest efficiency in the use of power.

Inasmuch as practically all land capable of profitable cultivation without irrigation is already in use, and since most of the large gravity systems have been developed to the point of economic saturation,

⁶ H. Doc. No. 103, 73d Cong., 1st sess.

pumping by electricity offers the last great agricultural opportunity in the Pacific Northwest. It is very conservative to say that at least 2 to 2½ million acres are susceptible to economic irrigation by electric-pumping methods. Such an acreage will require a demand of approximately 187,000 kilowatts, and use some 600,000,000 kilowatt-hours during the 6 months' growing season. This irrigation load, starting in April and advancing progressively to a peak in the latter part of July, when used in conjunction with a residential, commercial, and industrial load, can produce a 70-percent system load factor (one of the best possible obtainable in the United States). The potential load of 187,000 kilowatts is especially significant in view of the fact that such irrigation development utilizes even larger blocks of additional power for purposes other than irrigation water pumping. The experience of the Yakima Valley indicates that irrigation induces a complementary load of 2 kilowatt-hours for each kilowatt-hour used for pumping.

It is expected that the demand for electric energy for irrigation development will have a steady growth, which will be accelerated as practical demonstrations reveal the profitable use that can be made of large blocks of power for pumping irrigation water. Inasmuch as irrigation produces a population growth in excess of any other single type of power utilization, and consequently creates large complementary uses of energy, the total demand for power created by irrigation can be estimated reasonably at one-half of the ultimate capacity of the Bonneville plant. This estimate can be substantiated by the increasing power demands of the Yakima Valley.

The Northwest has the only large body of arable land left in the United States for additional rural population. This land, which is arid or semiarid, must be developed by irrigation and a large part of it by pump irrigation.

Power can be the "empire builder" to make the land, the water, and the climate the servant of the people.

POWERS AND DUTIES OF THE ADMINISTRATOR

Pursuant to the power vested in the Secretary of the Interior under section 2, paragraph (a) of Public, No. 329, Seventy-fifth Congress, approved August 20, 1937, J. D. Ross, of Seattle, Wash.,⁷ was appointed, on November 1, 1937, administrator of the Bonneville project.

The Administrator is in charge of the transmission and sale of the surplus electric energy generated at the Bonneville plant and not required for the operation of the dam and locks at such project and the navigation facilities employed in connection therewith.

The Administrator is authorized and directed to provide, construct, operate, maintain, and improve such electric-transmission lines and substations, and facilities and structures appurtenant thereto, as he finds necessary, desirable, or appropriate for the purpose of transmitting surplus energy, available for sale, from the Bonneville project to existing and potential markets and, for the purpose of interchange of electric energy, to interconnect the Bonneville project with other

⁷ (Note by the Department.) Mr. Ross was for 36 years superintendent of City Light, a municipally owned and operated power plant serving Seattle, Wash. He had charge of the building of City Light with its superb Skagit River hydro development. He also served as consulting engineer for the New York Power Authority during the year 1931. At the time of his appointment as administrator of the Bonneville project he was a member of the Securities and Exchange Commission.

Federal projects and publicly owned power systems now or hereafter constructed.

The act directs that the Administrator shall act in consultation with an advisory board composed of representatives designated by the Secretary of War, the Secretary of the Interior, the Secretary of Agriculture, and the Federal Power Commission, respectively.

The Administrator is authorized, in the name of the United States, to acquire, by purchase, lease, condemnation, or donation, such real and personal property, or any interest therein, including lands, easements, rights-of-way, franchise, electric-transmission lines, substations, and facilities and structures appurtenant thereto, as he finds necessary or appropriate to carry out the purpose of the act.

The Administrator is authorized to acquire any property or property rights, including patent rights, which in his opinion are necessary to carry out the purposes of the act.

The Administrator is authorized, in the name of the United States, to sell, lease, or otherwise dispose of such personal property as in his judgment is not required for the purposes of the act and such real property and interests in land acquired in connection with construction or operation of electric-transmission lines or substations as in his judgment are not required for the purposes of the act provided such sale, lease, or disposition of real property or transmission lines meets with the approval of the President of the United States.

Subject to the provisions of the act the Administrator is authorized, in the name of the United States, to negotiate and enter into such contracts, agreements, and arrangements as he shall find necessary or appropriate to carry out the purposes of the act.

The Administrator shall at all times, in disposing of electric energy generated at the Bonneville project, give preference and priority to public bodies and cooperatives.

Subject to the provisions of the act, and to such rate schedules as the Federal Power Commission may approve, the Administrator shall negotiate and enter into contracts for the sale at wholesale of electric energy, either for resale or direct consumption, to public bodies and cooperatives and to private agencies and persons. Contracts entered into shall not exceed a period of 20 years and shall contain such provisions as the Administrator and purchaser agree upon for the equitable adjustment of rates at intervals of not less frequently than once in every 5 years. In the case of a contract with any purchaser engaged in the business of selling electric energy to the general public the contract shall provide that the Administrator may cancel such contract upon 5 years' notice in writing if, in his judgment, any part of the electric energy purchased under such contract is likely to be needed to satisfy the requirements of the public bodies or cooperatives referred to in the act.

The Administrator is authorized to enter into contracts with public or private power systems for the mutual exchange of unused excess power upon suitable exchange terms for the purpose of economical operation or of providing emergency or break-down relief.

Schedules of rates and charges for electric energy produced at Bonneville and sold to purchasers shall be prepared by the Administrator and become effective upon confirmation and approval thereof by the Federal Power Commission. Said rate schedules may provide

for uniform rates or rates uniform throughout prescribed transmission areas.

Except in emergencies, or in the case of repair parts, accessories, supplemental equipment, or services previously furnished or contracted for, or where the aggregate amount involved in any purchase does not exceed \$500, the act directs the Administrator to make all purchases and contracts for supplies or services, except for personal services, after advertising, in such manner and at such times, sufficiently in advance of opening bids, as the case may be, so as to adequately insure notice and opportunity for competition.

The Administrator, subject to the requirements of the Federal Water Power Act, is required to keep complete and accurate accounts of operations, including all funds expended and received in connection with transmission and sale of electric energy generated at the Bonneville project.

The Administrator is authorized to make such expenditures for offices, vehicles, furnishings, equipment, supplies, and books; for attendance at meetings; and for such other facilities and services as he may find necessary for the proper administration of the act.

In December of each year the Administrator is required to file with the Congress, through the Secretary of the Interior, a financial statement and a complete report as to the transmission and sale of electric energy generated at the Bonneville project during the preceding governmental fiscal year.

The Administrator, with the Secretary of War and the Federal Power Commission, respectively, is authorized to appoint such attorneys, engineers, and other experts as may be necessary for carrying out the functions entrusted to them under the act, without regard to the provisions of the civil-service laws, and they may, subject to the civil-service laws, appoint such other officers and employees as may be necessary to carry out such functions.

The Administrator may, in the name of the United States, under the supervision of the Attorney General, bring such suits at law or in equity as in his judgment may be necessary to carry out the purposes of the act.

FINANCIAL BACKGROUND

Allocation.—In a determination of the allocated costs of the Bonneville project, issued on February 8, 1938, the Federal Power Commission, in part, stated:

The Bonneville project on the Columbia River, Oreg.-Wash., including the dam, ship lock, power plant, and appurtenant works, for the purpose of improving navigation on said river and for other purposes incidental thereto, is now substantially completed; and said power plant, hereinafter called the initial power development, will be ready for commercial operation on or about June 30, 1938, and will produce surplus electric energy as a byproduct of said navigation improvement, which will give the Federal Government opportunities to promote the public welfare by increasing the benefits derived from works for navigation through provision of a dependable supply of electric energy to potential consumers.

The actual cost incurred by the United States to and including October 31, 1937, for the construction of said Bonneville project was \$44,130,859.93, exclusive of interest during the construction period; and on the basis of said actual cost and of estimates of costs necessary to complete said project, including said initial power development with installed capacity of 86,400 kilowatts, the aggregate cost of said project, exclusive of interest during the construction period, when said initial power development is completed on or about June 30, 1938, will be approximately \$51,892,000.

The cost to the United States for the use of money during the 50-month period from November 1, 1933, to December 31, 1937, representing the principal period of construction, was 1.54271 percent, this being the weighted average rate of interest paid on all money borrowed by the United States during said 50-month period, including both long- and short-term financing.

Including interest at 1.54271 percent during the construction period, the cost of Bonneville project facilities to June 30, 1938, will be approximately as follows: Facilities solely for navigation purposes, \$5,517,600; facilities solely for power purposes, \$9,180,500; facilities having joint value for the purposes of navigation and power development, including fishways which are a joint responsibility, \$38,490,700; the estimated total cost of all Bonneville project facilities, to June 30, 1938, including interest during construction, being \$53,188,800.

Under the terms of the Bonneville Act, rate schedules for surplus power have been based upon an allocation of costs made by the Federal Power Commission (see appendix B). Since the dam was designed to overcome the major navigation hazard in the lower Columbia River, the Commission was directed to divide the cost of the structure according to the purposes served.

After extended studies, the Federal Power Commission, on February 8, 1938, set the allocation of costs for the respective facilities of the project. It fixed the total cost of the entire Bonneville project to June 30, 1938, at \$53,188,800, including interest on the funds used during the construction period. Of that sum \$5,517,600 represented facilities used solely for navigation purposes. Initial facilities useful solely for power purposes were fixed at \$9,180,500, and this entire initial cost was allocated to power. The dam, fishways, and appurtenant works were erected at a cost of \$38,490,700 and were designated as having joint value for navigation and power production.

The Commission determined that the ultimate power development may fairly bear 32.5 percent of the cost of the facilities having joint value. Inasmuch as only 2 of the 10 contemplated generators have been installed, the initial power development was charged with one-fifth of that proportion of the cost, or \$2,501,900. A total of \$11,682,400 was allocated to the initial power development. The proportion of jointly used facilities will be increased with the installation of additional generating units. The additional facilities will also bear a similar share of the cost of the jointly used facilities, which the Commission has set as a fair ratio to allocate to power development.

Section 7 of the act directs that the rate schedules shall be drawn, after allocation of costs, having regard to the recovery of the cost of producing and transmitting such electric energy, including the amortization of the capital investment over a reasonable period of years, which has been fixed by the Administrator as 40 years. It is the intent of Congress that rate schedules be fixed at levels that will reimburse the Government, within a reasonable period of years, for the cost of producing and transmitting the surplus energy developed at Bonneville, including interest and amortization charges on the power investment. The wholesale power schedules are designed to repay this cost, together with interest at 3½ percent per annum, which is approximately 1 percent more than the average cost of the money to the Government.

FINANCIAL REPORT, FISCAL 1938, CONGRESSIONAL APPROPRIATIONS

Classifications of obligations incurred by the Bonneville project during the fiscal year ended June 30, 1938

	148/0608	148/90614
Personal services.....	\$51,087.63	\$1,543.56
Supplies and materials.....	8,451.24	787.85
Storage of vehicles.....	51.46	0.00
Communication service.....	1,279.57	45.00
Travel expenses.....	5,324.22	483.45
Transportation of things.....	1,663.83	100.00
Printing and binding.....	899.85	75.86
Rents.....	2,786.79	2,283.63
Repairs and alterations.....	123.70	26.00
Special and miscellaneous expenses.....	696.83	0.00
Equipment.....	17,522.48	5,776.59
Land and interests in land.....	0.00	3,600.00
Structures.....	.00	18,187.54
Total expenditures, fiscal year 1938.....	89,887.60	32,908.88
Appropriations.....	100,000.00	3,500,000.00
Obligations incurred.....	89,887.60	32,908.88
Unobligated balances.....	10,112.40	3,467,091.12

Appropriation 148/0608 was the first fiscal year appropriation for administrative purposes only. Of the unobligated balance, \$10,000 was withheld by Executive order as a reserve.

Appropriation 148/90614 was a continuing appropriation for construction, operation, and maintenance, included in the Interior Department Appropriation Act, 1939 (Public, No. 497, 75th Cong., approved May 9, 1938), and made available May 26, 1938. The unobligated balance will be available for construction obligation in 1939 by the terms of this act. The 1939 Appropriation Act also included \$165,000 in addition for administrative purposes only, during the fiscal year 1939.

The \$32,908.88 obligation on appropriation 148/90614 was incurred during the month of June 1938, in connection with location surveys of a two-circuit 220-kilovolt transmission line between the Bonneville plant and Vancouver, Wash., and the building of a transmission line to Cascade Locks, Oreg. The unobligated balance of \$3,467,091.12 on this appropriation will be used in the fiscal year 1939 in constructing the Bonneville-Vancouver transmission lines, with substations and 110-kilovolt feeder lines to be built and purchased and connected with the Bonneville and Vancouver substations.

Following the close of the fiscal year 1938, the Administrator of Public Works, with the approval of the President, allotted \$10,750,000 for the construction of 550 miles of transmission line from the dam to Grand Coulee and to The Dalles, and from Vancouver to Eugene, Oreg., and to Aberdeen, Wash.⁸ These Public Works Administration funds became available on August 18, 1938.

⁸ These funds were allotted under the provisions of the Work Relief and Public Works Appropriation Act of 1938, approved June 21, 1938, title II of which authorized funds for Federal construction projects.

The lines covered by the allotment are as follows:

Project OP-752-05-168:	
Construction of 220-kilovolt single-circuit transmission line with substations, Bonneville to Grand Coulee, Wash.....	\$5, 390, 000
Project OP-752-05-169:	
Construction of 110-kilovolt single-circuit wood H type transmission line with substations, Bonneville to The Dalles.....	569, 000
Project OP-752-05-170:	
Construction of 220-kilovolt single-circuit transmission line with substations, West Vancouver to Aberdeen, Wash.; construction of 110-kilovolt transmission line with substations, Kelso to Aberdeen, Wash.....	1, 971, 000
Project OP-752-05-171:	
Construction of 110-kilovolt transmission line with substations, West Vancouver to Eugene, Oreg.....	2, 820, 000
Total allotment.....	10, 750, 000

This allotment represents sums to be expended during the fiscal year 1939 and until June 30, 1940. The facilities represented by the lines described above (fig. 13)¹ will be used to transmit power to several centers of population in Oregon and Washington. The circuit to Grand Coulee will not only serve as an intertie between the two projects, but it will also supply power to the intervening region and develop a market to the north of Coulee. These lines will be used for the transmission of the energy available from the two generators now installed at Bonneville Dam and those additional units provided by the appropriation carried in the War Department Civil Appropriation Act (Public, No. 591, 75th Cong., approved June 11, 1938). This initial network will be supplemented by other lines to serve the communities which already have applied for Columbia River power and to supply energy to other markets which can be developed as rapidly as transmission facilities are made available to them.

Clearing of all transmission line right-of-way and road construction is being done with Works Progress Administration labor. The Oregon Works Progress Administration application totaling \$698,916, and the Washington State November construction Works Progress Administration application totaling \$2,145,030, are in the process of being approved by the Works Progress Administration as this report is released.

RATES

Rate schedules shall be drawn having regard to the recovery (upon the basis of the application of such rate schedules to the capacity of the electric facilities of Bonneville project) of the cost of producing and transmitting such electric energy, including the amortization of the capital investment over a reasonable period of years * * *. (Sec. 7, Public, 329, 75th Cong., approved August 20, 1937.)

Following the issuance of the order of the Federal Power Commission on the allocation of costs, the Administrator and his staff made a careful study of contemplated wholesale rates. Suggestions received from hundreds of sources were carefully analyzed.

In order adequately to meet the needs of the region, field investigators of the project made surveys of local load conditions in every county within economic transmission distance. Special attention was given to the problems of serving agricultural regions, a large part of which is within economic transmission distance of Bonneville.

¹See page 45.

Existing rates of private and public agencies were studied by the rate engineers on the Administrator's staff. The statistical records of the regulatory commissions of the States of Washington, Oregon, and Idaho were examined to obtain a more thorough understanding of the electric needs of the region. Economic surveys of the natural resources of the area were analyzed to determine the most beneficial applications of electric power. The resulting rate schedules reflect months of study of electrical, physical, and economical factors surrounding the problem of encouraging the widest use of the electric energy generated on the Columbia River for the benefit of the entire general public.

In accordance with the provisions of section 5 of the act, the Administrator and his staff began studies of proposed wholesale rates and conditions to be included in contracts with utilities engaged in the sale of energy to the public. The widely varying rates of existing private and public distribution agencies were examined with a view to establishing a simple and effective rate structure. Experts on the Administrator's staff were concerned with devising schedules that would encourage a more abundant use of electric energy in all fields. At the present time existing distribution properties—poles, conductors, transformers, house wiring, etc.—are in use only a fraction of the 24-hour period. With little additional investment, these distribution systems could carry heavily increased power loads. Since distribution costs make up the major portion of the ultimate consumer's bill, it follows that increased utilization of existing facilities would be the best way of assuring the consumer the full benefits of Bonneville power. Idle lines are as costly as loaded lines.

The prevailing electric consumption of residential, commercial, agricultural, and industrial consumers was analyzed to determine the increased power loads that could be absorbed by the introduction of low promotional rates. Demands for cheap power for pumping water were studied carefully, estimates were developed covering street lighting, industrial, and general domestic and agricultural utilization.

Public hearings were opened on March 11, 1938, at which the Administrator presided, in conjunction with the Public Utility Commissioners of Oregon and Washington and the chairman of the State planning board of Idaho, respectively. Representatives of the Federal Power Commission⁹ attended these hearings, and participated in the conferences with the Administrator and his staff in the development of the wholesale schedule of rates. Hearings were held in Portland, Salem, and Pendleton, Oreg., in Olympia, Yakima, Walla Walla, and Spokane, Wash., and Boise, Idaho.

A number of conferences were held with members of the State regulatory commissions regarding resale rate structures, and with the Oregon Hydroelectric Commission regarding the relation of the Bonneville project to the people's utility districts supervised by that body.

Representatives of private utilities, municipalities, power districts, civic, commercial, and farm groups presented their views. In addition, more than 30,000 questionnaires were sent to officials and organizations throughout the Northwest.

The great majority of citizens appearing at the hearings favored a uniform wholesale rate for electricity throughout the entire transmission area. Four out of five replies to the questionnaires favored

⁹Hon. Claude L. Draper, Commissioner; Leshar S. Wing, regional director.

such a rate policy. By a 2 to 1 ratio, Northwest residents expressed approval of the authority vested in the Administrator to control by contract the resale rates for Bonneville power.

Power from Bonneville Dam will be sold at wholesale in a new unit—the kilowatt-year. At Bonneville the Columbia River flows steadily to the sea. There is little storage possible. Day and night electricity can be produced as the water passes through the dam. The power must be used as it is created or it is lost forever. So the Administrator has designed a rate schedule that will encourage the maximum use of electricity—a schedule based on abundance rather than scarcity.

The rates were determined after study not only of the Bonneville project, but of the entire Columbia Basin power possibilities.

Summary of wholesale rates

[See Appendix C]

Transmission system:

Primary power-----	kilowatt-year--	\$17. 50
Secondary power-----	do-----	11. 50
Optional rate-----	kilowatt-hour--	½ cent
(Special development rate for 2-year period for small customers whose demands are less than 1,000 kilowatts.)		

At site rates:

Primary power-----	kilowatt-year--	\$14. 50
Secondary power-----	do-----	9. 50
(At site power is available to purchasers building their own lines for use within 15 miles of the dam.)		

In a year, there are 8,760 hours; so in a kilowatt-year there are 8,760 kilowatt-hours. Districts, cities, or utility systems buying a kilowatt-year of electricity will fix their retail rates to encourage all-day use of power. Instead of just having a few lights burning in the evening, it will be economical to use power all through the day for irrigation, refrigeration, cooking, water-heating, and other purposes.

The wholesale schedule of rates makes no differential in the cost of energy to public or private agencies, to small or large consumers. All pay exactly the same price. Four simple schedules offer Bonneville power to small and large users at equal rates. The small cooperative association, municipal system, or private company, can buy energy at exactly the same price as a large metropolis or a far-flung utility network. It is contemplated that additional off-peak schedules will be prepared for irrigation and interchange loads.

The Bonneville rates are designed to increase "load factors"—to keep power steadily in use throughout the day. A wholesale purchaser buying primary power for \$17.50 a kilowatt-year would pay less than a fifth of a cent per kilowatt-hour for energy if used continuously. If the power is kept in use half the time, the rate for firm power would be less than two-fifths of a cent per kilowatt-hour. By using secondary power at \$11.50 a kilowatt-year, purchasers would lower their costs considerably.

To encourage cooperative associations and other small purchasers to build up their loads, a special limited optional rate of one-half cent a kilowatt-hour is offered. This will be in effect for a 2-year developmental period. As retail consumers purchase appliances and build up their loads, the district, city, or small utility will be able to

purchase Bonneville power by the kilowatt-year, and reduce the cost of its wholesale energy.

The policy governing the sale of power from the dam is clearly defined in the Bonneville Act. The Administrator has a specific Congressional mandate to market the energy to encourage its widest possible use within economic transmission distance of the plant. To prevent monopolization of the power by limited groups, the statute directs him to provide reasonable outlets to existing and potential markets. He is also empowered to interchange energy and to interconnect with other Federal projects and publicly owned systems.

The Bonneville Act provides that in order to assure the operation of the power facilities for the benefit of the general public (and particularly for the benefit of domestic and rural consumers) the Administrator shall, at all times, give preference and priority in the sale of energy to public bodies and cooperatives. In order to preserve this preferential status, 50 percent of the available energy is reserved until January 1, 1941, for such groups. In the interim, the power may be disposed of temporarily. Contracts with utilities may be canceled on 5 years' notice if energy is needed for public bodies or cooperatives.

A reasonable time is granted to public bodies to hold necessary elections and to arrange for the financing and acquisition of distribution systems.

RESALE RATES

Section 5, par. (a), of Public, 329, Seventy-fifth Congress, approved August 20, 1937, provides that—

Contracts entered into with any utility engaged in the sale of electric energy to the general public shall contain such terms and conditions, including among other things stipulations concerning resale, and resale rates by any such utility as the Administrator may deem necessary, desirable, or appropriate to effectuate the purposes of this act and to insure that resale by such utility to the ultimate consumer shall be at rates which are reasonable and nondiscriminatory.

Study has been given to the application of resale rates through contracts in order to comply with the provisions of the Bonneville Act. Although these studies have not as yet been completed, for all classes of service and all kinds of distributing agencies, an objective rate has been established for homes and farms to be served by public utility districts. This objective rate which, it is believed, will not only be met but will be exceeded, is as follows:

	<i>Cents per kilowatt-hour</i>
First 50 kilowatt-hours a month.....	2½
Next 150 kilowatt-hours a month.....	2
Next 100 kilowatt-hours a month.....	1
Next 1,700 kilowatt-hours a month.....	½
Excess above 2,000 kilowatt-hours a month.....	¼
Minimum monthly bill—50¢ per meter.	

In establishing this schedule of resale rates, it is appreciated that varying conditions such as duplicating competition in some cases, and sparsely settled districts in other cases, requires a higher rate initially during an adjustment period. The scheduled resale rates will permit such adjustments during this interim period so that at all times such public utility districts will be operated on a sound financial basis. This is necessary to meet the requirements of the State laws governing public district financing.

Wholesale rate schedules are prepared by the Administrator and become effective upon approval by the Federal Power Commission. Under the Act of Congress, uniform rates may be set throughout prescribed transmission areas to encourage the equitable distribution of power.

Receipts from the sale of electric energy are required by law to be covered into the Treasury of the United States. The Administrator is required to maintain complete accounts of operations in the manner prescribed by the Federal Water Power Act.¹⁰

Provision is made for establishment of an emergency fund to insure uninterrupted operation of the power system.

PROGRESS

The office of the Bonneville project is authorized under section 2, paragraph (a) of Public, No. 329—Seventy-fifth Congress, approved August 20, 1937.

After undertaking certain preliminary work in Washington, D. C., including the selection of the general counsel and the executive assistant, the Administrator opened the offices of the project in Portland, Oreg., on November 15, 1937.

On November 27, 1937, the Administrator held the first meeting with the advisory board authorized under section 2, paragraph (a) of Public, No. 329. Col. Thomas M. Robins, Division Engineer, United States Army, Portland, Oreg., was designated by the Secretary of War to serve on the board; Halbert E. Selby, senior agricultural economist, was appointed by the Secretary of Agriculture; F. A. Banks, construction engineer, was chosen by the Secretary of the Interior; and Roger B. McWhorter, chief engineer, was named by the Federal Power Commission.

Subsequently, a staff to investigate the engineering, legal, financial and economic phases of the electric problems of the Bonneville project was selected by the Administrator.

On May 26, 1938, the first regular construction appropriation for the fiscal year 1939 was made available to the Administrator. It totaled \$3,500,000 and, in addition, \$165,000 was appropriated for administrative and operating expenses to become available July 1, 1938. This separation of operation and construction funds was made in conformity with section 9a of the Bonneville Act, Public, No. 329.¹⁰

The initial construction appropriation of \$3,500,000 provided for the construction of a two-circuit 220,000-volt line from the Bonneville power plant to Vancouver, Wash., with river crossings at Bonneville, and substations at Bonneville and Vancouver. Also included in this appropriation was the construction and purchase of 110,000-volt and lower voltage feeder lines.

Although funds for the Bonneville-Vancouver "backbone" line did not become available until May 26, 1938, by the end of the month operations had progressed to the following percentages of completion:

	<i>Percent</i>
Preliminary surveys.....	88
Line location.....	53
Property ties.....	35
Topography.....	90
Profile.....	90

¹⁰ Sec. 9a requires the administrator to keep his accounts in conformity with the requirements of the Federal Water Power Act. This necessitates adopting the accounting procedure of the Federal Power Commission, which separates administrative and operating accounts from capital accounts.

The initial construction appropriation from Congress enabled the Administrator to organize a construction department and employ engineering personnel to design and draft specifications for the 220,000-volt line and substations that will supply electric energy to western Oregon and Washington.

The engineering, construction and land acquisition staff of the project rapidly was expanded to hasten construction of the lines designated in the Public Works allotment. This involved immediate organization of transmission, system engineering substation, drafting, clerical, and statistical divisions to handle the numerous details in the construction projects.

In order to provide maximum employment both directly on the project and in the industrial plants fabricating electrical equipment, specifications for contracts during the fiscal year were prepared and issued.¹¹

The greater portion of the transmission line authorization not having been received until August 15, 1938, work in the field on a large scale could not be started until that time. However, by November 1 approximately half of the field work required for the line design and construction and purchase of right-of-way had been completed.

At that time the Engineering and Construction Department consisted of 158 persons in Portland and 360 in the field. In addition, 152 men were employed by the Works Progress Administration in clearing transmission right-of-way. The work of the office force includes, as is usual in projects of this kind, design, calculations, and

¹¹ See the following table:

Bid No.	Issued	Opened	Commodity
15	1938 July 5	1938 Aug. 10	1,271,000 linear feet conductor and appurtenances, Bonneville-Vancouver line.
16	July 15	Aug. 15	35,400 insulator units, Bonn ville-Vancouver line.
33	Aug. 15	Sept. 15	13,968 insulators, Bonneville-The Dalles line.
34	...do.....	...do.....	43,016 insulators, Bonneville-Eugene line.
35	...do.....	...do.....	28,416 insulators, Kelso-Aberdeen line.
36	...do.....	...do.....	21,488 insulators, Vancouver-Kelso line.
37	...do.....	...do.....	68,500 insulators, Bonneville-Coulee line, northern division.
38	...do.....	...do.....	68,500 insulators, Bonneville-Coulee line, southern division.
41	Aug. 17	Sept. 19	Towers and appurtenances (1,353 towers in all), Bonneville-Coulee line.
42	Aug. 19	...do.....	Towers and appurtenances (356 towers in all), Bonneville-Vancouver line.
43	Aug. 24	Sept. 23	Towers and appurtenances (215 towers in all), Vancouver-Kelso line.
44	Aug. 22	Sept. 20	524,000 linear feet conductor and appurtenances, Bonneville-Coulee line, North Bonneville, Wash., to a point approximately 30 miles east of North Bonneville.
45	...do.....	Sept. 22	3,764,000 linear feet conductor and appurtenances, Bonneville-Coulee line, point approximately 5 miles east of Condit, Wash., to Grand Coulee project.
46	Aug. 23	...do.....	680,000 linear feet conductor and appurtenances, Vancouver-Kelso line.
50	Aug. 25	Sept. 15	3 transformers delivered to Bonneville.
51	Aug. 29	Sept. 30	1,586,000 linear feet conductor and appurtenances, Kelso-Aberdeen 115-kilovolt line.
52	...do.....	...do.....	784,000 linear feet conductor and appurtenances, Bonneville-The Dalles, 115-kilovolt line.
53	Sept. 2	Oct. 4	540,000 linear feet conductor and appurtenances, Vancouver-Salem 115-kilovolt line, point approximately 8 miles west of Oregon City, Oreg., to Salem, Oreg.
54	...do.....	...do.....	750,000 linear feet conductor and appurtenances, Vancouver-Salem 115-kilovolt line, section from Vancouver, Wash., to point approximately 5 miles west of Oregon City, Oreg.

drawing. In the field, several types of surveying required in transmission line work is accomplished by the field force of 360. By November 1, the number of miles of several classes of surveys accomplished included:

Preliminary.....	351
Location.....	332
Property ties.....	213
Profile.....	306
Tower location.....	78

In addition to the field and office activities already mentioned, specifications have been prepared for substantially all the material that will be needed for completing the transmission lines and substations under the present authorizations. Contracts for line material in the amount of \$3,490,522.25 have been closed, and for trucks and other equipment contracts for \$93,579.78 have been closed. The transmission-line material contracts include about 15,000 tons of steel and about 6,000 tons of transmission-line conductor and 1,500 tons of insulators. The schedule for the construction of the transmission lines and substations anticipates the completion of the Bonneville-Vancouver line in 1939, the Vancouver-Kelso-Aberdeen line in 1940, the Bonneville-The Dalles line in 1939, the Bonneville-Grand Coulee line in 1940, and the Vancouver-Eugene line in 1939.

DESIGN OF SYSTEM

In anticipation of Congressional appropriations, the engineering staff in the spring of 1938 began design of transmission lines and substations for marketing power from Bonneville Dam. They examined characteristics of potential loads to be served by the proposed system, including irrigation requirements, rural electrification, development of natural resources, and railway electrification, as well as the ordinary commercial and domestic uses.

Studies also included interchange of electricity with northwest transmission systems to alleviate power shortage in various areas. The capacities of existing lines were examined to determine the extent to which they might be used to supply the needs of specific regions. These analyses were made to avoid duplication of existing facilities and to provide for an integrated power system that would fit into the ultimate plant.

The effect of an intertying line between the Federal projects at Bonneville and Grand Coulee was thoroughly investigated, particularly in relation to "firming up" the outputs of both plants.

LOCATION OF LINES

The terrain over which the lines would pass was explored both afoot and from the air. Engineers and land acquisition specialists studied the right-of-way problem from the standpoint of most efficient and economical location of the lines.

On the basis of this tentative information, engineering calculations were made to determine the physical and electrical characteristics of the lines. Preliminary drawings were drafted to assist in the writing of general specifications and to select routes for detailed surveys.

Of the initial appropriation of \$100,000, the maximum number of survey crews was employed to locate the "backbone" line for transmission of energy from the dam site to Vancouver and Portland. The problems involved in the acquisition of land for this major circuit were studied to enable the expeditious execution of the necessary work immediately upon appropriation of required funds by Congress.

TRANSMISSION SYSTEM

(The fundamental requirement of a system is that it shall supply power reliably and uniformly.) If the electrical energy is to find a ready market among domestic and industrial consumers, its supply must be free from interruption at all times. The energy must be available over a large area, at locations accessible for interconnection with existing systems and industrial plants. The capacity of the system must be adequate for present needs with a power allowance for future growth. The Bonneville system was designed so that its capacity could be increased without any change in its original and fundamental pattern.

Specific technical requirements relate to the accurate and regulated transmission of energy at specified voltage and frequency. The system should provide constant voltage at all points of interconnection. Several factors are required to accomplish this, including the use of transmission lines of suitable characteristics, and synchronous generators and condensers with automatic voltage control. Constant frequency must be maintained at all times. This is an essential requirement for some industrial processes and for all flexible interconnection between systems. Constant frequency is maintained by sensitive prime mover governors. The entire system must be so designed that any unit may be removed for inspection without interruption to service. An electrical system which extends over a wide area is subject to disturbances by lightning and storms which may cause a temporary interruption of service. The principal load centers should, therefore, be connected with emergency or stand-by generating equipment to be used in such exigencies. In a widespread system for transmitting large amounts of energy, the older generating and distribution facilities can serve as stand-by equipment. Automatic protective arrangements must be incorporated in the system, so that in case of failure in any part, that part will be separated from the rest of the system. This requires highly selective, quickly operating relays and circuit breakers capable of interrupting heavy currents at high voltage.

The system must be simply arranged so as to be efficient, economical, flexible, and easily operated and controlled. Certain systems have recognized advantages over others. Unless the system is built according to a definitely drawn plan, it may develop by successive random additions into a system without desirable characteristics.

Some of these types of system are known as (1) the assigned-area system, (2) the loosely connected system, (3) the rigidly connected network, and (4) the synchronized-at-the-load system.

(1) The assigned-area system is one in which certain generating facilities are connected into a local network of transmission and dis-

tribution circuits and are assigned to serve a definite area or a definite group of customers. In such a system, no consideration is given to pooling the capacity of the energy resources nor of saving capital expenditures in equipment through the wider diversity of load made possible by interconnection. This system has one, and only one, advantage: it is independent of any disturbance outside its limited area.

(2) The loosely connected system is one made up of several minor systems interconnected by small-capacity transmission lines and apparatus which are sufficient to transmit only a small amount of power from one minor system to another. The loosely connected elements are so arranged as to separate automatically at time of disturbance in any one portion of the system.

(3) The rigidly connected system is one in which the generating and transmission facilities are designed and operated as a unit. Such a system utilizes all of the transmission and generating facilities by taking advantage of the daily, seasonal, and yearly diversity of loads which occur over any large service area. It has the advantage of keeping the investment cost of the system at a minimum and of making large blocks of power available at any point within the territory served by such a network. It has two distinct disadvantages in the fact that additions to the system may require fundamental changes and in that it is not flexible in its operation.

(4) The synchronized-at-the-load system is one in which the generating stations feed directly into a high-capacity network. In such a system the large generators or groups of generators are usually operated without any interconnection except at the point where they connect to the power grid. Such a system has all of the advantages of a rigidly connected grid without any of its inherent disadvantages. In general, the synchronized-at-the-load system is the one that is to be preferred. However, the development of a system having a number of plants remote from the load centers will tend to approach toward the rigidly connected network. In such an arrangement, the synchronized-at-the-load concept can be carried into the development. This is due to the fact that a central rigidly connected network may be regarded as the load at which the several interconnecting stations are synchronized through their respective lines. Such a development comprises a ring of transmission lines with radial lines to the several important stations.

In all systems of high-power capacity and large geographical extent the matters of stability and power limits develop into an important factor. Stability in a system is that property which enables it to maintain itself in operation at normal frequency and voltage when loads or generating plants are suddenly disconnected or when system lines are opened. If the system will remain in synchronism, under all ordinary conditions of operation, it is said to be stable. The stability of a system is not only dependent upon the power limits of the several transmission lines in the system but also includes generator design and generator reactance, transmission line and transformer reactance, synchronous condensers, load characteristics, voltage regulators and exciter characteristics, governor response, inertias of rotating machines, grounding systems, circuit-breaker-operation speeds, and relay

systems. All these factors must be considered together for proper design of a stable system. The scope of this report does not permit a detailed discussion of a solution of these factors in the design of suggested system arrangements, but the results of such investigation are embodied in the projected networks as described in this report.

The stability of a system is also dependent upon the power limits of the transmission lines in the system. The power limit of a line connected between two synchronous machines is the power corresponding to the maximum torque that can be applied to one of the machines before it loses synchronism with the machine at the other end of the line. The power limit depends upon the combined resistance and reactances of the lines and the connected machines and also upon the voltage of the line. An idea of the magnitude of the power limit of a typical transmission line is conveyed by the fact that a 220,000-volt line, 150 miles long, consisting of three 500,000 circular-mil copper conductors, will transmit approximately 100,000 kilowatts when connected between appropriately large generators and loads. Thus it will be evident that a generating plant of the ultimate size of the Bonneville plant will require at least four 220,000-volt lines, the number depending upon the lengths of the lines or an equivalent capacity in lines of other voltage in order to transmit the generated energy.

THE "MASTER PLAN"

The type of transmission system selected for the present basic design for Bonneville is one which can become a part, without fundamental changes, of an advanced synchronized-at-the-load master system. In such a set-up the existing facilities, shown in figure 9,¹ will serve through the successive development steps as secondary feeder or distributing transmission lines, thus avoiding duplication. With the exception of some 154,000- and 220,000-volt lines in the Seattle City Light's Skagit development all the other lines shown in figure 9 operate at voltages of 110,000 or less. The first stage of high voltage, high-power-system development is illustrated in figure 10,² which shows the existing system with the projected lines superimposed. Although dated for 1940, some of the lines shown may not be completed by that time. However, all lines shown are considered desirable in a program of development at that time.

¹ See page 40.

² See page 41.

The lines shown in figure 10 are only the beginning of a fully developed larger power transmission system. Assuming completion of these lines by 1940, the system should be extended, within the 5 years following, to about the stage of development shown in figure 11.¹ The actual sequence of line installation will be determined in part by

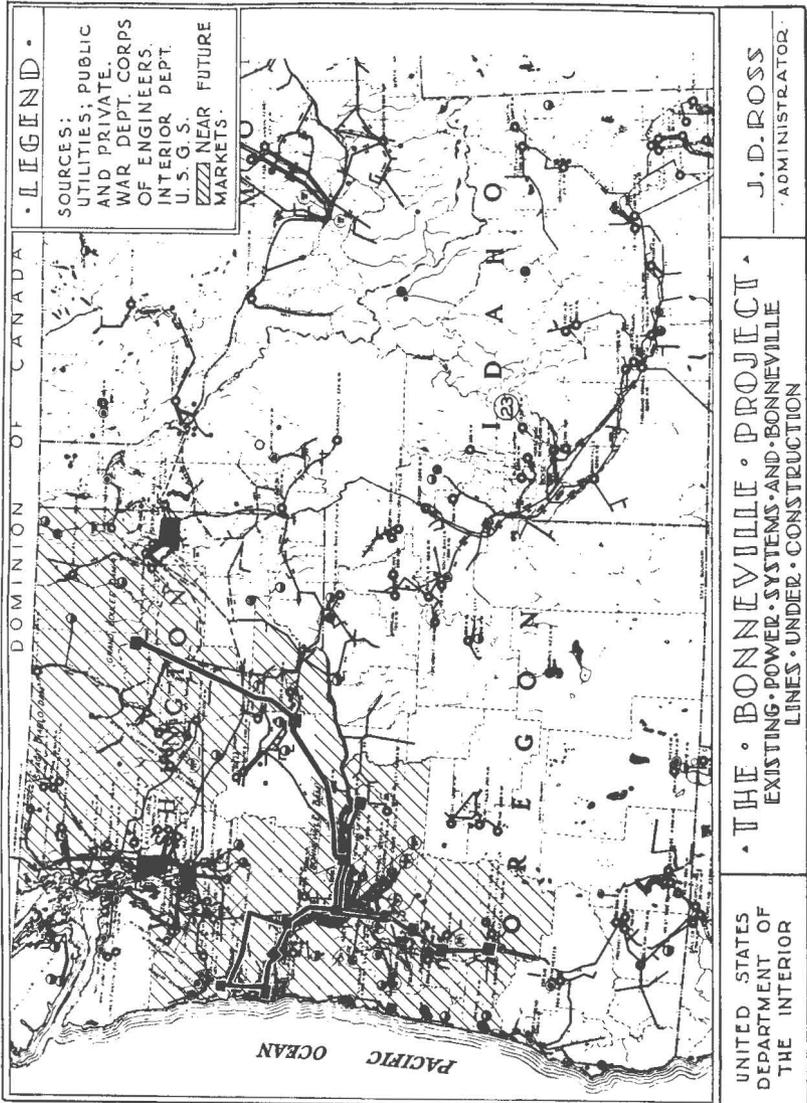


FIGURE 10.

the sequence of construction of additional generating plants. This sequence can only be surmised at present, but the general character of the development can be illustrated by considering any one of a group of associated plants. In figure 11 the system illustrates the high-powered central-ring idea to some extent in a form adaptable to synchronized-at-the-load methods of operation.

¹See page 42.

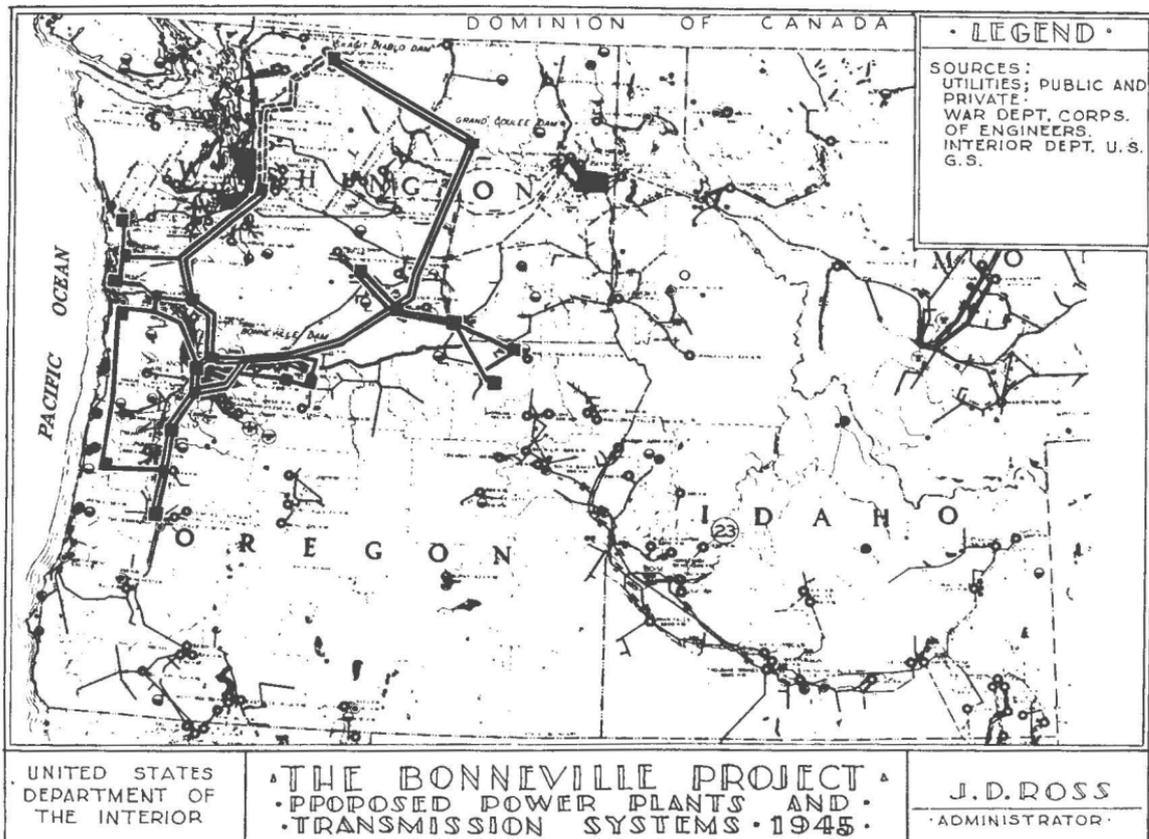


FIGURE 11.

The projected development referred to as the "master plan" is shown in figure 12. No date for its completion is stated because it will depend upon the growth of the load, the wishes of the people served, the construction schedule of the plants, the economics of the problem

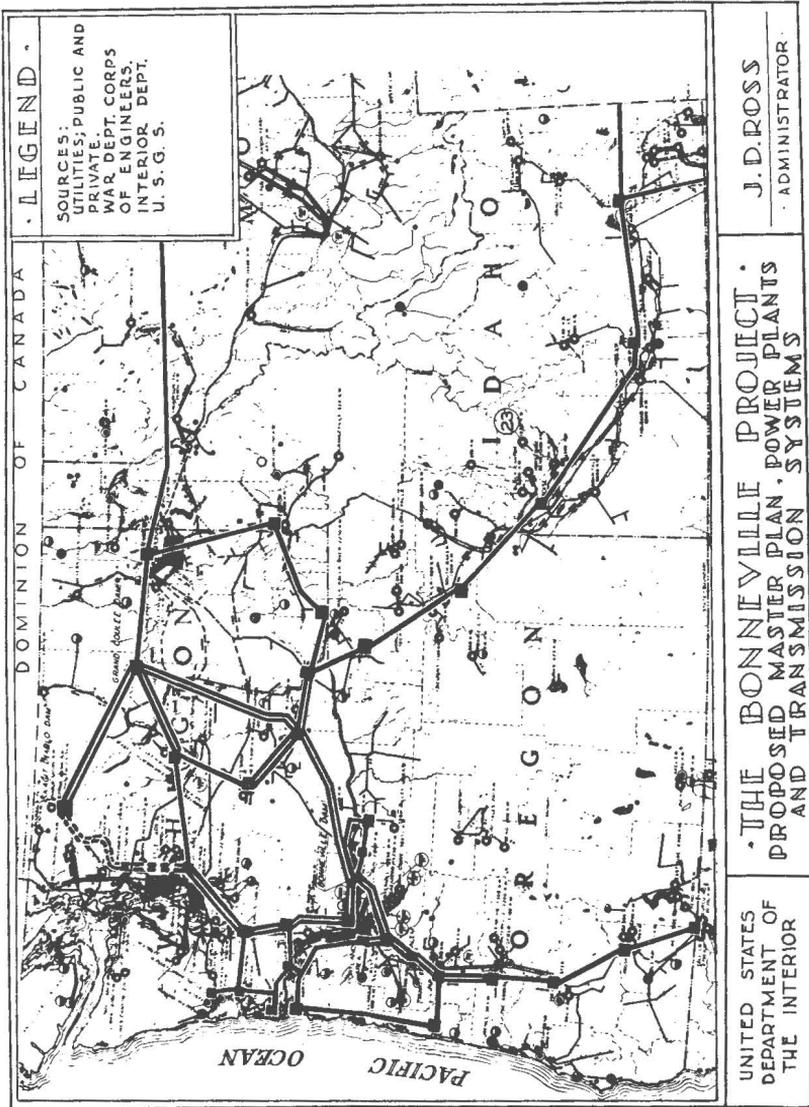


FIGURE 12.

of competitive hydroelectric plants at remote points, and the development of direct-current transmission. Eventually, however, lines should be built to accommodate the entire output of a fully developed Columbia system, together with a completed Skagit development, and other projects.

For a clearer presentation of the projected development of transmission lines, they are shown without the existing lines in figures 10, 11, and 12.¹ Figure 13² shows the lines actually to be built for the 1939 program, and figure 14³ for the 1940 proposal. Figure 15⁴ shows the lines proposed for 1945, and figure 16⁵ shows the lines which will eventually be built in accordance with the master plan. The lines shown in figures 13, 14, 15, and 16 are marked "110" or "220" to indicate the nominal line voltages, 110,000 volts or 220,000 volts. The 220,000-volt lines have the dual purpose of transmitting energy for distribution and of holding the several interconnected systems in synchronism. The 110,000-volt lines are suitable for distributing large amounts of energy and for holding the lower-capacity stations and sections of the system in synchronism with the higher-capacity units. In several parts of the system the intention is to place two or more 220,000-volt lines in parallel. This has several advantages. It makes the system more stable in normal and in emergency operation. It provides a line for maintaining the continuity of the circuit when one of the lines is disconnected for maintenance or to clear a fault. It also permits the use of selective differential protective relaying which is a highly desirable form of discriminating fault clearing.

All efforts are being directed toward completion of these initial transmission lines at the earliest practicable date. The accelerated construction of the system will not only speed energy to markets now awaiting low-cost power but will help the Government to begin recovering its investment in the dam and transmission facilities at the earliest possible time.

STORAGE, STREAM FLOW, AND TIME DIVERSITY OF LOADS

A situation of considerable social and economic significance is found in the diversity of loads between localities in the Pacific Northwest and in the diversity of flow in the several streams of the region. Due to the differences in time between extreme portions of the three States and due to daily, seasonal variations in stream flow, coordinated generation and distribution in the region can be accomplished with practically no generation by the use of fuel. This means that the consumers of the power generated in this area have at their disposal a practically everlasting source of energy at a cost per kilowatt-hour that will be lower than in any other comparable region once the facilities are paid for and owned by the public.

The realization of this highly desirable situation depends largely on the full utilization of the diversity of load in daily and seasonal cycles, in the diversity of stream flow, and in the full development of stream storage. Cyclical diversity of load is of considerable importance in the regulation of a system. The larger the area over which interconnection is accomplished the more effective cyclical diversity becomes. Without adequate stream-flow control and storage, load diversity cannot bring about optimum conditions of operation.

¹ See pages 41, 42, and 43.

² See page 45.

³ See page 46.

⁴ See page 47.

⁵ See page 48.

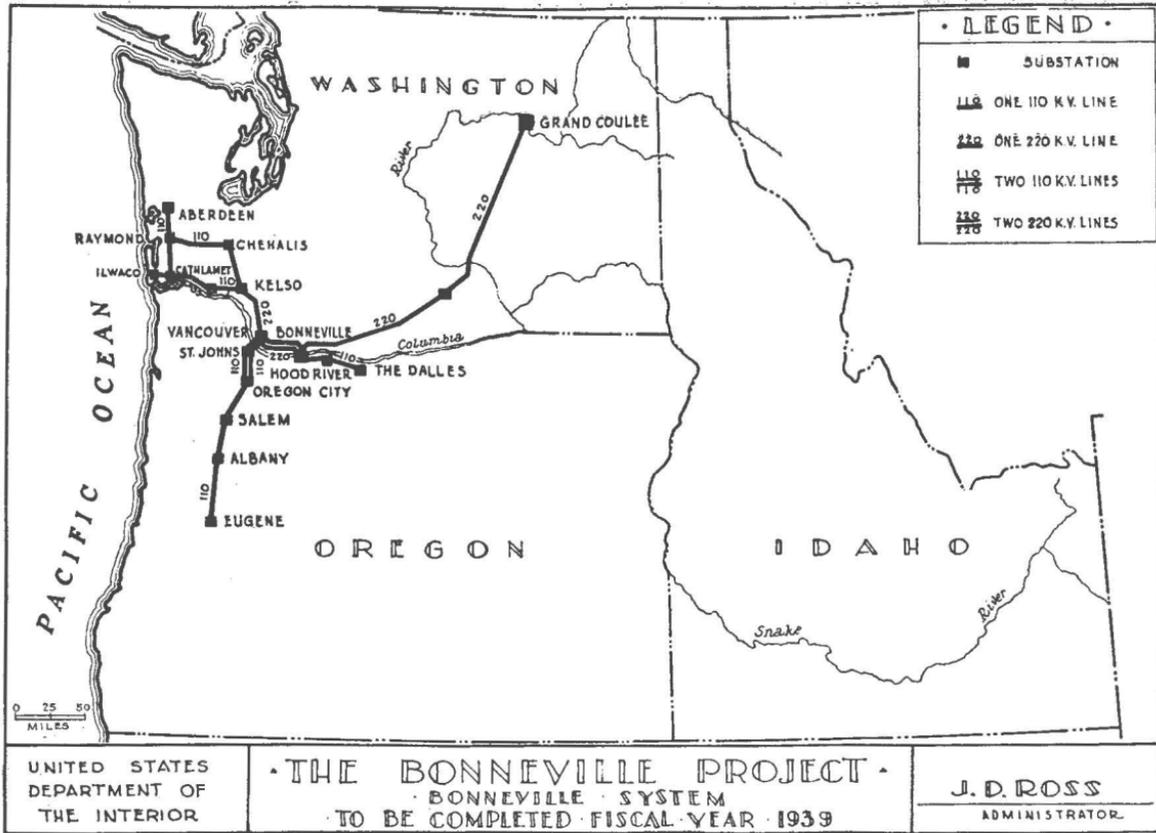


FIGURE 13.

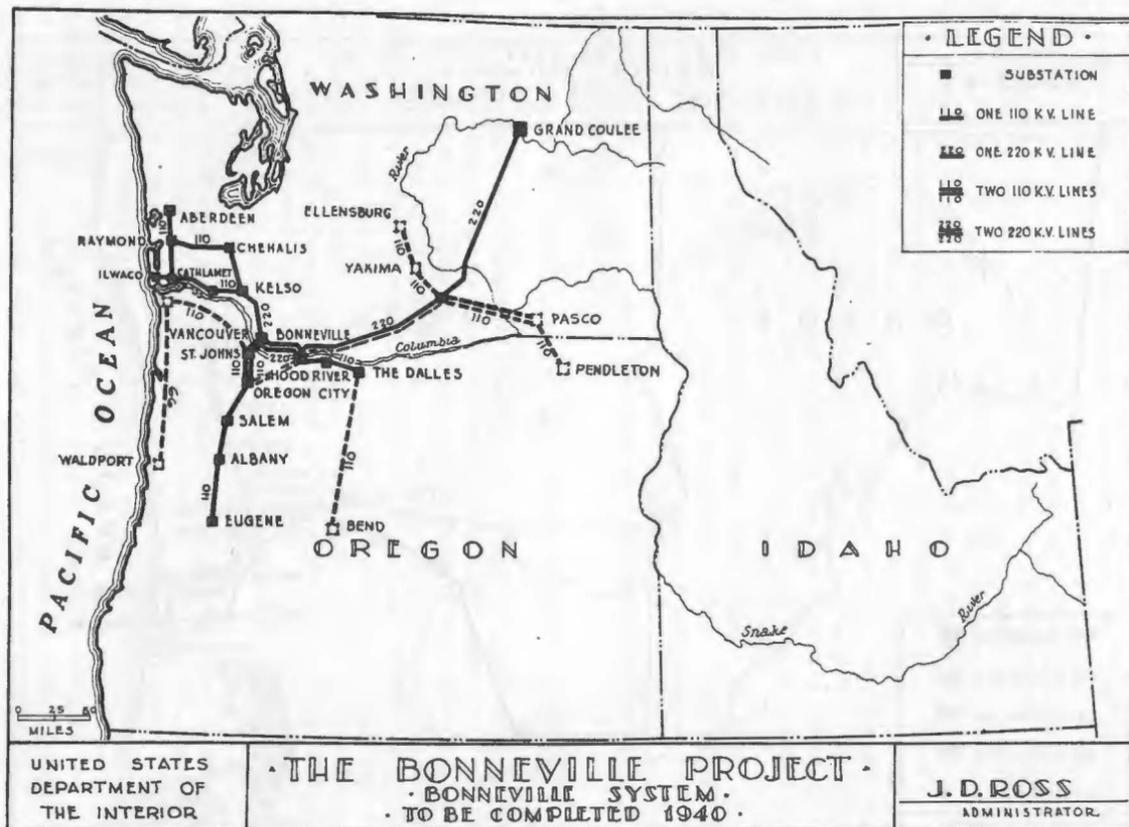


FIGURE 14.

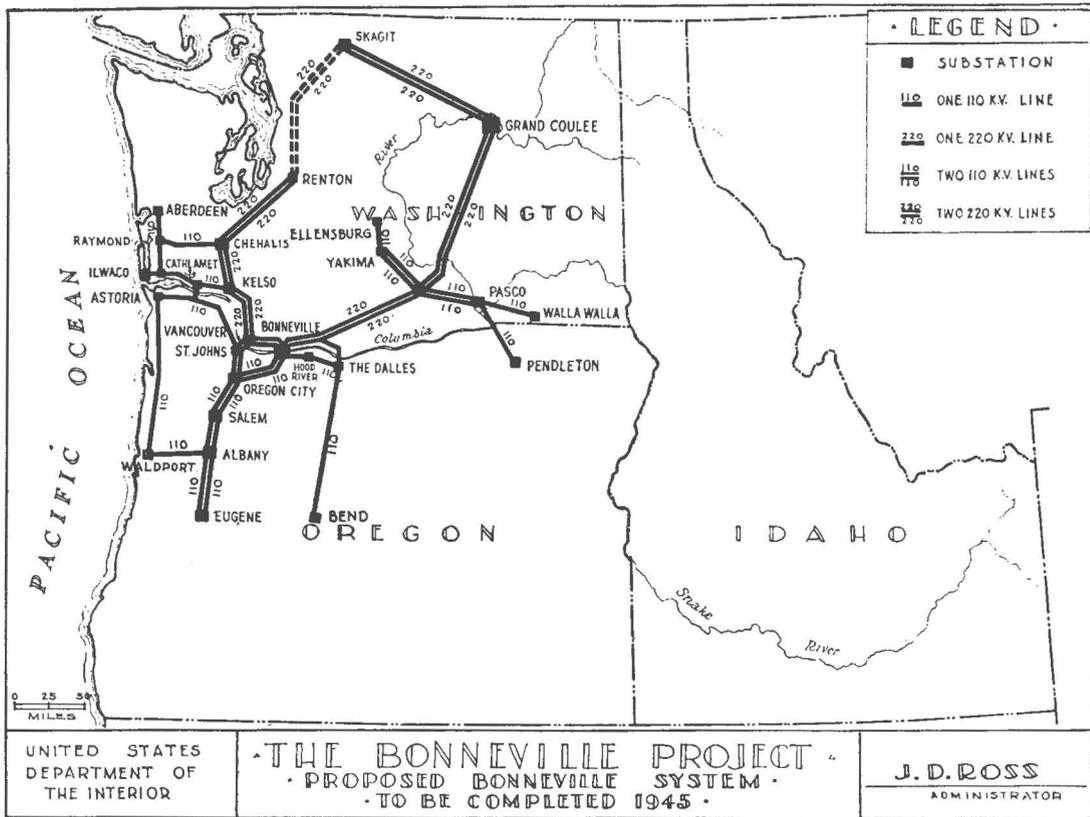


FIGURE 15.

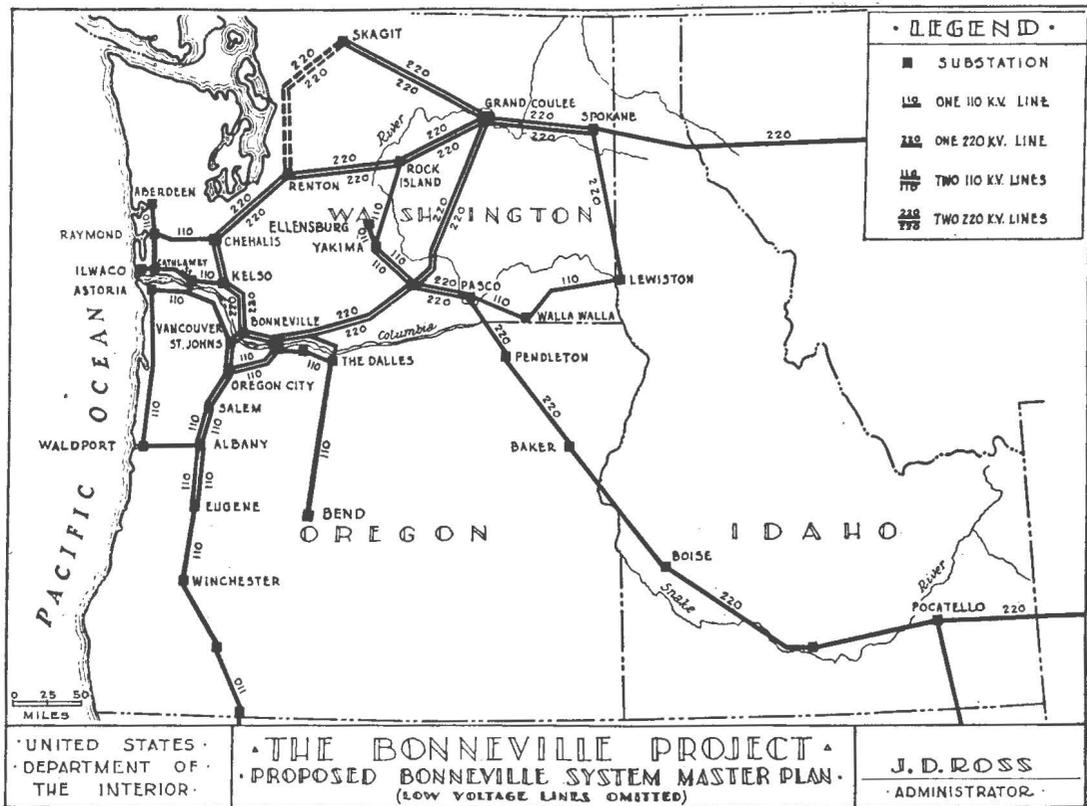


FIGURE 16.

POWER DISTRICTS

The distribution of population and historical developments in Oregon and Washington make power districts the logical type of public bodies to distribute energy generated by public projects.

A third of a century's experience in Seattle, with competition between public and private enterprises, has convinced the administrator that the distribution of electricity is logically a monopolistic undertaking. In Tacoma, Wash., and Eugene, Oreg., the municipally owned power plants early removed competition by purchasing the facilities of the private utility companies, with the result that the lowest rates in the United States are found in these two cities, together with a sound amortized financial structure. Two power systems cost twice as much as one. Parallel lines and duplicated facilities are all paid for out of the consumers' bills. While public competition may help to bring rates down to a more reasonable level, the most efficient and economical service demands a single system—either rigidly regulated or publicly owned.

In his first annual message to the New York Legislature, on January 2, 1907, Gov. Charles Evans Hughes warned against the surrender of water powers to private interests, when he declared:

* * * It is well to consider the great value of the undeveloped waters thus placed under State control. They should be preserved and held for the benefit of all the people and should not be surrendered to private interests. It would be difficult to exaggerate the advantages which may ultimately accrue from these great resources of power if the common right is duly safeguarded.

Speaking at Portland, Oreg., on September 21, 1932, Gov. Franklin D. Roosevelt, of New York, said:

* * * I therefore lay down the following principle: That where a community—a city or county or a district—that is not satisfied with the service rendered or the rates charged by the private utility, it has the undeniable basic right, as one of its functions of government, one of its functions of home rule, to set up, after a fair referendum to its voters has been had, its own governmentally owned and operated service.

If the people choose to have their own monopoly, that is their inalienable right.

The application of these principles to the power situation of the Pacific Northwest is eminently brought to the forefront by the completion of the Bonneville Dam.

Prior to 1938, 18 counties in the State of Washington voted and organized public power districts. In the election of November 8, 1938, 7 additional counties so voted; making a total of 25 power districts. These 25 counties in the State of Washington, together with King and Pierce Counties, in which are located the Seattle and Tacoma public plants, comprise all the heavy-load centers, excepting the territory immediately adjacent to Spokane and in Yakima County. These districts and municipalities constitute the location of all power loads west of the Cascades and adjacent to Puget Sound and the Pacific Ocean. In addition, they constitute a ring on the eastern slope of the Cascades to the Canadian border. [In Yakima County the franchise of the distributing company in the city of Yakima has expired. South of Spokane the territory not included in a utility district is being served by a large rural cooperative. A map of the location of these districts is given in figure 17,¹ together with available loads in 1941 and 1945. All of these districts are negotiating with

¹ See p. 50.

the private power companies for the acquisition of their properties. Contracts are practically concluded in a number of these counties, and power will be taken from Bonneville. Upon the completion of the transmission system, now in the process of construction, at least

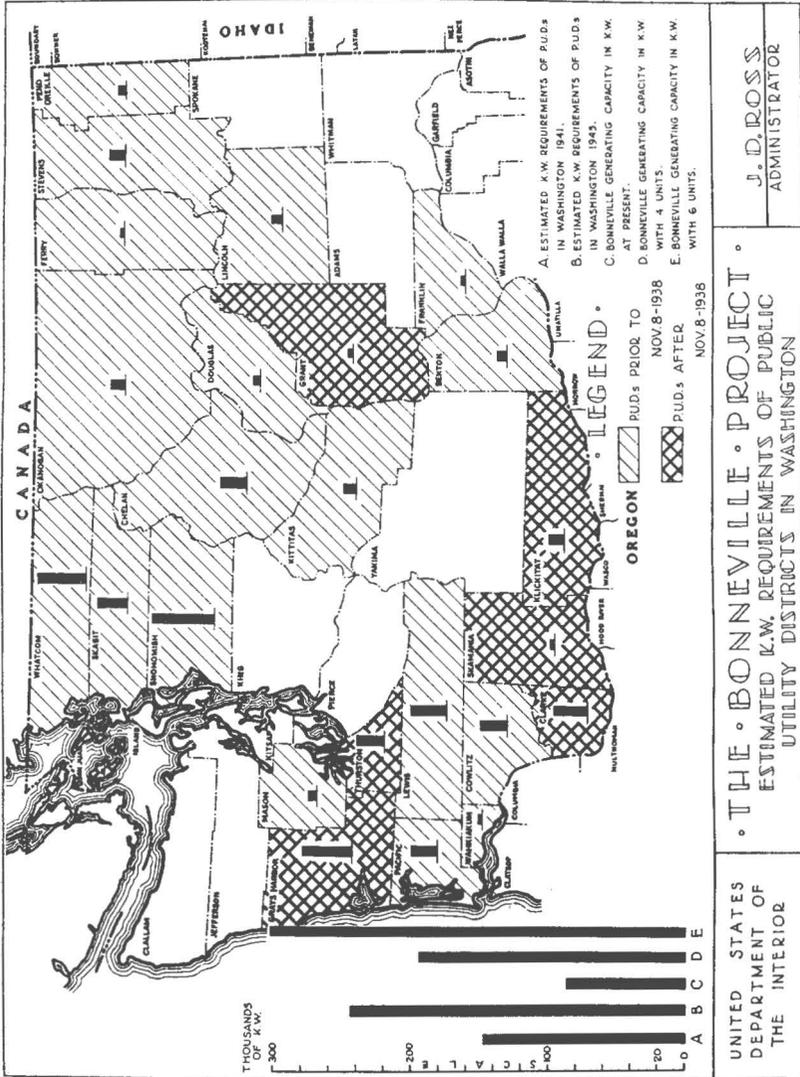


FIGURE 17.

six of these county-wide districts will be in a position to immediately take power from Bonneville.

In the State of Oregon, two power districts and six municipalities have requested service. The load situation in Oregon both for 1941 and 1945 is shown on figure 18.¹

¹ See p. 51.

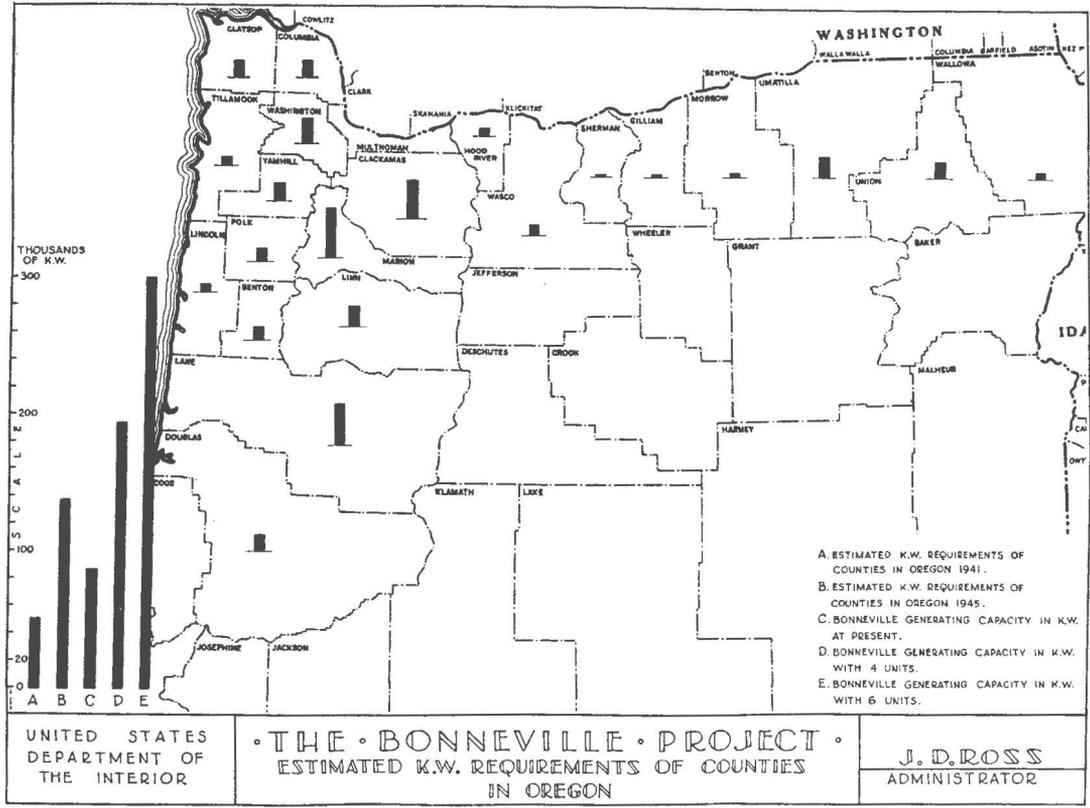


FIGURE 18.

In each instance these power districts have heeded the Administrator's warning that competition and duplication of facilities is a costly and trying experience. The Administrator has offered his services to settle amicably any disputes that might arise in connection with the acquisition of such properties. He has pointed out that it is good business for public agencies to offer a fair price before going into competition with private agencies. Such competition usually ends in the purchase of the private system, but not before the private investors and the public at large have suffered losses that might have been avoided by earlier sale of the properties at a fair price.

The experience of Cascade Locks, a community 5 miles east of the project, illustrates the soundness of the Administrator's conclusions. There the citizens, by a 10-1 ratio, voted to purchase Bonneville power and distribute it at cost over publicly owned lines. The community at first was unable to arrive at any agreement with the West Coast Power Co. for the sale of the Cascade Locks system. The company countered with an offer of slightly lower retail rates, which the community rejected. Thereupon, the community began the construction of duplicate parallel facilities with the intention of excluding the power company from its territorial limits upon the expiration of the utility franchise in July of 1938. At the end of the fiscal year 1938, the administrator suggested the community adopt the policy outlined above. Following his suggestion, the community of Cascade Locks abandoned its competitive plans and a solution is being worked out by which the investors will be paid a fair value for the existing system. In valuing the properties, consideration was given not merely to the physical inventory but to the operating merit of the company, to prospects of future revenue, and the value of the property as an integrated unit.

Instead of acquiring merely the property within the town limits, Cascade Locks is following the Administrator's advice and arranging to purchase the entire Cascade Locks' division of the West Coast Power Co. Three-fourths of the revenue from this system comes from outside the town limits. By following the Administrator's recommendation the community not only avoided payment of heavy severance damages but was enabled to serve industrial sites situated along the Columbia River. The larger operations permit employment of efficient personnel and provide opportunity for expansion. At the same time the power company is not left with an uneconomic territory—territory from which the "cream" has been skimmed.

Retail rates of the private company operating in the community are 7 cents a kilowatt-hour for the first 40, 3 cents for the next 60, and 2 cents each for everything over 300 kilowatt-hours per month. The compromise plan, developed with the assistance of the Administrator, will permit a substantial reduction of rates within a short time. Transfer of these facilities to the city is expected to be concluded by March 30, 1939.

The Administrator recommended that financing be undertaken with bonds payable solely from revenues rather than general obligations which would be a lien upon the property of the taxpayers.

In his discussion of the Washington power districts the Administrator has urged local officials and power-company representatives to pursue the course recommended to Cascade Locks. He has suggested the purchase of existing private properties as complete units and, to

such an extent as practicable, the retention of existing personnel. Such an arrangement permits the municipality to accomplish the desired objectives of improvement and extension of service, and also the reduction of rates without subjecting the community to the social or economic repercussions which would follow from a conflict between privately and publicly owned organizations.

At all times the Administrator has endeavored to persuade district and utility officials to adopt a rational, businesslike approach in the transfer of distribution properties. The early offer of a fair price facilitates negotiation, avoids injury to private investors, and places the distribution of power on a sound business basis. The Administrator has repeatedly pointed out that such a transfer of properties is in the best interests of both investors and consumers. The consumer will benefit even though he pays a slightly higher price than he believes warranted by the condition of the properties. A long-drawn-out battle would result in higher rates during the competitive period. Investors, too, will benefit through such a procedure. The Administrator has indicated that investors will never get more for their utility properties than they will at the present time. Bitter competitive battles reduce the value of private systems and inevitably lead to loss both to the consumer and the investor.

SALE OF POWER

Although the Bonneville plant was in a position to generate power about July 1, 1938, no facilities were available for the transmission of power, with the exception of a line owned by the Northwestern Electric Co., having a capacity of about 15,000 kilowatts, which furnished power during the construction of the dam. As this was the only source for the sale of power, there was entered into with the Northwestern Electric Co., on August 1, 1938, a temporary contract for the sale of 5,000 to 12,000 kilowatts, for a period of 6 months, which disposed partially of Bonneville power, and at the same time served an experimental purpose in the operation of the generators at the dam.

As the construction of the transmission lines progresses, intensive action is being taken for disposition of Bonneville power as soon as these transmission lines are completed. Negotiations are now under way with a number of municipalities, public power districts, industrial plants, and private utilities which, it is estimated, will take the major portion of the existing surplus generating capacity of the dam above navigation and reserve requirements.

On the Vancouver-Eugene line a tentative understanding has been reached with the municipally owned plant of the city of Eugene, Oreg., providing for the sale of 1,000 kilowatts base load initially and increasing the load with time. Bonneville will also provide interchange peak power at a rate to be submitted shortly to the Federal Power Commission for confirmation and approval.

The city of Canby, Oreg., which owns its distribution system, has made application for power and a survey is now being made of their requirements with the view of entering into a contract in the near future. The city of Canby is considering also combining with the rural district so as to furnish power for irrigation pumping.

The city of Monmouth, Oreg., has decided by a vote of the people to purchase the distribution system within their city, and has requested negotiations looking toward a contract with Bonneville.

The city of McMinnville, Oreg., which has a municipally owned plant, has indicated desirability of purchasing base load from Bonneville.

Negotiations in these latter two cases are suspended pending further progress in the completion of the transmission system.

The public power district of Tillamook, Oreg., which is located along the Oregon coast, has indicated that it desires to proceed with the acquisition of the private power company now serving it, and to purchase power from Bonneville. However, the present transmission system does not contemplate reaching this district, and it will be necessary to build additional lines to serve this section.

On the Bonneville-The Dalles line, the city of Hood River owns its light plant, and they have requested Bonneville power.

The city of Cascade Locks, which has been referred to in detail previously, and which is now directly connected to Bonneville Dam, will also be served from this line.

Nine counties in western Washington have on file with the Administrator requests for power totaling 150,000 kilowatts. Four districts and the city of Ellensburg in central Washington have filed requests for 87,000 kilowatts. Six counties and a rural electrification project in eastern Washington have requests on file for 17,200 kilowatts. These requests total 224,000 kilowatts, or over three times the existing capacity of the Bonneville plant.

The State of Washington now has 25 county-wide public power districts. All these districts are negotiating with the private power companies for the acquisition of their properties. Contracts are practically concluded in a number of these counties, and power will be taken from Bonneville. It is anticipated by the time of the completion of the transmission system in the State of Washington that at least six of these county-wide public power districts will be in a position to immediately take power from Bonneville. In a few cases these public power districts will be operating before the completion of the system.

INDUSTRIES

Industries have shown an interest in taking advantage of Bonneville power. Negotiations are in process for a contract involving the location of an industrial plant at Cascade Locks, with a contemplated plant investment of over \$1,000,000. In this case this industry will take power direct from Bonneville Dam at the at-site rate. Another chemical plant, involving close to one-quarter of the capacity of one of the two installed units, is also negotiating for power.

GENERATING UNITS

Under the Bonneville Act, the Administrator is required to anticipate future demands for power, and make application to the Secretary of War for the installation of additional units as power markets are developed. Anticipating this demand, a request for two additional generators was made upon the Secretary of War in January 1938. Under Public, No. 591, Seventy-fifth Congress, approved June 11,

1938, Congress appropriated the funds to proceed with the construction and installation of two additional units. These additional units are now under construction, but it is not anticipated that they will be completed before the spring of 1941, at which time the requirements of Bonneville will be such that the four units will be insufficient to meet the demand, both from public and private utilities.

LEGAL ASPECTS

Federal authority over navigable streams long has been established by law and precedent. In the delegation of powers to the Federal Government, the Constitution of the United States provides that Congress shall have power to "regulate commerce with foreign nations and amongst the several States."² Since 1808 the Congress, by legislative acts, has regulated navigable streams, which action has been upheld by a series of decisions handed down by the United States Supreme Court.³

From 1825 to 1840 the Congress acted to extend inland navigation by authorizing grants of public lands and loans to aid in the development of navigable waterways. In those days electricity was unknown, hence the only interest in water-power development was in connection with mechanical power, which accounts for the stressing in early legislation of navigation and transportation.

Federal legislation authorizing and controlling power developments on navigable streams is comparatively recent, the General Dam Act of 1906 being the initial law fixing conditions attaching to power authorizations on navigable streams.

In 1908 President Theodore Roosevelt, in his veto message on the Rainey River bill, called attention to the impending development of water power and the necessity for caution when he stated:

We are now at the beginning of a great development in water power. Its use in electrical transmission is entering more and more largely in every element of the daily life of the people. Already evils of monopoly are becoming manifest * * *.

Four years later in vetoing the Coosa River bill President Taft stated:

If the Federal Government chooses to build this dam itself as an aid to navigation, its right to the water power incidentally created would be beyond question * * *.

This principle set out by President Taft in his Coosa River veto message has been upheld and extended by the United States Supreme Court in the decision handed down on the *Ashwander case*⁴ in 1936. In this decision the Court stated:

That the water power and the electric energy generated at the dam are susceptible of disposition as property belonging to the United States is well established. We know of no constitutional ground upon which the Federal Government can be denied the right to seek a wider market * * *.

In view of these decisions no question properly can be raised regarding the constitutionality of the act authorizing the Bonneville project and the right of the Federal Government to dispose of the surplus energy generated at the dam.

² Constitution of the United States, art. I, sec. 8.

³ *Gibbons v. Ogden*, 9 Wheat, 1, 190; *Gilman v. Philadelphia*, 3 Wall. 713, 725; *Philadelphia Co. v. Stimson*, 223 U. S. 605, 634; *U. S. v. Chandler Dunbar*, 229 U. S. 53, 72, 73; *Kaukauna Water Power Co. v. Green Bay Canal Co.*, 142 U. S. 254.

Disposition of energy generated at navigable dams: *Green Bay Company v. Patten Paper Co.*, 172 U. S. 58-80; *Utah Power and Light Co. v. Pfoest*, 286 U. S. 165-170; Story on the Constitution, secs. 1325-1326.

⁴ *Ashwander v. Tenn. Valley Authority et al.*, 297 U. S. 288.

From the time of the establishment of the Portland office on November 1, 1937, to the end of the fiscal year, the legal department consisted of the general counsel and an associate attorney. On August 1, 1938, the legal department was increased by the addition of two attorneys, and it is contemplated that the organization will be further increased to meet the requirements of title examinations.

The legal department has briefed the utility laws of the States of Idaho, Oregon, and Washington in order to determine the effect of these respective statutes on the local problems that will arise in connection with the sale and transmission of surplus Bonneville energy.

This department is primarily concerned with the legal problems growing out of the allocation presentation, rates, rate orders, rights-of-way, contracts, and all litigation arising out of the administration of the Bonneville Act, including all judicial proceedings, under the supervision of the Attorney General of the United States, on behalf of the project before the courts.

To be prepared for right-of-way acquisition, when and if congressional appropriations become available, the legal department set up the outline for the necessary organization and procedure to speed up land procurement.

It is contemplated that most of the right-of-way through the Willamette Valley in Oregon will be secured by negotiation and purchase. In the State of Washington, right-of-way acquisition will be by purchase or condemnation. Where delay may ensue, due to various causes, it is planned to file a declaration of taking. Following the filing of such a declaration, parcels will be negotiated where possible and condemnation resorted to only where necessary.

The appraisals and negotiations for land purchase will be handled by the land department of the project. As a check on values, an independent land appraisal board consisting of three members has been created by the Administrator. One member of this board has been designated by the United States Reclamation Service, one by the United States District Attorney at Portland, and the third by the Administrator. The legal department of the project, in conjunction with the Solicitor of the Department of the Interior, will pass upon all titles.

In Oregon the public power laws are markedly different from the Washington statutes and have not, as yet, been passed upon by the Supreme Court of the State of Oregon. In a test case brought by the Tillamook County People's Utility District, the circuit court upheld the constitutionality of the district law.

Oregon's reluctance to organize people's utility districts is generally attributed to the lack of a statute specifically authorizing the issuance of revenue bonds for financing the acquisition and extension of power systems. Unlike the Washington law, the Oregon statute makes no provision for financing distribution systems directly out of earnings and does not provide for the formation of districts with boundaries co-extensive with county lines. Both of these provisions are different from the Washington law.

A number of Oregon organizations and individuals are now advocating certain amendments to the people's utility district law. The Bonneville Federation of Oregon, an association of officials of municipal systems, power districts, cooperative associations, and representatives of farm organizations, formally requested the Adminis-

trator to analyze the existing district law to determine the feasibility of marketing Bonneville power under its provisions. The legal department of the project prepared an analysis of the law and examined the eligibility of the district to purchase energy from the Federal Government and distribute it at cost. The Bonneville Federation asked that this material be made available to its legislative committee in order to draft a model power district bill which will be presented to the Oregon legislature in its session of January 1939.

The legislative committee sponsoring this revision of the Oregon power-district law is composed of representatives of interested municipalities and districts, the master of the State Grange, the president of the Farmers' Union of Oregon, and representatives of the People's Power League.

The Washington public power laws enable a district to finance the acquisition of a distribution system by issuing bonds payable solely out of the earnings from the sale of energy. All of the Washington districts are planning to acquire power systems through the issuance of such revenue bonds instead of general obligation bonds. The Washington statutes also grant to districts the right of eminent domain in the acquisition of such private systems. Since the close of the fiscal year, two districts in southwestern Washington succeeded in securing offers from the West Coast Power Co. to sell portions of its system which serve their respective areas at prices which appear to be fair and equitable and at which the purchases can be readily financed by the public bodies. Condemnation proceedings against the Washington Gas & Electric Co. were commenced in July by the Cowlitz County public utility district, and shortly thereafter a similar suit was instituted against the Willapa Electric Co. by the Pacific County public utility district. Both districts are in the State of Washington.

The sale of energy to private utilities and industries presents few legal problems. An interim contract has been executed with the Northwestern Electric Co. covering the sale of energy for a short period. This agreement will enable the Administrator to subject the generating and transmission equipment to necessary tests and will supply needed technical information to be used in operating the completed power network.

If the people choose to have their own monopoly, this is their inalienable right.

THE REGION

Nature has endowed the Pacific Northwest with an incomparable wealth of resources in its soils, forests, minerals, and in the inexhaustible supply of hydroelectric energy of the Columbia River and its tributaries. This region has almost a tenth of the land area of the Nation and nearly half of the potential water power. The integrated development of the Columbia River offers the promise of wider opportunity, not only for the population already in the region but for the millions who look westward to our last frontier to solve the problem of security and contentment in the American way.

The multiple use of the Columbia River for navigation, for irrigation, for the conservation of the soil, for recreation, for flood control, and for power makes its development essentially a governmental function. Bonneville Dam is the initial step in the comprehensive

Federal program for the Columbia Basin. And power, paying its own way, also makes possible the most complete development of this watershed for the widest benefit of all the people.

The Columbia River, flowing in a southerly direction from its Canadian headwaters, parallels the eastern foothills of the high Cascade Range. Some 200 miles from its mouth, it turns abruptly to the west and enters a massive canyon piercing the second highest mountain range in the United States. At first the river flows between sage-covered banks. As it progresses westward, its waters become confined by basaltic walls which rise to thousands of feet in height. About 40 miles west of the location of the Bonneville Dam the rocky battlements become carpeted with towering firs which cling to the cliffs in an evergreen blanket. The river cuts deeper into the massive mountains until the major peaks of the Cascade Range look directly over it.

The great river, flowing through the lofty walls of the severed range passes, within the comparative short range of the gorge, from the arid regions north and east of the mountains into the luxuriant areas of the western slopes. The dramatic and rapid transition at a single level from the continental to marine geographic and climatic conditions creates, along this section of the river, a panoramic display of joined contrasts and combinations of such features as are only to be found elsewhere in widely separated locations.

The diversity in the character of land structure and growth which exists horizontally also exists vertically. The formations and cover of tidewater-affected shore areas change as the terrain rises through different altitude forms to the subalpine summit region. The mountains which flank the gorge reach heights of nearly 5,000 feet above the floor of the valley, and within 20 miles of the river rise to over 11,000 and 12,000 feet, respectively, in glacier-covered Mount Hood and Mount Adams.⁵

The Columbia Gorge is unequalled for its beauty. Hundreds of thousands of visitors are drawn each year to the spectacle of this canyon, its verdure, and the waterfalls which tumble hundreds of feet from the cliffs that line the Columbia River.

The intrusion of man into this creation of Nature brought with it the serious problem of preserving the scenic wonder of the gorge. With the completion of the Bonneville Dam came the probability of an industrial development. Individuals and organizations visualized a Pittsburgh of the West rising in the shadow of the dam, an exploitation similar to that of Niagara Falls, blotting out the grandeur of the gorge. Unplanned erection of ugly factories, belching fumes and smoke in this famous recreation area might jeopardize one of the great natural assets of the Nation. A spawn of clapboard shacks spreading about the industrial area might end a tourist trade locally valued at millions of dollars a year.

Of equal importance was the problem of protecting the purity of the water of the Columbia River. The uncontrolled discharge of industrial wastes might imperil the famous fish "runs" of the Columbia River. Hundreds of thousands of salmon which migrate upstream to spawning grounds in the headwaters might be unable to withstand the effects of the chemical wastes. Fingerlings would be fatally affected on their way to the sea. These wastes, either by direct toxic action or by their removal of oxygen from the water, might also destroy the adequate food life necessary for the young fish. An industry providing thousands of persons with a yearly income estimated at \$10,000,000 might be wiped out if careful foresight were not exer-

⁵ "Columbia Gorge Conservation and Development in Pacific Northwest, Regional Planning Commission, January 1937."

cised in the industrial development of the region in the neighborhood of the dam. Viscid liquids thrown up along the shore would create a danger not only to plant and animal life but would impair many of the recreational values of the river banks.

Nature, to some extent, has provided for the preservation of the gorge. Due to the precipitous bluffs which shadow the Columbia, few industrial sites are available along the shores of the gorge. A short distance above and below the canyon, the terrain flattens out and offers numerous possibilities for fine industrial development. Forty miles down-stream at Portland and Vancouver and along the Willamette and lower Columbia Rivers, excellent facilities are available for commercial enterprises which seek low cost electric energy, water and rail transportation, and suitable accommodations for their employees.

To assure the preservation of the natural beauty of the gorge, the Administrator has inserted in the rate schedules restrictive conditions which will apply to industries using energy within 15 miles of the dam site. The restrictions are set forth in the rate schedule as follows:

Purchase of power under all rate schedules and contracts shall be subject to the following general terms and conditions:

Conservation of natural resources.—Power from the Bonneville project plant shall be available only to those purchasers, the waste products from whose plants or operations shall not be harmful to, or destructive of, the fish or other aquatic life of the Columbia River; nor otherwise pollute the stream; nor detract from the scenic beauties of the Columbia River Gorge.

At-site power.—The aggregate contract demands of at-site power, prime and secondary, shall not exceed 20 percent of the installed generating capacity of the plant.

It is felt by the Administrator that industry will realize its share of responsibility in the preservation of the gorge. The situation demands cooperation among industry, State and Federal officials, as well as those who have waged a ceaseless struggle to maintain the gorge in its natural aspect. The design of plants and accompanying facilities, the selection of sites, the solution of problems relating to effluent waste must be resolved in the interest of the entire region.

The Administrator shares the belief that beauty and industry are not incompatible; that power from the great Federal projects can be used to raise the economic standards of large numbers of Americans without impairing the esthetic values which make life full and rich. In carrying this principle to fruition, the Administrator will cooperate with public spirited citizens and State officials in preserving the beauty of the gorge.

Although the future of the Pacific Northwest is inextricably entwined with that of the rest of the United States, there are natural factors which make it a distinct unit both physical and economical.

Nature has roughly marked the boundaries of the Pacific Northwest by the outstretched web of a mighty watershed. The Basin of the Columbia River embraces the greater parts of Washington, Idaho, and Oregon, and a lesser portion of Montana, and is surpassed in size only by the Mississippi Basin. The man-made boundaries of Canada lie to the north, and those of California, Nevada, and Utah to the south. Within its 250,000 square miles—an area larger than that of France—several natural divisions exist. Two mountain ranges, running north and south, face each other and divide the region into three general valley systems. Between the Pacific Ocean and the hills of the coastal range is a gently rolling plain only a few miles wide, the

greater part of which is covered with dense stands of timber which extend eastward over the range. Between the coastal range and the Cascades stretches a fertile valley. Between the snow-capped peaks and ridges of the Cascade Mountains and extending to the foothills of the rugged Rockies is a vast plateau, much of it already reclaimed from the desert by irrigation.

The Cascade Mountain Range, running north and south like an almost impenetrable wall, sharply divides the climatic conditions of the region. West of this barrier, the summers are dry and temperate; the winters are wet and cool with an annual rainfall varying between 40 inches in the valleys to 100 inches or more on the mountain slopes. Comparatively little rainfall can surmount the U-stretched ridges, and the land to the east struggles on with from 6 to 15 inches of moisture, while the resulting temperature ranges are of great extremes.

NATURAL RESOURCES

Land, water, people * * * the basic wealth of a Nation.

TABLE 6.—*Employment in Pacific Northwest (four States)*

[1930 Census, vol. 1—Unemployment]

Industry group:	Percent gainful workers
Agriculture.....	23.8
Fishing.....	.5
Extraction of minerals.....	2.0
Manufacturing and mechanical industries, except forest products.....	15.1
Forest-product industries.....	10.3
Transportation.....	10.7
Trade.....	16.1
Public service.....	2.5
Professional.....	8.2
Domestic and personal.....	8.6
Industry not specified.....	2.2
Total.....	100.00

AGRICULTURE

Since the days of the pioneers agriculture has been the sustaining occupation of the Northwest. A diversity of specialized products is a tribute to the fertility of the soil and the benign climate. Here fruit, grain, and vegetables are grown in abundance. The vegetal cover of the Pacific Northwest varies in accordance with the precipitation and altitude of the region. The higher elevations, which receive the greater amount of rainfall are usually covered with luxuriant forests. In the valleys and plains to the east of the Cascade Range, the plant life approaches in character that of the arid and semi-arid land of the western United States. There is considerable dry farming, but it is through the application of irrigation that the greatest utilization of extremely fertile soils can be achieved. West of the Cascade Range there is usually need of supplemental irrigation during the dry summer months to sustain rich crops. The experience of 1938 demonstrated this need of additional water.

The American farm is no longer merely a producer of foodstuffs, but is rapidly becoming a source of raw materials for industry. For instance, the cultivation of flax, which is in its infancy in the Northwest, is eminently suited to the character of the soils and climate of the region. The processing of fruits and vegetables could be developed

into an important factor in the economy of the region. The utilization of dairy products for plastics and solvents could add considerably to the farm and manufacturing pay rolls.

LUMBER

It is interesting to note that the Pacific Northwest (Idaho, Montana, Oregon, and Washington) is dependent upon the forest industries to a greater extent than any other region of the country. For example, in 1929 more than 56 percent of all persons engaging in manufacturing were employed by forest industries. The pay rolls of the forest industries reported a similar percentage of the total manufacturing pay rolls. Thus, the cash income of most of the people of the Pacific Northwest has followed closely the rise and fall in the prosperity of the lumber industry. Slackening of building activity throughout the Nation has reflected in closed saw mills, cessation of logging operations, and a sharp and burdensome increase in relief needs.

Thus we see that lumber is the most important industry of the Northwest. Approximately 40 percent of the annual lumber cut of the United States comes from the Pacific Northwest. More than half of the remaining timber supply of the United States is in the forest lands of the Pacific Northwest. This region furnishes more than one-third of the Nation's lumber. The industries dependent on this resource sustain more than a quarter of the population. In Oregon and Washington, for example, lumber industries furnish directly and indirectly the livelihood of more than three-quarters of a million people.

The history of the lumber industry as it swept across the virgin forests of the Nation offers a grave warning to the people of the Pacific Northwest. Timber is a resource rapidly depleted; replacement is exceedingly slow. The denuded areas of the Middle West and South are examples of what must not happen in the Pacific Northwest. A diminished timber resource is reflected invariably in widespread unemployment and in the decline of the economy of the region; a territory stripped of its covering furnishes very slim prospects of livelihood for those workers remaining. The prevalence of soil erosion and floods are consequent upon the removal of the vegetal cover. The problem is especially serious when so large a proportion of the population is directly dependent on wood products and agriculture for its livelihood.

At the present rate of depletion, it is estimated that the more important stands of timber will be exhausted within one generation. A recent survey⁶ indicates that "* * * Within about 25 to 30 years certain important parts of the region's lumber industry will be devoided of raw materials unless the annual depletion is sharply reduced before that time has expired." An analysis of the growth of timber under planned management or a sustained yield basis shows that there will be a period of reduced productivity until the growing trees mature. The preservation of the capital value of the land is of primary importance to the Pacific Northwest. The perpetuation of a sustained yield policy for forestry will not only assure a permanent crop of timber, but will protect the region to a great extent against the loss of its top soil from floods and erosion. Large scale migration from an exhausted area to one of greater productivity presents serious

⁶ Forest Resources of the Pacific Northwest—Report of the Pacific Northwest Planning Commission, published by the National Resources Committee, March 1938.

problems to both regions and profoundly affects the social and economic welfare of the people involved in such uprooting.

Although better utilization and manufacturing methods will tend to somewhat alleviate the situation, new industrial and agricultural opportunities must absorb the large number of persons who will be displaced by the changing industrial pattern. Otherwise, the decline of the largest source of income of the Pacific Northwest will be reflected in a strained economy for the entire region. Diminished purchasing power and mounting relief rolls are unpleasant prospects to contemplate.

FISH

The clear depths of the Pacific Ocean and the cool streams of the basin have always abounded in fish so that the fishing industry is one of the oldest in the region. Salmon, halibut, crabs, and oysters are well-known products of the Pacific Northwest which have found worldwide markets.

METALS

Hidden below the surface of the fertile lands of the Pacific Northwest are untold riches of mineral ores. No detailed estimates have been made, but the preliminary exploration indicates that the territory possesses large quantities of valuable minerals. The metals of the future are buried in the Northwest and only await development, which is a matter of national concern. Iron, copper, chrome, lead, zinc, magnesium, manganese, and other materials await the coming of mills and smelters to be made available to the foundries and factories of the Nation. Mining and the processing of minerals long have been linked with the fortunes of the West, but the exploitation of this wealth is in the preliminary stage in the Pacific Northwest.

The contemplated expansion of our national defense will demand that these metals be utilized rather than depending on imported processed materials. Domestic ores should be processed within our own borders. The Pacific Northwest is plentifully endowed with deposits of "strategic minerals." In view of the national needs, a geological and economic survey to determine the exact extent and character of mineral deposits in this region would be warranted; such a survey should include metallurgical research, investigation of production costs, and markets. The needs are sufficient to be given consideration by the Congress.

In the field of metals technological strides are being made in the use of power for the reducing and processing of low-grade ores. Increasing demands for light metals and ferro-alloys will require expanded production to serve the needs of the country. The development of a few of these basic metal industries, such as iron and steel, would stimulate the establishment of industrial units for processing the products of these plants. Such orderly and needed growth would not only relieve prevalent seasonal unemployment but would provide for the permanent occupation of a large number of people.

WHITE COAL

Hydroelectric power is a coal mine that will never be dug out, an oil well that will never run dry.

The potential water power of the Nation is equivalent to 43 million horsepower or approximately the present capacity of all the generating

plants. The national growth of population and the further expansion of industry will enhance the value of this water power. Diminishing resources of competitive fuels will entail increased costs for extraction, production, and transportation. The abundant waters of the Pacific Northwest represent more than two-fifths of the entire Nation's hydro power, of which the Columbia River accounts for about one-third.

As the rivers of the Columbia drainage basin are controlled in the interest of navigation and irrigation, a vitally needed byproduct—hydroelectric power—is released to serve the mounting needs of the region. At Bonneville the initial step in the development of the Columbia River, authorized by Congress, points the way to the solution of many of the problems which face this great territory of the Northwest.

Generally, this white coal—power, cheap and abundant—can stimulate the growth of industries to meet the demands of the region itself. All basic requisites are at hand: Raw materials, labor of an exceptionally high standard, an abundance of water, and a temperate climate. Bonneville is the key unit in the development of a waterway unexcelled in the country, furnishing a ready outlet to the markets of the Nation and other parts of the world.

In addition to its broad general value in the household, power can be a major factor in three important fields—farm, irrigation, and industrial development. In the forest industries the utilization of lumber wastes for the production of cellulose and lignin products may stimulate new industrial developments and pay rolls. The local demands for rayon and plastic as well as other types of wood products may encourage enterprising manufacturers to establish local units for the production of such materials.

Not to be neglected in the roster of possible industrial development are those smaller factories for the manufacture of machinery, farm equipment, and household goods. The many benefits to be derived from such decentralized manufacturing and assembly plants located near adequate transportation facilities will be important factors in the future industrial life of the Pacific Northwest.

SUMMARY OF THE ECONOMY OF THE PACIFIC NORTHWEST

The economy of the region is based primarily upon three major resources, none of which is inexhaustible—agriculture, forestry, and mining. The resulting trade situation is shown in the following table:

TABLE 7.—*Trade balance of Pacific Northwest—1929—States (Idaho, Montana, Oregon, Washington)*

[From "The Balance of Trade of the Pacific Northwest"—Pacific Northwest Regional Planning Commission, July 1937]

Major industrial groups	Export (thou- sands of pounds)	Per- cent	Import (thou- sands of pounds)	Per- cent	Export (thou- sands of dollars)	Per- cent	Import (thou- sands of dollars)	Per- cent
Agricultural products.....	4,330	20.3	653	4.8	206,645	24.2	42,957	6.1
Animal and animal products.....	546	2.6	122	.9	146,562	17.2	31,174	4.4
Mine products.....	388	1.8	3,944	29.5	19,708	2.3	75,370	10.6
Forest products.....	15,066	70.8	883	6.6	348,532	40.8	10,313	1.5
Manufactures and miscella- neous.....	949	4.5	7,794	58.2	132,025	15.5	548,513	77.4
Total.....	21,279	100.0	13,396	100.0	853,472	100.0	708,327	100.0

Exports from the region are predominantly forest products, representing 71 percent of the total tonnage or 41 percent of the value. Manufactured and miscellaneous products are imported in great quantities, representing 58 percent of the total imported tonnage and 77 percent of the total value of imports. The consequent drain upon the region makes for an unbalanced and unstable economy. There is no "cushion" to absorb the shocks of price fluctuations and depressions, no diversity of production to insure the economic independence of the population. From the table it will be seen that the export of products, which in themselves are not a serious drain upon the natural resources of the region, amount only to approximately 7 percent of the export tonnage, and approximately 33 percent of the total value. This compares to almost 60 percent of the imports tonnage, and almost 82 percent of the import value.

As the resource base becomes exhausted it will be obviously more difficult for the region to pay for the products it now imports. The Pacific Northwest must place its economy on a stable basis; it must prepare for the continuing prosperity of its people by the establishment of permanent basic industries adapted to the region. The growth of those industries, at present a negligible portion of the total business, should be planned and encouraged to prevent economic decline in the near future.

The natural resources of the Nation belong to the people and can be properly appropriated and used only and solely for the benefit of all the people.

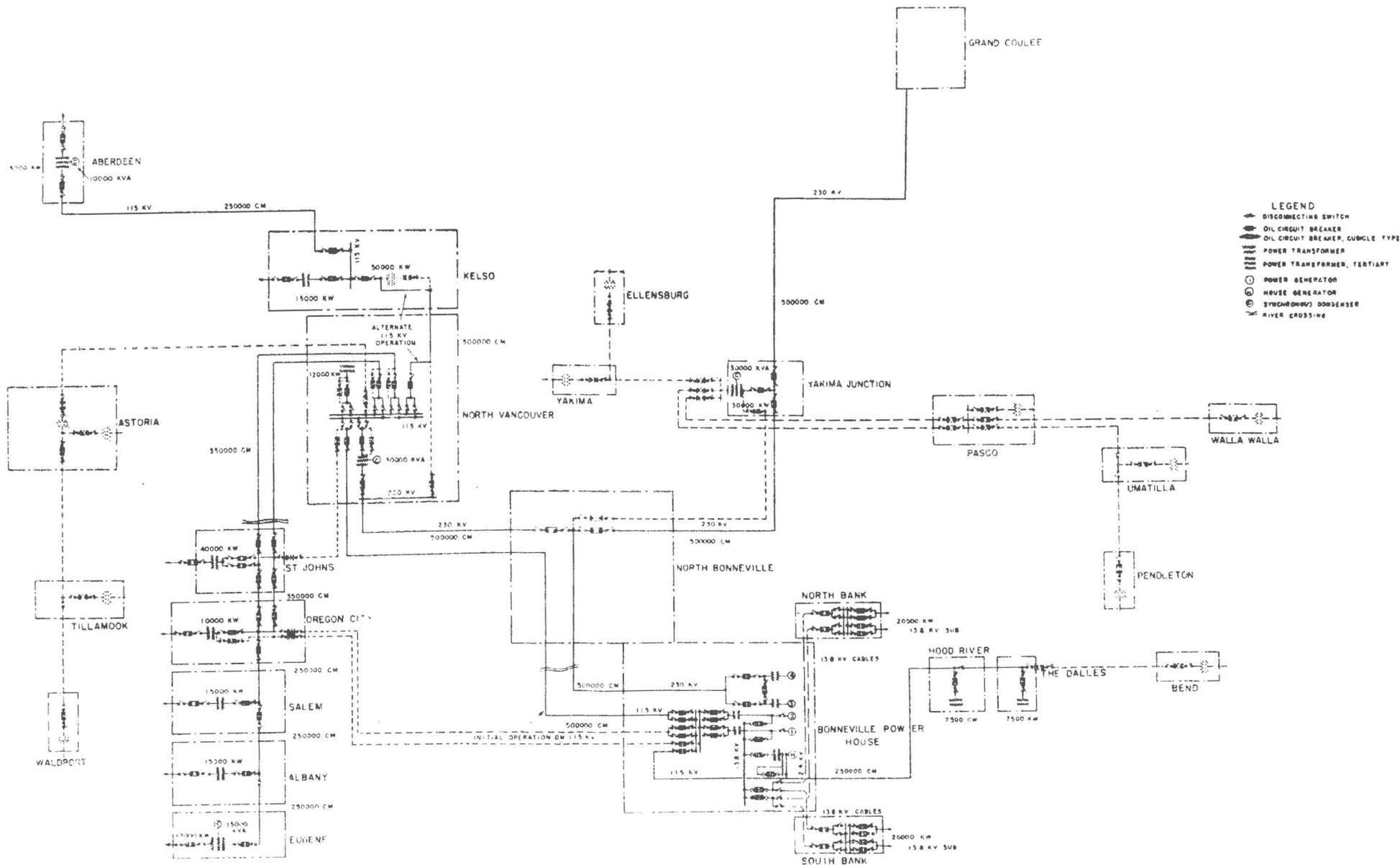
National progress is the growing participation of more and more people in more and more of the good things of life, which is normal, just, reasonable, and right.

In a sound democracy cognizance must be taken of the needs of the people which, from time to time, necessitates readjustments of ideas and expansion of efforts to cope with the complexities of our modern civilization.

As the Columbia River system is the only natural artery of transportation for the movement of products of the Northwest, the Federal Government is properly aiding the people of the entire region in inaugurating, designing, and executing plans for its ultimate development.

The proposed series of multiple-purpose dams will open a vast inland empire, rich in natural resources, to the people. As the waters of the Columbia River are brought into use for navigation and reclamation purposes, the Federal projects will harness the greatest potential source of hydroelectric energy in the Nation.

Soil, water, and power are the combination that will give to thousands of American families new opportunities for economic security.



UNITED STATES
DEPARTMENT OF
THE INTERIOR

THE BONNEVILLE PROJECT

SCHEMATIC DIAGRAM

J. D. ROSS
ADMINISTRATOR

APPENDIXES

APPENDIX A

(Public—No. 329—75th Congress)

(Chapter 720—1st Session)

(H. R. 7642)

AN ACT To authorize the completion, maintenance, and operation of Bonneville project for navigation, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That for the purpose of improving navigation on the Columbia River, and for other purposes incidental thereto, the dam, locks, power plant, and appurtenant works now under construction at Bonneville, Oregon, and North Bonneville, Washington (hereinafter called Bonneville project), shall be completed, maintained, and operated under the direction of the Secretary of War and the supervision of the Chief of Engineers, subject to the provisions of this Act relating to the powers and duties of the Bonneville power administrator provided for in section 2 (a) (hereinafter called the administrator) respecting the transmission and sale of electric energy generated at said project. The Secretary of War shall provide, construct, operate, maintain, and improve at Bonneville project such machinery, equipment, and facilities for the generation of electric energy as the administrator may deem necessary to develop such electric energy as rapidly as markets may be found therefor. The electric energy thus generated and not required for the operation of the dam and locks at such project and the navigation facilities employed in connection therewith shall be delivered to the administrator, for disposition as provided in this Act.

SEC. 2. (a) The electric energy generated in the operation of the said Bonneville project shall be disposed of by the said administrator as hereinafter provided. The administrator shall be appointed by the Secretary of the Interior; shall be responsible to said Secretary of the Interior; shall receive a salary at the rate of \$10,000 per year; and shall maintain his principal office at a place selected by him in the vicinity of the Bonneville project. The administrator shall, as hereinafter provided, make all arrangements for the sale and disposition of electric energy generated at Bonneville project not required for the operation of the dam and locks at such project and the navigation facilities employed in connection therewith. He shall act in consultation with an advisory board composed of a representative designated by the Secretary of War, a representative designated by the Secretary of the Interior, a representative designated by the Federal Power Commission, and a representative designated by the Secretary of Agriculture. The form of administration herein established for the Bonneville project is intended to be provisional pending the establishment of a permanent administration for Bonneville and other projects in the Columbia River Basin. The Secretary of War shall install and maintain additional machinery, equipment, and facilities for the generation of electric energy at the Bonneville project when, in the judgment of the administrator, such additional generating facilities are desirable to meet actual or potential market requirements for such electric energy. The Secretary of War shall schedule the operations of the several electrical generating units and appurtenant equipment of the Bonneville project in accordance with the requirements of the administrator. The Secretary of War shall provide and maintain for the use of the administrator at said Bonneville project adequate station space and equipment, including such switches, switchboards, instruments, and dispatching facilities as may be required by the administrator for proper reception, handling, and dispatching of the electric energy produced at the said project, together with transformers and other equipment required by the administrator for the transmission of such energy from that place at suitable voltage to the markets which the administrator desires to serve.

(b) In order to encourage the widest possible use of all electric energy that can be generated and marketed and to provide reasonable outlets therefor, and to prevent the monopolization thereof by limited groups, the administrator is authorized and directed to provide, construct, operate, maintain, and improve such electric transmission lines and substations, and facilities, and structures appurtenant thereto, as he finds necessary, desirable, or appropriate for the purpose of transmitting electric energy, available for sale, from the Bonneville project, to existing and potential markets, and, for the purpose of interchange of electric energy, to interconnect the Bonneville project with other Federal projects and publicly owned power systems now or hereafter constructed.

(c) The administrator is authorized, in the name of the United States, to acquire by purchase, lease, condemnation, or donation, such real and personal property, or any interest therein, including lands, easements, rights-of-way, franchises, electric transmission lines, substations, and facilities and structures appurtenant thereto, as the administrator finds necessary or appropriate to carry out the purposes of this Act. Title to all property and property rights acquired by the administrator shall be taken in the name of the United States.

(d) The administrator shall have power to acquire any property or property rights, including patent rights, which in his opinion are necessary to carry out the purposes of this Act, by the exercise of the right of eminent domain and to institute condemnation proceedings therefor in the same manner as is provided by law for the condemnation of real estate.

(e) The administrator is authorized, in the name of the United States, to sell, lease, or otherwise dispose of such personal property as in his judgment is not required for the purposes of this Act and such real property and interests in land acquired in connection with construction or operation of electric transmission lines or substations as in his judgment are not required for the purposes of this Act: *Provided, however,* That before the sale, lease, or disposition of real property or transmission lines, as herein provided, the administrator shall secure the approval of the President of the United States.

(f) Subject to the provisions of this Act, the administrator is authorized, in the name of the United States, to negotiate and enter into such contracts, agreements, and arrangements as he shall find necessary or appropriate to carry out the purposes of this Act.

SEC. 3. As employed in this Act, the term "public body," or "public bodies," means States, public power districts, counties, and municipalities, including agencies or subdivisions of any thereof.

As employed in this Act, the term "cooperative," or "cooperatives," means any form of non-profit-making organization or organizations of citizens supplying, or which may be created to supply, members with any kind of goods, commodities, or services, as nearly as possible at cost.

SEC. 4. (a) In order to insure that the facilities for the generation of electric energy at the Bonneville project shall be operated for the benefit of the general public, and particularly of domestic and rural consumers, the administrator shall at all times, in disposing of electric energy generated at said project, give preference and priority to public bodies and cooperatives.

(b) To preserve and protect the preferential rights and priorities of public bodies and cooperatives, as provided in section (a) and to effectuate the intent and purpose of this Act that at all times up to January 1, 1941, there shall be available for sale to public bodies and cooperatives not less than 50 per centum of the electric energy produced at the Bonneville project, it shall be the duty of the administrator in making contracts for the sale of such energy to so arrange such contracts as to make such 50 per centum of such energy available to said public bodies and cooperatives until January 1, 1941: *Provided,* That the electric energy so reserved for but not actually purchased by and delivered to such public bodies and cooperatives prior to January 1, 1941, may be disposed of temporarily so long as such temporary disposition will not interfere with the purchase by and delivery to such public bodies and cooperatives at any time prior to January 1, 1941: *Provided further,* That nothing herein contained shall be construed to limit or impair the preferential and priority rights of such public bodies or cooperatives after January 1, 1941; and in the event that after such date there shall be conflicting or competing applications for an allocation of electric energy between any public body or cooperative on the one hand and a private agency of any character on the other, the application of such public body or cooperative shall be granted.

(c) An application by any public body or cooperative for an allocation of electric energy shall not be denied, or another application competing or in conflict therewith be granted, to any private corporation, company, agency, or person, on the ground that any proposed bond or other security issue of any such public

body or cooperative, the sale of which is necessary to enable such prospective purchaser to enter into the public business of selling and distributing the electric energy proposed to be purchased, has not been authorized or marketed, until after a reasonable time, to be determined by the administrator, has been afforded such public body or cooperative to have such bond or other security issue authorized or marketed.

(d) It is declared to be the policy of the Congress, as expressed in this Act, to preserve the said preferential status of the public bodies and cooperatives herein referred to, and to give to the people of the States within economic transmission distance of the Bonneville project reasonable opportunity and time to hold any election or elections or take any action necessary to create such public bodies and cooperatives as the laws of such States authorize and permit, and to afford such public bodies or cooperatives reasonable time and opportunity to take any action necessary to authorize the issuance of bonds or to arrange other financing necessary to construct or acquire necessary and desirable electric distribution facilities, and in all other respects legally to become qualified purchasers and distributors of electric energy available under this Act.

SEC. 5. (a) Subject to the provisions of this Act and to such rate schedules as the Federal Power Commission may approve, as hereinafter provided, the administrator shall negotiate and enter into contracts for the sale at wholesale of electric energy, either for resale or direct consumption, to public bodies and cooperatives and to private agencies and persons. Contracts for the sale of electric energy to any private person or agency, other than a privately owned public utility engaged in selling electric energy to the general public, shall contain a provision forbidding such private purchaser to resell any of such electric energy so purchased to any private utility or agency engaged in the sale of electric energy to the general public, and requiring the immediate canceling of such contract of sale in the event of violation of such provision. Contracts entered into under this subsection shall be binding in accordance with the terms thereof and shall be effective for such period or periods, including renewals or extensions, as may be provided therein, not exceeding in the aggregate twenty years from the respective dates of the making of such contracts. Contracts entered into under this subsection shall contain (1) such provisions as the administrator and purchaser agree upon for the equitable adjustment of rates at appropriate intervals, not less frequently than once in every five years, and (2) in the case of a contract with any purchaser engaged in the business of selling electric energy to the general public, the contract shall provide that the administrator may cancel such contract upon five years' notice in writing if in the judgment of the administrator any part of the electric energy purchased under such contract is likely to be needed to satisfy the requirements of the said public bodies or cooperatives referred to in this Act, and that such cancellation may be with respect to all or any part of the electric energy so purchased under said contract to the end that the preferential rights and priorities accorded public bodies and cooperatives under this Act shall at all times be preserved. Contracts entered into with any utility engaged in the sale of electric energy to the general public shall contain such terms and conditions, including among other things stipulations concerning resale and resale rates by any such utility, as the administrator may deem necessary, desirable, or appropriate to effectuate the purposes of this Act and to insure that resale by such utility to the ultimate consumer shall be at rates which are reasonable and non-discriminatory. Such contract shall also require such utility to keep on file in the office of the administrator a schedule of all its rates and charges to the public for electric energy and such alterations and changes therein as may be put into effect by such utility.

(b) The administrator is authorized to enter into contracts with public or private power systems for the mutual exchange of unused excess power upon suitable exchange terms for the purpose of economical operation or of providing emergency or break-down relief.

SEC. 6. Schedule of rates and charges for electric energy produced at the Bonneville project and sold to purchasers as in this Act provided shall be prepared by the administrator and become effective upon confirmation and approval thereof by the Federal Power Commission. Subject to confirmation and approval by the Federal Power Commission such rate schedules may be modified from time to time by the administrator, and shall be fixed and established with a view to encouraging the widest possible diversified use of electric energy. The said rate schedules may provide for uniform rates or rates uniform throughout prescribed transmission areas in order to extend the benefits of an integrated transmission system and encourage the equitable distribution of the electric energy developed at the Bonneville project.

SEC. 7. It is the intent of Congress that rate schedules for the sale of electric energy which is or may be generated at the Bonneville project in excess of the amount required for operating the dam, locks, and appurtenant works at said project shall be determined with due regard to and predicated upon the fact that such electric energy is developed from water power created as an incident to the construction of the dam in the Columbia River at the Bonneville project for the purposes set forth in section 1 of this Act. Rate schedules shall be drawn having regard to the recovery (upon the basis of the application of such rate schedules to the capacity of the electric facilities of Bonneville project) of the cost of producing and transmitting such electric energy, including the amortization of the capital investment over a reasonable period of years. Rate schedules shall be based upon an allocation of costs made by the Federal Power Commission. In computing the cost of electric energy developed from water power created as an incident to, and a byproduct of, the construction of the Bonneville project, the Federal Power Commission may allocate to the costs of electric facilities such a share of the cost of facilities having joint value for the production of electric energy and other purposes as the power development may fairly bear as compared with such other purposes.

SEC. 8. Notwithstanding any other provision of law, all purchases and contracts made by the administrator or the Secretary of War for supplies or for services except for personal services, shall be made after advertising, in such manner and at such times, sufficiently in advance of opening bids, as the administrator or Secretary of War, as the case may be, shall determine to be adequate to insure notice and opportunity for competition. Such advertisement shall not be required, however, when (1) an emergency requires immediate delivery of the supplies or performance of the services; or (2) repair parts, accessories, supplemental equipment, or services are required for supplies or services previously furnished or contracted for; or (3) the aggregate amount involved in any purchase of supplies or procurement of services does not exceed \$500; in which cases such purchases of supplies or procurement of services may be made in the open market in the manner common among businessmen. In comparing bids and in making awards the administrator or the Secretary of War, as the case may be, may consider such factors as relative quality and adaptability of supplies or services, the bidder's financial responsibility, skill, experience, record of integrity in dealing, and ability to furnish repairs and maintenance services, the time of delivery or performance offered, and whether the bidder has complied with the specifications.

SEC. 9. (a) The administrator, subject to the requirements of the Federal Water Power Act, shall keep complete and accurate accounts of operations, including all funds expended and received in connection with transmission and sale of electric energy generated at the Bonneville project.

(b) The administrator may make such expenditures for offices, vehicles, furnishings, equipment, supplies, and books; for attendance at meetings; and for such other facilities and services as he may find necessary for the proper administration of this Act.

(c) In December of each year the administrator shall file with the Congress, through the Secretary of the Interior, a financial statement and a complete report as to the transmission and sale of electric energy generated at the Bonneville project during the preceding governmental fiscal year.

SEC. 10. The administrator, the Secretary of War, and the Federal Power Commission, respectively, shall appoint such attorneys, engineers, and other experts as may be necessary for carrying out the functions entrusted to them under this Act, without regard to the provisions of the civil-service laws, and shall fix the compensation of each of such attorneys, engineers, and other experts at not to exceed \$7,500 per annum; and they may, subject to the civil-service laws, appoint such other officers and employees as may be necessary to carry out such functions and fix their salaries in accordance with the Classification Act of 1923 as amended.

SEC. 11. All receipts from transmission and sale of electric energy generated at the Bonneville project shall be covered into the Treasury of the United States to the credit of miscellaneous receipts, save and except that the Treasury shall set up and maintain from such receipts a continuing fund of \$500,000, to the credit of the administrator and subject to check by him, to defray emergency expenses and to insure continuous operation. There is hereby authorized to be appropriated from time to time, out of moneys in the Treasury not otherwise appropriated, such sums as may be necessary to carry out the provisions of this Act, including installation of equipment and machinery for the generation of electric energy and facilities for its transmission and sale.

SEC. 12. The administrator may, in the name of the United States, under the supervision of the Attorney General, bring such suits at law or in equity as in his judgment may be necessary to carry out the purposes of this Act; and he shall be represented in the prosecution and defense of all litigation affecting the status or operation of Bonneville project by the United States attorneys for the districts, respectively, in which such litigation may arise, or by such attorney or attorneys as the Attorney General may designate as authorized by law, in conjunction with the regularly employed attorneys of the administrator.

SEC. 13. If any provision of this Act or the application of such provision to any person or circumstance shall be held invalid, the remainder of the Act and the application of such provision to persons or circumstances other than those as to which it is held invalid shall not be affected thereby.

Approved, August 20, 1937.

APPENDIX B—ALLOCATION

Commissioners:
 Clyde L. Seavey, Acting Chairman
 Claude L. Draper
 Basil Manly
 John W. Scott

BONNEVILLE PROJECT

UNITED STATES OF AMERICA,
 FEDERAL POWER COMMISSION,
February 8, 1938.

In re Bonneville Project, Columbia River, Oregon-Washington.

ALLOCATION OF COSTS TO INITIAL POWER DEVELOPMENT

It appearing to the Commission that:

(1) The Bonneville project on the Columbia River, Oregon-Washington, including the dam, ship lock, power plant, and appurtenant works, for the purpose of improving navigation on said river and for other purposes incidental thereto, is now substantially completed; and said power plant, hereinafter called the initial power development, will be ready for commercial operation on or about June 30, 1938, and will produce surplus electric energy as a byproduct of said navigation improvement, which will give the Federal Government opportunities to promote the public welfare by increasing the benefits derived from works for navigation through provision of a dependable supply of electric energy to potential consumers;

(2) The said initial power development will have installed electric generating capacity of 86,400 kilowatts, in two units of 43,200 kilowatts each, this initial installation being approximately one-fifth of the probable ultimate installation; the additional generating capacity will be provided by stages, as Congress may direct, probably in increments of about 104,000 kilowatts, or two units having capacity of about 52,000 kilowatts each, as required reasonably to supply the market demands for power; and the power installation for the ultimate development has not as yet been determined with exactness, but is expected to be not less than 500,000 kilowatts in not less than ten generating units;

(3) In view of the provisions of Section 7 of an Act of Congress approved August 20, 1937 (Public, No. 329, 75th Congress), particularly the requirement thereof that rate schedules for the sale of Bonneville power "shall be based upon an allocation of costs made by the Federal Power Commission," it is desirable that such allocation of costs to power development be determined well in advance of the time when said initial power development will be completed and ready for operation, in order that the Administrator of the Bonneville project may have this essential information for use in preparing rate schedules;

(4) The actual cost incurred by the United States to and including October 31, 1937, for the construction of said Bonneville project was \$44,130,859.93, exclusive of interest during the construction period; and on the basis of said actual cost and of estimates of costs necessary to complete said project, including said initial power development with installed capacity of 86,400 kilowatts, the aggregate cost of said project, exclusive of interest during the construction period, when said initial power development is completed on or about June 30, 1938, will be approximately \$51,892,000;

(5) The cost to the United States for the use of money during the 50-month period from November 1, 1933, to December 31, 1937, representing the principal period of construction, was 1.54271 per centum, this being the weighted average rate of interest paid on all money borrowed by the United States during said 50-month period, including both long-term and short-term financing;

(6) Including interest at 1.54271 per centum during the construction period, the cost of Bonneville project facilities to June 30, 1938, will be approximately as follows: Facilities solely for navigation purposes, \$5,517,600; Facilities solely for power purposes, \$9,180,500; Facilities having joint value for the purposes of navigation and power development, including fishways which are a joint responsibility, \$38,490,700. The estimated total cost of all Bonneville project facilities, to June 30, 1938, including interest during construction, being \$53,188,800;

(7) As nearly as may be estimated at this time, the cost of the ultimate power development with ten generating units, having aggregate capacity of 504,000 kilowatts, together with the cost of all at-site appurtenant facilities for power use only, will be approximately \$29,448,000; and likewise the ultimate cost of facilities having joint value, including fishways, will be approximately \$39,179,000; and no additional capital costs for facilities solely for navigation purposes are contemplated;

(8) The form of administration for the Bonneville project is declared by Congress in Section 2 of the aforesaid Act, approved August 20, 1937, to be provisional pending the establishment of a permanent administration for Bonneville and other projects in the Columbia River Basin;

(9) It is impossible to determine at this time the cost of the remaining eight generating units, representing about 80 percent of the probable ultimate installation.

The Commission, having duly considered the physical aspects of said project, the matters hereinabove recited, and other pertinent data relating to said Bonneville project, together with all of the provisions and requirements of the aforesaid Act of August 20, 1937, hereby *determines*:

(a) That ultimately power development may fairly bear 32.5 percent of the cost of facilities having joint value for the production of electric energy and other purposes, this percentage being subject to revision and readjustment by the Commission from time to time, on the basis of facts and circumstances obtaining at any time;

(b) That the entire cost of the initial power development facilities, solely for power use, in the amount of \$9,180,500, shall be allocated to the initial power development; and that in addition thereto \$2,501,900 of the estimated cost to June 30, 1938, of facilities having joint value, including fishways, shall be allocated to the initial power development, the said \$2,501,900 being one-fifth of 32.5 percent of the aforesaid \$38,490,700; and,

(c) That, therefore, of the total estimated Bonneville project cost of \$53,188,800 to June 30, 1938, the sum of \$11,682,400 shall be and is hereby allocated to the said initial power development.

By the Commission.

LEON M. FUQUAY, *Secretary*.

APPENDIX C

Commissioners:

Clyde L. Seavey, Acting Chairman
 Claude L. Draper
 Basil Manly
 John W. Scott

UNITED STATES OF AMERICA,
 FEDERAL POWER COMMISSION,
 June 8, 1938.

In re Bonneville Project, Columbia River, Oregon-Washington. Docket No. IT-5519

ORDER CONFIRMING AND APPROVING RATE SCHEDULES

The Administrator of the Bonneville Project, having prepared certain schedules of rates and charges, and general terms and conditions and definitions pertaining thereto (hereinafter collectively referred to as "Rate Schedules"), with respect to the sale of electric energy produced at said Project as provided in the Act of Congress approved August 20, 1937, Public, No. 329, 75th Congress (hereinafter

referred to as the "Bonneville Act"), and having submitted said Rate Schedules for confirmation and approval by the Commission;

It appearing to the Commission that:

(a) Section 7 of the Bonneville Act provides in part as follows: "Rate schedules shall be drawn having regard to the recovery (upon the basis of the application of such rate schedules to the capacity of the electric facilities of Bonneville project) of the cost of producing and transmitting such electric energy, including the amortization of the capital investment over a reasonable period of years. Rate schedules shall be based upon an allocation of costs made by the Federal Power Commission;"

(b) By its order adopted February 8, 1938, the Commission made an allocation of costs to the initial power development of the Bonneville Project;

(c) The Rate Schedules designated as Wholesale Power Rate Schedules A-1 and B-1 relate to prime power and secondary power, respectively, at the Bonneville Project Power Plant, hereinafter referred to as "At Site" power, and the Rate Schedules designated as Wholesale Power Rate Schedules C-1 and D-1 relate to prime power and secondary power, respectively, to be delivered from the proposed transmission system of the Bonneville Project;

(d) The aggregate contract demands for "At Site" power are limited to 20 per cent of the installed generating capacity of the Bonneville Project Power Plant;

(e) Said Rate Schedules do not cover all possible types of power or conditions of service that will be available from the Bonneville Project but do cover certain essential classes of power and customers;

(f) At various times between the 10th and 18th days of March 1938 public rate hearings were held at Boise, Idaho; Salem, Pendleton, and Portland, Oregon; and at Olympia, Spokane, Walla Walla, and Yakima, Washington.

The Commission, having considered said Rate Schedules, and having due regard to the fact that electric energy produced at the Bonneville Project is developed from water power created as and incident to the construction of the dam in the Columbia River for the purposes set forth in Section 1 of the Bonneville Act, and based on present available information and data pertinent thereto, *finds* that:

(1) The benefits of an integrated transmission system, and the equitable distribution and the widest possible diversified use of the electric energy developed at the Bonneville Project Power Plant will be attained by the establishment of (a) rates at the site of the Bonneville Project Power Plant, and (b) uniform rates over the transmission system within economical transmission distance of the Bonneville Project;

(2) The Rate Schedules can reasonably be expected to yield sufficient revenues to recover (upon the basis of the application of such rate schedules to the capacity of the electric facilities of the Bonneville Project) the allocated cost of producing and the cost of transmitting electric energy produced at the Bonneville Project, including the amortization of the allocated capital investment over a reasonable period of years.

Now, therefore, the Commission *orders* that:

(A) The Rate Schedules, designated as Wholesale Power Rate Schedules A-1, B-1, C-1, and D-1, and the General Terms and Conditions and Definitions pertaining thereto, all being attached hereto and made a part hereof, be and the same are hereby confirmed and approved;

(B) Said Rate Schedules may be modified from time to time by the Administrator, subject to confirmation and approval by the Federal Power Commission.

By the Commission.

LEON M. FUQUAY, *Secretary*.

UNITED STATES OF AMERICA

DEPARTMENT OF THE INTERIOR—THE BONNEVILLE PROJECT

J. D. ROSS, ADMINISTRATOR

Portland, Oregon

SCHEDULES OF RATES AND CHARGES

GENERAL TERMS AND CONDITIONS

Purchase of power under all rate schedules and contracts shall be subject to the following general terms and conditions:

Conservation of natural resources.—Power from the Bonneville Project Power Plant shall be available only to those purchasers the waste products from whose

plants or operations shall not be harmful to, or destructive of, the fish or other aquatic life of the Columbia River; nor otherwise pollute the stream; nor detract from the scenic beauties of the Columbia River Gorge.

Measurement of demand, energy, and power factor.—Demand and energy measurements shall be made by suitable instruments at the point, or points, of delivery; or may, at the option of the Administrator, be made at some other point, or points, where housing facilities are available or may be made available, or operation simplified: *Provided, however,* That in the event the metering is effected at some other location than at the point of delivery, suitable correction shall be made by the Administrator, of the amounts determined at such location, so that the adjusted amounts will, so far as possible, reflect the exact quantities delivered at the actual point, or points, of delivery.

The Administrator shall, without charge to the purchaser, install and maintain the necessary meters for measuring the maximum demand, and the amount of energy furnished to purchaser: *Provided, however,* That should these meters fail, or be found inaccurate, the maximum demand, and the amount of energy delivered, will be estimated by the Administrator from the best information available. The Administrator may also measure power factor. The purchaser shall permit the use of his housing and other facilities for Administrator's metering equipment.

Whenever a purchaser contracts for Secondary power in addition to Prime power, computation of his billing demands under the two classes of service shall be made as follows: When the sum of the purchaser's billing demands exceeds the sum of his contract demands, the excess of his billing demands above his contract demands shall be billed as Prime power or Secondary power, in the ratio that each contract demand bears to the sum of the contract demands: *Provided, however,* That the amount billed as Prime power shall, in no case, be less than the highest billing demand established for Prime power during the preceding eleven months; nor, in the case of curtailed Secondary power deliveries, shall the amount billed as Prime power be less than the difference between the total of the Prime and Secondary demands, and the curtailed Secondary power demand as prorated to the purchaser by the Administrator.

At-Site Power.—The aggregate contract demands for "At-Site" power, Prime and Secondary, shall not exceed 20 percent of the installed generating capacity of the plant.

Meter tests.—The Administrator shall, not less frequently than once a year, make periodical tests and inspections of metering equipment installed by him, in order to maintain a high standard of accuracy. At the request of purchaser, the Administrator may make additional tests or inspection of such equipment in the presence of representatives of purchaser. If such additional tests show that the metering equipment does not register or indicate within 2 percent of the correct reading, the metering equipment shall be corrected, and an adjustment will be made in purchaser's bill over a period of not more than 30 days prior to date of such test unless the period of faulty registration can be definitely established. Such tests shall be made without charge to the purchaser.

Inspections.—The Administrator shall have the right, but shall not be obligated, to inspect purchaser's installation at any time, and reserves the right to reject any wiring or equipment not in accordance with the Administrator's reasonable standards; but such inspection, or failure to inspect, or to reject, shall not render the Administrator, his agents, or employees, liable or responsible for any loss, damage, or accident resulting from defects in the installation of any electrical equipment, or from violation of the contract of which these terms and conditions are a part.

Purchaser's responsibility for property installed by the administrator.—All meters, services, and other equipment furnished by the administrator shall be and remain the property of the United States, and the right to remove, replace, or repair all such equipment is expressly reserved. The purchaser shall exercise proper care to protect the property of the United States on purchaser's premises, and in the event of loss or damage to property of the United States, arising from neglect of purchaser, the cost of necessary repairs or replacement shall be paid by purchaser.

Right of access.—Administrator's identified employees shall have access to purchaser's premises at all reasonable times for the purpose of reading meters, and for testing, repairing, renewing, exchanging, or removing any or all equipment installed by the Administrator.

Additional loads.—No change shall be made in purchaser's installation that may cause his demand to exceed his contract demand by 10 percent except after notice to and written permission from the Administrator. Additions to, or material changes in the characteristics of load, made without permission from the

Administrator, shall render purchaser liable for any damage caused by the additional or changed installation, and to cancellation of the contract.

Purchaser's lines and equipment.—All lines and substations from point of delivery (as defined in the contract of which these terms and conditions are a part), and all electrical equipment, except the metering equipment installed by the Administrator, located on purchaser's side of such point of delivery, shall be furnished, installed, and maintained by purchaser.

Purchaser's lines and equipment—Standards.—All lines and equipment of purchaser must conform to accepted modern practice, as exemplified by the requirements of the National Electrical Safety Code, and the National Electric Code, and to such State and local regulations as may apply.

Billing.—Bills will be rendered monthly and shall be due and payable at the office of the Administrator within fifteen days from the date of the bill. Failure to receive bill shall not release purchaser from payment obligation. If payment is not made on or before the close of business on the date due a penalty of two percent (2%) of the bill rendered will be added for failure to pay within the fifteen days. Should bills not be paid within the fifteen days, the Administrator may, at any time thereafter, and after giving the purchaser ten days advance notice in writing, discontinue service.

Should the final date for payment of the bill fall on a Sunday or holiday, the business day next following the final date will be held as a day of grace for delivery of payment. Remittances received by mail after expiration of the time limit for payment, will be accepted by Administrator as made in time if the incoming envelope bears United States Post Office date stamp of the final date for payment, or any date prior thereto.

Discontinuance of supply under this section shall not relieve the purchaser of his liability for the agreed minimum monthly payment during the time the supply of energy is so discontinued.

Interruption of Service.—Administrator will furnish energy as agreed upon continuously so far as reasonable diligence will permit; but neither the United States, the Administrator, nor his duly authorized employees shall be liable for damages when, for any reason, suspensions of the operation of the generation and transmission system serving purchaser, or any part thereof, shall interfere with the delivery of electric energy to purchaser; nor shall such an interruption constitute a breach of contract on the part of the Administrator. Administrator will, whenever possible, give reasonable notice of any predetermined interruption to purchaser's service; and, in event of curtailment of power, shall give preference to purchasers of Prime power for resale.

Voltage fluctuations caused by purchaser.—Electric service must not be used in such a manner as to cause unusual fluctuations or disturbances to the system of the Bonneville Project. Administrator may require purchaser at his own expense to install suitable apparatus to reasonably limit such fluctuation.

Balancing of loads.—Purchaser shall at all times take and use energy in such manner that the load will be balanced between phases as nearly as practicable to within 10 percent. In the event of unbalanced polyphase loads, Administrator reserves the right to require purchaser at his own expense to make the necessary changes to correct this condition, or to compute the kilowatt demand on the assumption that the load on each phase is equal to the greatest load on any phase.

Notice of trouble.—Purchaser shall notify the Administrator immediately should the service be unsatisfactory for any reason; or should there be any defects, trouble, or accidents affecting the supply of electricity. Such notices, if verbal, should be confirmed in writing.

Single point delivery.—Unless otherwise specifically provided in the contract, if service is rendered from more than one substation, or through more than one transformation at the same substation, Administrator will bill purchaser for power at each substation or additional transformation separately.

CONTRACTS

(1) Contracts for the sale of electric energy to any private person or agency other than a privately owned public utility engaged in selling electric energy to the general public, shall contain a provision forbidding such private purchaser to resell any of such electric energy so purchased to any private utility or agency engaged in the sale of electric energy to the general public, and requiring the immediate cancelling of such contract of sale in the event of violation of such provision.

(2) Contracts shall be binding in accordance with the terms thereof and shall be effective for such period or periods, including renewals or extensions, as may be provided by the rate schedule under which service is rendered, but not exceeding in the aggregate twenty years from the dates of the making of such contracts.

(3) Contracts shall contain such provisions as the Administrator and purchaser agree upon for the equitable adjustment of rates at appropriate intervals, not less frequently than once in every five years. Such adjustments of rates shall be subject to the approval of the Federal Power Commission.

(4) Contracts with purchasers engaged in selling electric energy to the general public shall provide that the Administrator may cancel such contract upon five years' notice in writing if in the judgment of the Administrator any part of the electric energy purchased under such contract is likely to be needed to satisfy the requirements of public bodies or cooperatives, and that such cancellation may be with respect to all or any part of the electric energy so purchased under the contract.

(5) Contracts with any utility engaged in the sale of electric energy to the general public shall contain such terms and conditions, including among other things, stipulations concerning resale and resale rates by any such utility, as the Administrator may deem necessary, desirable, or appropriate to insure that resale by such utility to the ultimate consumer shall be at rates which are reasonable and nondiscriminatory. Such contract shall also require such utility to keep on file in the office of the Administrator a schedule of all its rates and charges to the public for electric energy and such alterations and changes therein as may be put into effect by such utility.

Federal Power Commission.—Schedules of rates and charges for electric energy produced at the Bonneville Project and sold to purchasers shall become effective only after confirmation and approval of the Federal Power Commission. Subject to confirmation and approval of the Federal Power Commission such rate schedules may be modified from time to time by the Administrator.

DEFINITIONS

The terms appearing in the Schedules of Rates and Charges and in the General Terms and Conditions shall have the following meanings:

Administrator.—Means the Bonneville Project Administrator.

"At Site."—Refers to the Bonneville Project Power House, or points adjacent thereto.

Billing Demand.—Purchaser's maximum or contract demand used for computing power bill.

Bonneville Project.—Means dam, locks, power plant, and appurtenant works at Bonneville, Oregon, and North Bonneville, Washington; and such other facilities as may be constructed, leased, or acquired in accordance with the Bonneville Act.

Contract Demand.—The kilowatts of demand specified in the purchaser's contract for power, to establish the amount of power that will be sold the customer under the particular agreement.

Cooperative and Cooperatives.—Any form of non-profit-making organization or organizations, of citizens supplying or which may be created to supply, members with any kind of goods, commodities, or services, as nearly as possible at cost.

Dollars per year per kilowatt.—The amount of money charged annually for each kilowatt of contract demand, or maximum billing demand.

Electric energy.—(See Energy.)

Energy.—Electric energy, measured in kilowatt-hours.

Kilowatt.—The rate of power generation, or delivery, equal to approximately 1.341 horsepower (44,253 foot-pounds per minute).

Kilowatt-hour.—The amount of energy generated or delivered in one hour, when delivery is at a constant rate of one kilowatt.

Load.—Power requirements of a purchaser, or purchasers, supplied by the Bonneville Project.

Point of Delivery.—Unless otherwise specifically defined in the power schedules or contracts with the purchaser, means at the point of connection of the purchaser's lines with the switch on the feeder through which the purchaser receives power delivery.

Power.—When used in text refers to either kilowatts of demand, or kilowatt-hours of energy, or both; when reference is made to definite amounts of energy, or to a rate of power generation or power delivery, it is expressed in kilowatt-hours, or kilowatts, as required.

Power Factor.—Defined as the ratio of the kilowatts to the kilovolt-amperes supplied to a system determined at the time of the purchaser's maximum monthly demand.

Prime Power.—Prime Power, as referred to herein, is defined as the kilowatt output capacity that is estimated to be available at the Bonneville Project Power Plant (based on stream-flow records, 1879 to 1934) 99.5 percent of the time; viz, whenever the flow in the Columbia River at the Bonneville Project Power Plant site is less than 800,000 c. f. s. and greater than 35,000 c. f. s. (the minimum unregulated flow of record).

Private Purchasers.—Persons, firms, or corporations, other than privately owned utilities, public bodies, or cooperatives, requiring power for use in their own plants and operations.

Public Body or Public Bodies.—Means States, public power districts, counties, and municipalities, including agencies or subdivisions of any thereof.

Secondary Power.—All power that can be produced at the Bonneville Project Power Plant in excess of that defined as "Prime." Secondary power is not continuously available. When it is produced, but in less than the aggregate contract demands, the Administrator may curtail deliveries to purchasers.

Year.—Twelve consecutive calendar months.

UNITED STATES OF AMERICA

DEPARTMENT OF THE INTERIOR—BONNEVILLE PROJECT

J. D. ROSS, ADMINISTRATOR

Portland, Oregon

WHOLESALE POWER RATE SCHEDULE A-1

("At Site" Prime Power)

Availability.—This rate schedule covers Prime Power delivered at the bus bars of the Bonneville Project Power Plant, or at such point or points adjacent thereto, as may be designated by the Administrator.

Power under this rate schedule shall be available to private purchasers for their own use, but not for resale; and to public bodies, cooperatives, and privately-owned electric utilities at 13,800 volts (nominal), for distribution within fifteen miles of the Bonneville Project Power Plant.

Rate.—Fourteen and One-Half Dollars (\$14.50) net per year, per kilowatt of contract demand or maximum billing demand, whichever is higher.

Determination of demand.—The demand shall be determined by suitable indicating and recording instruments installed at such locations as may be designated by the Administrator. The demand for any month shall be defined as the highest integrated load during any thirty-minute (30 minute) period occurring in the calendar month for which the determination is made.

Maximum billing demand.—Purchaser shall maintain as nearly 100 percent (100%) power factor as practicable. Whenever the purchaser's power factor at the time of maximum monthly demand is less than eighty-five percent (85%), the demand for billing purposes shall be determined by taking eighty-five percent (85%) of the kilovolt-amperes indicated at the time of the maximum monthly demand. In no case shall the billing demand for any month be less than the contract demand, nor less than the highest billing demand that has occurred during the preceding eleven months.

Contract demand.—Each contract under this schedule shall specify the amount of capacity in kilowatts to be made available to the purchaser each year of the contract term. This capacity in kilowatts shall be termed the contract demand. The purchaser may not exceed the contract demand by more than 10 percent, without the written consent of the Administrator.

Minimum charge.—The minimum charge for service under this schedule shall be the contract demand at \$14.50 net per kilowatt per year.

Point of delivery.—The purchaser shall accept delivery of power at approximately 13,800 volts at the transmission-line side of the circuit breakers connecting the purchaser's cables to the generator bus at the Bonneville Project Power Plant, or at such substation adjacent thereto, located on either the north bank or the south bank of the Columbia River, as may be designated by the Administrator.

The purchaser shall accept delivery as provided above; and shall install, at his own expense, such necessary switches, cables, transmission lines, lightning arresters, and other equipment, as may be designated by the Administrator. If, however, facilities are provided by the Administrator for the delivery of power at a point removed from those specified above, the purchaser shall pay the capital or annual cost of such facilities.

Character of service.—Delivery of power hereunder shall be at approximately 13,800 volts, three phase, and sixty cycles.

Payment.—Bills shall be rendered monthly, on the basis of one-twelfth of the annual rate, and shall be due and payable at the office of the Administrator within fifteen days from the date of the bill.

The above rate is net. If payment is not received on or before the close of business on the date due a penalty of two percent (2%) of the bill rendered will be added for failure to pay within the fifteen days. Should bills not be paid within the fifteen days, the Administrator may, at any time thereafter, and after giving the purchaser ten days advance notice in writing, discontinue service.

Contract and term.—Service under this schedule shall, in each case, be covered by a contract entered into with each purchaser by the Administrator.

Contracts shall be for a period of not less than five years, nor more than twenty years in the aggregate, including renewals or extensions provided for therein, from date of making.

Adjustment of rates.—Contracts shall contain such provisions as the Administrator and purchaser agree upon for the equitable adjustment of rates at appropriate intervals, not less frequently than once in every five years. Such adjustments of rates shall be subject to the approval of the Federal Power Commission.

Rules and regulations.—Purchase of power under the rate schedule shall be subject to the rules and regulations prescribed by the Administrator, contained in the General Terms and Conditions, which by reference are made a part of the schedule and to all the provisions of the Bonneville Act.

J. D. Ross,
Administrator, the Bonneville Project.

Confirmed and Approved by the Federal Power Commission, June 8, 1938.

LEON M. FUQUAY, *Secretary.*

UNITED STATES OF AMERICA

DEPARTMENT OF THE INTERIOR—BONNEVILLE PROJECT

J. D. ROSS, ADMINISTRATOR

Portland, Oregon

WHOLESALE POWER RATE SCHEDULE B-1

("At Site" Secondary Power)

Availability.—This rate schedule covers Secondary Power delivered at the bus bars of the Bonneville Project Power Plant, or at such point or points adjacent thereto, as may be designated by the Administrator.

Power under this rate schedule shall be available to private purchasers for their own use, but not for resale; and to public bodies, cooperatives, and privately-owned electric utilities at 13,800 volts (nominal), for distribution within fifteen miles of the Bonneville Project Power Plant. However, service under this schedule shall be available only to purchasers having contracts with the United States for prime power.

Rate.—Nine and One-Half Dollars (\$9.50) net per year, per kilowatt of contract or maximum billing demand, whichever is higher.

Determination of demand.—The demand shall be determined by suitable indicating and recording instruments installed at such locations as may be designated by the Administrator. The demand for any month shall be defined as the highest integrated load during any thirty-minute (30 minute) period occurring in the calendar month for which the determination is made.

Maximum billing demand.—Purchaser shall maintain as nearly 100 percent (100%) power factor as practicable. Whenever the purchaser's power factor at the time of maximum monthly demand is less than eighty-five percent (85%), the demand for billing purposes shall be determined by taking eighty-five percent (85%) of the kilovolt-amperes indicated at the time of the maximum monthly demand. In no case shall the billing demand for any month be less than the contract demand, nor less than the highest billing demand that has occurred during the preceding eleven months.

Limitation of demand.—Purchaser's contract demand for service under this schedule shall not exceed the contract demand under the purchaser's contract for Prime Power.

Contract demand.—Each contract under this schedule shall specify the amount of capacity in kilowatts to be made available to purchaser each year of the contract term. This capacity in kilowatts shall be termed the contract demand. The purchaser may not exceed his contract demand by more than 10 percent, without the written consent of the Administrator.

Whenever it becomes necessary for the Administrator to curtail, for any period, deliveries of power hereunder below the contract demand specified, the curtailed demand shall be substituted for the contract demand for the period.

Minimum charge.—The minimum charge for service under this schedule shall be the contract demand at \$9.50 net per kilowatt per year

Point of delivery.—The purchaser shall accept delivery of power at approximately 13,800 volts at the transmission-line side of the circuit breakers connecting the purchaser's cables to the generator bus at the Bonneville Project Power Plant, or at such substation adjacent thereto, located on either the north bank or the south bank of the Columbia River, as may be designated by the Administrator.

The purchaser shall accept delivery as provided above; and shall install, at his own expense, such necessary switches, cables, transmission lines, lightning arresters, and other equipment, as may be designated by the Administrator. If, however, facilities are provided by the Administrator for the delivery of power at a point removed from those specified above, the purchasers shall pay the capital or annual cost of such facilities.

Character of service.—Delivery of power hereunder shall be at approximately 13,800 volts, three phase, and sixty cycles.

Payments.—Bills shall be rendered monthly, on the basis of one-twelfth of the annual rate, and shall be due and payable at the office of the Administrator within fifteen days from the date of the bill.

The above rate is net. If payment is not received on or before the close of business on the date due a penalty of two percent (2%) of the bill rendered will be added for failure to pay within the fifteen days. Should bills not be paid within the fifteen days, the Administrator may, at any time thereafter, and after giving the purchaser ten days advance notice in writing, discontinue service.

Delivery of power.—Power delivery is not guaranteed under this schedule, and in case of power shortage the amount of power available will be prorated among purchasers on the basis of the amounts contracted for.

Contract and term. Service under this schedule shall, in each case, be covered by a contract entered into with each purchaser by the Administrator.

Contracts shall be for a period of not less than one year, nor more than twenty years in the aggregate, including renewals or extensions provided for therein, from date of making.

Adjustment of rates.—Contracts shall contain such provisions as the Administrator and purchaser agree upon for the equitable adjustment of rates at appropriate intervals, not less frequently than once in every five years. Such adjustments of rates shall be subject to the approval of the Federal Power Commission.

Rules and regulations.—Purchase of power under the rate schedule shall be subject to the rules and regulations prescribed by the Administrator, contained in the General Terms and Conditions, which by reference are made a part of the schedule and to all the provisions of the Bonneville Act.

J. D. Ross,
Administrator, the Bonneville Project.

Confirmed and approved by the Federal Power Commission, June 8, 1938.

LEON M. FUQUAY, *Secretary.*

REPORT OF THE BONNEVILLE ADMINISTRATOR
 UNITED STATES OF AMERICA
 DEPARTMENT OF THE INTERIOR—THE BONNEVILLE PROJECT
 J. D. ROSS, ADMINISTRATOR
 Portland, Oregon

WHOLESALE POWER RATE SCHEDULE C-1
 (Transmission System Prime Power)

Availability.—This rate schedule covers Prime Power delivered from the Bonneville Project Transmission System at points to be designated by the Administrator.

Power under this schedule shall be available to public bodies, cooperatives and privately-owned electric utilities for resale.

Rate.—Seventeen and One-Half Dollars (\$17.50) net per year, per kilowatt of contract demand or maximum billing demand, whichever is higher.

Determination of demand.—The demand shall be determined by suitable indicating and recording instruments installed at such locations as may be designated by the Administrator. The demand for any month shall be defined as the highest integrated load during any thirty-minute (30 minute) period occurring in the calendar month for which the determination is made.

Maximum billing demand.—Purchaser shall maintain as nearly 100 percent (100%) power factor as practicable. Whenever the purchaser's power factor at the time of maximum monthly demand is less than eighty-five percent (85%), the demand for billing purposes shall be determined by taking eighty-five percent (85%) of the kilovolt-amperes indicated at the time of the maximum monthly demand. In no case shall the billing demand for any month be less than the contract demand, nor less than the highest billing demand that has occurred during the preceding eleven months.

Contract demand.—Each contract under this schedule shall specify the amount of capacity in kilowatts to be made available to purchaser each year of the contract term. This capacity in kilowatts shall be termed the contract demand. The purchaser may not exceed his contract demand by more than 10 percent, without the written consent of the Administrator.

Minimum charge.—The minimum charge for service under this schedule shall be the contract demand at \$17.50 net per kilowatt per year.

Optional billing.—Cooperatives and other small customers to whom this schedule is available purchasing their entire energy requirements from the Bonneville Project and requiring less than 1,000 kw. of contract demand will be permitted a developmental period of two years commencing with the date service is first rendered. During this period monthly bills rendered shall not exceed five (5) mills multiplied by the number of kilowatt-hours delivered for the month.

Point of delivery.—The purchaser shall accept delivery of power at the purchaser's-line side of the circuit breakers connecting the purchaser's wires or cables to the Bonneville Project Transmission System at points to be designated by the Administrator.

The purchaser shall accept delivery as provided above; and shall install, at his own expense, such necessary switches, cables, transmission lines, lightning arresters, and other equipment, as may be designated by the Administrator.

Character of service.—The voltage for this service shall be such suitable standard, designated by the administrator, as load, location, and other pertinent conditions shall indicate desirable, and such as is available at the point designated.

The frequency shall be 60-cycle commercial standard.

The service shall be standard three phase unless otherwise agreed upon by the administrator.

Payments.—Bills shall be rendered monthly, on the basis of one-twelfth of the annual rate, and shall be due and payable at the office of the administrator within 15 days from the date of the bill.

The above rate is net. If payment is not received on or before the close of business on the date due a penalty of 2 percent of the bill rendered will be added for failure to pay within the 15 days. Should bills not be paid within the 15 days the administrator may, at any time thereafter, and after giving the purchaser 10 days advance notice in writing, discontinue service.

Contract and term.—Service under this schedule shall, in each case, be covered by a contract entered into with each purchaser by the administrator.

Contracts shall be for a period of not less than 5 years, nor more than 20 years in the aggregate, including renewals or extensions provided for therein, from date of making.

Adjustment of rates.—Contracts shall contain such provisions as the administrator and purchaser agree upon for the equitable adjustment of rates at appropriate intervals, not less frequently than once in every 5 years. Such adjustments of rates shall be subject to the approval of the Federal Power Commission.

Rules and regulations.—Purchase of power under the rate schedule shall be subject to the rules and regulations prescribed by the administrator, contained in the general terms and conditions, which by reference are made a part of the schedule and to all the provisions of the Bonneville Act.

J. D. ROSS,
Administrator, The Bonneville Project.

Confirmed and approved by the Federal Power Commission, June 8, 1938.

LEON M. FUQUAY, *Secretary.*

UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR—THE BONNEVILLE PROJECT

J. D. ROSS, ADMINISTRATOR
Portland, Oreg.

WHOLESALE POWER RATE SCHEDULE D-1
(Transmission System Secondary Power)

Availability.—This rate schedule covers secondary power delivered from the Bonneville project transmission system at points to be designated by the administrator.

Power under this schedule shall be available to public bodies, cooperatives, and privately owned electric utilities for resale. However, service under this schedule shall be available only to purchasers having contracts with the United States for prime power.

Rate.—Eleven and one-half dollars net per year, per kilowatt of contract demand or maximum billing demand, whichever is higher.

Determination of demand.—The demand shall be determined by suitable indicating and recording instruments installed at such locations as may be designated by the administrator. The demand for any month shall be defined as the highest integrated load during any 30-minute period occurring in the calendar month for which the determination is made.

Maximum billing demand.—Purchaser shall maintain as nearly 100 percent power factor as practicable. Whenever the purchaser's power factor at the time of maximum monthly demand is less than 85 percent, the demand for billing purposes shall be determined by taking 85 percent of the kilovolt-amperes indicated at the time of the maximum monthly demand. In no case shall the billing demand for any month be less than the contract demand, nor less than the highest billing demand that has occurred during the preceding eleven months.

Limitation of demand.—Purchaser's contract demand for service under this schedule shall not exceed the contract demand under purchaser's contract for prime power.

Contract demand.—Each contract under this schedule shall specify the amount of capacity in kilowatts to be made available to purchaser each year of the contract term. This capacity in kilowatts shall be termed the contract demand. The purchaser may not exceed his contract demand by more than 10 percent, without the written consent of the administrator.

Whenever it becomes necessary for the administrator to curtail, for any period, deliveries of power hereunder below the contract demand, the curtailed demand specified shall be substituted for the contract demand for the period.

Minimum charge.—The minimum charge for service under this schedule shall be the contract demand at \$11.50 net per kilowatt per year.

Point of delivery.—The purchaser shall accept delivery of power at the purchaser's line side of the circuit breakers connecting the purchaser's wires or cables to the Bonneville project transmission system at points to be designated by the administrator.

The purchaser shall accept delivery as provided above; and shall install, at his own expense, such necessary switches, cables, transmission lines, lightning arresters, and other equipment, as may be designated by the administrator.

Character of service.—The voltage for this service shall be such suitable standard designated by the administrator as load, location, and other pertinent conditions shall indicate desirable, and such as is available at the point designated.

The frequency shall be 60-cycle commercial standard.

The service shall be standard three phase or as otherwise agreed upon by the administrator.

Payments.—Bills shall be rendered monthly, on the basis of one-twelfth of the annual rate, and shall be due and payable at the office of the administrator within 15 days from the date of the bill.

The above rate is net. If payment is not received on or before the close of business on the date due a penalty of 2 percent of the bill rendered will be added for failure to pay within the 15 days. Should bills not be paid within 15 days, the administrator may, any time thereafter, and after giving the purchaser 10 days' advance notice in writing, discontinue service.

Delivery of power.—Power delivery is not guaranteed under this schedule, and in case of power shortage the amount of power available will be prorated among purchasers on the basis of the amounts contracted for.

Contract and term.—Service under this schedule shall, in each case, be covered by a contract entered into with each purchaser by the administrator.

Contracts shall be for a period of not less than 1 year, nor more than 20 years in the aggregate, including renewals or extensions provided for therein, from date of making.

Adjustment of rates.—Contracts shall contain such provisions as the administrator and purchaser agree upon for the equitable adjustment of rates at appropriate intervals, not less frequently than once in every 5 years. Such adjustments of rates shall be subject to the approval of the Federal Power Commission.

Rules and regulations.—Purchase of power under the rate schedule shall be subject to the rules and regulations prescribed by the administrator, contained in the general terms and conditions, which by reference are made a part of the schedule and to all the provisions of the Bonneville Act.

J. D. Ross,
Administrator, the Bonneville Project.

Confirmed and approved by the Federal Power Commission, June 8, 1938.

LEON M. FUQUAY, *Secretary.*

APPENDIX D

Unit requirements for electric energy

From Federal Power Commission's report, "Power Requirements in Electrochemical, Electrometallurgical, and Allied Industries"—1938]

Product	Average consumption of electric energy, kilowatt-hours		Unit
	Total electrolytic	Total electro-thermal	
Aluminum.....	23,988	21,021	Per short ton.
Copper.....	367	249	Do.
Zinc.....	3,714	3,381	Do.
Cadmium.....	2,342	2,048	Do.
Magnesium.....		16,000-20,000	Do.
Chlorine and caustic soda.....	3,400	3,000	Per short ton of chlorine.
Cast and alloy iron:			
Duplex.....		50-115	Per short ton of metal melted.
Batch-cold melt.....		500-600	Do.
Cast steel:			
Duplex.....		75-150	Do.
Batch-cold melt.....		500-700	Do.
Steel ingots:			
Duplex.....		100-210	Per long ton.
Batch-cold melt—tool and special alloys.....		550-750	Do.
Stainless and automotive.....		525-650	Do.
Straight carbon.....		500-550	Do.

Unit requirements for electric energy—Continued

Product	Average consumption of electric energy, kilowatt-hours		Unit
	Total electrolytic	Total electro-thermal	
Ferrosilicon, 15 percent silicon		4,000-5,000	Per short ton.
Ferrosilicon, 50 percent silicon		5,000-6,000	Do.
Ferrosilicon, 70 percent silicon		6,000-8,500	Do.
Ferromanganese, 80 percent manganese		6,000-7,000	Do.
Silicomanganese, 70 percent manganese		4,500-6,500	Do.
Ferrochromium, 70 percent chromium		6,000-8,000	Do.
Ferrotungsten, 70-75 percent tungsten:			
Smelting		4,200	Do.
Refining		3,400	Do.
Total		7,600	Do.
Ferromolybdenum, 70 percent molybdenum		8,000-9,000	Do.
Ferrovandium, 35-45 percent vanadium		4,500-8,000	Do.
Ferro-uranium 35-50 percent uranium		7,000	Do.
Core type induction furnaces:			
Red brass		252	Per short ton of metal melted.
Yellow brass 2:1		195	Do.
Bronze		285	Do.
Pure copper		310	Do.
Zinc		90	Do.
Nickel-silver		275	Do.
Coreless type induction furnaces:			
Special steels		660	Per short ton.
Nickel-silver		340	Do.
Rocking hearth indirect ore furnaces:		250-300	Do.
Brass, general			
Artificial abrasives:			
Silicon carbide	9,380	8,495	Do.
Fused alumina	3,143	2,809	Do.
Calcium carbide	3,150	3,000	Do.
Graphitized products		3,000-8,000	Do.
Nitrogen—Existing synthetic ammonia plants in United States at capacity operation	1,530		Per short ton of contained nitrogen.
Nitrogen—Synthetic ammonia using electrolytic hydrogen	15,000		Do.
Fertilizer:			
Dry mixing	8.0		Per short ton.
Required superphosphate (0.44 tons)	9.5		Do.
Total complete fertilizer	17.5		Do.
Phosphoric acid (electric furnace)	16	4,500-5,500	Per short ton of contained P ₂ O ₅ .