WATER RESOURCES

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Some Very General Considerations

Federal expenditures relating to our water resources are intimately associated with the problems that have arisen in connection with water use and supply. Abstractly considered, water in association with land is our most fundamental natural resource and in its relation with the phenomenon of population growth has become an increasingly scarce commodity. Hence there can be no questioning that its proportionate supply and use provide the very underpinning for the growth and stability of the economy. In the production of goods and services the economic allocation of scarce water resources constitutes our most fundamental problem. But this problem has several different facets, depending upon how this resource is organized and used. It may be a matter of individual or collective use and supply. Thus we meet at the very outset of our consideration of this problem the question of its institutional orientation.

Should the supply and use of this resource be organized as a collective State function supported by taxation? Should it be organized on a less collective scale and supported by beneficiaries alone under a system of fees and special assessments? Should it be set up as a public utility where the supply and utlilization are commercially organized under a system of governmentally fixed rates, or may the supply and utilization be safely left to individual initiative? Are combinations of these arrangements more suitable under given circumstances? These are political questions, the answers to which are a matter of public policy and come to us freighted with historical antecedents.

Some Historical Considerations

From both an engineering and social point of view the major problems arising out of the development of our water resource may be summarized as follows:

1. The provision of a domestic and industrial water supply from surface or ground-water sources, adequate in quantity and quality. The great bulk of our population takes service from public utilities which are mostly public agencies. In rural areas private supply is still pervasive.

2. The companion piece to these water utilities are the sewer systems, again dominantly public. The systems are usually supported through a combination of taxes and special assessments, though there is a new tendency to place sewer facilities on the backs of water utilities through a system of water-rate surcharges. Private systems of industrial waste disposal and sewage treat-

ment also are designed to make headway against the growing water pollution.

3. Similarly, the growing intensity of floods requires measures of flood control by way of "upstream engineering," the construction of levees to confine high water and of reservoirs to reduce peak flows. Best results flow from combinations because intense rains give point to the quip of the proponents of reservoirs "that they would like to see 7 inches of rainfall perched on a leaf." They are organized as public agencies with public financing by means of taxes and special assessments.

4. Irrigation and drainage to regulate water supply for agricultural purposes by means of natural underground storage and artifical reservoir storage with appurtenant distribution systems and drainage collecting systems. These are usually organized as territorial districts or cooperatives.

5. Soil conservation to retard runoff and prevent sedimentation of downstream water courses. Soil conservation is accomplished by means of strip cropping, terracing, check dams, and similar structures. They are usually organized as soil-conservation districts with taxes and special assessments.

6. Aids to navigation, such as harbors and maintenance of adequate river channel depths by means of slack-water pools. Dams with appurtenant locks control water levels and water flows. Supplied by Federal agencies—Corps of Army Engineers, Public corporations—with Federal taxes and tolls (St. Lawrence seaway).

7. Hydroelectric power by means of dams, reservoirs, and powerhouses. Supplied by Federal, State, and local public agencies or as private licensees of the Federal Power Commission, financed by means of Federal or local public funds or private funds, but subject to reimbursement out of power sales.

8. Facilities for public recreation and maintenance of wild and fish life. They are provided by Federal, State, and local public agencies with Federal tax funds supplemented by imposition of fees.

Until the end of the 19th century Federal participation in the development of our water resources was decidedly limited, although the Congress had the constitutional power to regulate interstate commerce under the commerce clause. This power had been held to include navigation which gave Congress jurisdiction over navigable waters of the United States. It also included flood protection and watershed development. A further extension of this power authorized Federal generation and sale of hydroelectric power or its development by other agencies, public or private, under a Federal license. Regulation and disposal of water and land resources in the public domain stem from the property clause of the Constitution, under which the Reclamation Act was passed by Congress in 1902. With the spread of the movement for conservation of our natural resources, Federal activity, both regulatory and proprietary, was stepped up. Under the treaty powers of the Federal Constitution, treaties with foreign governments—and with Indian tribes—were held by the courts to be the supreme law of the land. They regulate and dispose of water resources in international streams. Under the compact clause of the

Constitution, States, with the consent of Congress, have apportioned the water resources of interstate streams among themselves.

From Single Project to Comprehensive Planning

The last century and a half have witnessed the gradual evolution of our Federal water-resources policy from one which had in view the planning of single-project and single-purpose development of a given water resource to one which comprehended the progressive planning and development of multiple projects for multiple purposes for an entire river system. The growing realization that, for the best economic development and conservation of these water resources, a basinwide approach to the problem would be necessary was never more succinctly stated than in a letter by President Theodore Roosevelt transmitting the report of an early waterway commission:

> Every stream should be used to its utmost. No stream can be so used unless such use is planned for in advance. When such plans are met, we shall find that, instead of interfering, one use can often be made to assist another. Each river system, from its headwaters in the forest to its mouth on the coast, is a single unit and should be treated as such.

However much the members of the second Hoover Commission disagree among themselves, they were as one with respect to this aspect of national policy:

> (*a*) That water resources should be developed to assure their optimum use and their maximum contribution to the national economic growth, strength, and general welfare.
> (*b*) That water-resources development should be generally undertaken by drainage areas—locally and regionally.

Criteria Derived From Dimensions of Economy

In securing better utilization of our scarce, and hence costly, natural resources, economists and engineers have long sought to achieve what may be called economies of the load factor. As applied to electric-power production, the load factor has been defined as the ratio of the average power (average load) used to the maximum power (peak) used during a certain period of time. This ratio measures economy in the use of capacity already installed. A higher load factor expresses greater economic productivity. This is true because the same fixed cost of the plant when divided by the greater output of the plant operating at a higher load factor will yield a lower cost per unit of output.

Another dimension of economy is expressed by the diversity factor. Applied to power production, it is an economy which relates to the installation of power-producing capacity and arises out of the diversity in the time of individual peak requirements. If the demand for service comes at different times, the same plant capacity can be made to serve different customers. Hence, the diversity factor has been defined as the ratio of the sum of the maximum power demands of the subdivisions of any power system, or parts of a system, to the maximum demand of the whole system, or part of the system under consideration, measured at the point of supply. The effect of diver-

sity in bringing about savings in power installations can climb to a peak when there is diversity between the demands made upon individual power stations, and when these power sources can be interconnected by means of transmission ties into a regional power system.

A third dimension of economy has to do with the size and scale of operations. Load factor and diversity factor economies apply to small as well as large plants and are therefore independent of the scale of operations. With the expansion of the market, it is possible to secure fuller utilization of existing plants, but when this expansion becomes continuous it also becomes possible to increase the size of plants as the electric utility business has been doing for some time. Electrical operations started on a small scale, with plants serving customers only in the immediate vicinity. Soon the combination movement set in, with intervals of short-lived competition, but the end result was citywide and later areawide consolidations. Inefficient, high-cost plants were retired from service or relegated to carry only the peak load. The aim was to carry the continuous or "base" load by means of the most efficient productive instruments available. Another economy of scale arises from the technological fact that larger units of equipment cost less per unit of capacity.

A final category of economies are those of joint cost. Another way of stating this is to say that some products or services may be jointly produced. When one of the joint products is of greater economic importance than the other, the other may be called a byproduct, often rising to this economic status from being a waste product. The important point, however, is that the production of one product is technically so arranged that its production will of necessity lead to the production of the other. There is an extension of this principle when it is cheaper to turn out 2 or more products or services from 1 central process or structure than to produce them separately. The best exemplification of the operation of this principle is the Tennessee Valley Authority which so planned and designed the construction of dams as to regulate the Tennessee River for flood-control, navigation, and power purposes as true joint products. The joint production of these services realizes certain economies whose separate realization would have been more costly, if not impossible, if an attempt had been made to develop the river without using these multiple-purpose structures.

In general, the concatenation of these dimensions of economy in any organization, whether public or private, provides an opportunity to realize the optimum of production of goods and services and raises economic productivity to a higher power. This is the principle concealed in the quotation from President Roosevelt's letter. Bringing water for irrigation or urban water-supply purposes from a distance and over mountain ranges may create "heads" for the production of hydraulic power. The Los Angeles-Owens Valley aqueduct would be an example where joint costs are of the byproduct variety. In general, operations of most utilities, especially if they are multiple-service enterprises, illustrate the organization of these dimensions of economy in their operations. But its application need not be restricted to utilities.

The foremost examples of the operation of these principles, especially joint cost, as applied in the development of our water and energy resources are afforded by the Colorado River, the Columbia

River, and the Tennessee River. These Federal examples are what Max Weber would have called three ideal types of policy formation. Referring back to our previous discussion of the institutional bases for these problems, the Colorado exemplifies the States-rights and interstate-concept approach. The Columbia exhibits the old-line departmental agencies in action, that is to say, the Bureau of Reclamation, the Corps of Army Engineers, supplemented by the Bonneville Power Administration to provide some interagency coordination. The Tennessee approach was sui generis, in that the Tennessee Valley Authority was a Federal corporate instrumentality with a single, unified jurisdiction over the water and related resources of an entire watershed.

The Problem of Joint Cost Allocation

The prime focus of all controversy over the development of our water and related resources (How much development should there be? Who is to do it, public or private agencies?) has to do with the technique of joint cost allocation. Unless this has first been explored we are set adrift upon the field of hauling and pulling as to who should get the benefit of this dimension of economy. However briefly and inadequately, I propose to discuss this first before commenting on these three distinct types of procedure in developing water resources.

At the threshold of any consideration of the economies of multiple-purpose projects, whether State, Federal, or local, we meet this question of joint-cost allocation. One standard of judging the economic value of different employments of natural resources is to measure their comparative costs. Cost is not the only standard, of course, but it is the most abiding and universal.

All multiple-purpose projects, if their costs are to be properly brought to book, involve the problem of cost allocation. This was specifically recognized in section 14 in the Tennessee Valley Project Act. The TVA Board was required to investigate the present value of Wilson Dam and certain steam plants acquired from the Army engineers and also the cost of constructing all future dams "for the purpose of ascertaining how much of the value or the cost of said properties shall be allocated and charged up to (1) flood control, (2) navigation, (3) fertilizer, (4) national defense, and (5) the development of power." These "findings" of the Board, when approved by the President of the United States, were to be considered final and were to be used in keeping the "book value" of the properties. I may state parenthetically that no allocation was ever made to fertilizer production. Instead, the fertilizer plant was treated as a consumer of TVA power and bore its share of the cost as a ratepayer. National defense was likewise eliminated as the recipient of a joint cost allocation except during the war emergency. It was the present writer's assignment to make this first allocation.

Isolating joint costs

The first step in securing a segregation of project costs among the functions recognized in the act was to distinguish structures or identifiable parts of structures which served only a single purpose. For example, the powerplant portion of Wilson Dam was structurally capable of serving only for the production of power. Similarly, navigation locks serve only a navigation purpose. In the case of storage

dams like Norris, according to "rule curves" laid down for their operation, the capacity of the upper portion of such dams is reserved to store exceptional runoff and is therefore held available only for the single use of flood control. The remainder of the dams, however, usually their spillway sections, jointly serve all the various uses to which the particular dam is put. Costs attributable to these sections may thus be isolated as joint costs. However, an additional adjustment must first be made before all joint costs have been accumulated. If in the case of main river dams, the lock section and powerhouse section (usually at opposite ends) were removed, it would be necessary to replace them with a nonoverflow section. The estimated cost of such replacements should thus be subtracted from the cost of the lock section and powerhouse section and added to the joint cost. This operation puts all single-purpose expenditure on an incremental cost basis. Here then is the incidence of the allocation problem because some share of the remaining joint costs must be assigned to each of the single purposes.

The effect of public policies

In developing principles and methods of allocating joint costs for Federal projects one must bear in mind the legal limitations, both constitutional and statutory, in accordance with which these water-control works were designed, constructed, and operated. According to the TVA Act these works must provide at least an 11-foot channel to make possible 9-foot draft navigation in the Tennessee River and maintain a water supply for the same from Knoxville to the mouth of the river at Paducah. The dams on the main stem and on the tributaries must together control destructive floodwaters in the Tennessee, lower Ohio, and lower Mississippi drainage basins. In operating these works the Board was required to regulate streamflow "primarily for the purpose of promoting navigation and controlling floods." Insofar as consistent with these primary purposes, the Board was "to provide and operate facilities for the generation of electric energy in order to avoid the waste of waterpower."

In order to help liquidate costs, the Board was authorized to transmit and market this power. In other words, the Board was not at liberty in the development and operation of these multiple-purpose dams to give priority or even equal consideration to power but must give priority to navigation and flood control with electric generation subordinate thereto. The release of water from storage was accordingly not in the charge of the power department but in charge of water control departments. The allocation of joint costs had to recognize all of these limitations.

Further study of the allocation problem for TVA dams, as well as for other Federal projects, brought awareness of the dynamic aspect of joint costs. Under unified development plans for an entire watershed, single dams were only interdependent units in a progressive program. However critical the Muscle Shoals section of the river may have been for navigation, Wilson Dam in overcoming this barrier made only a partial contribution to the contemplated channel. Full value for navigation would emerge only after all the dams in the program were constructed. The same consideration applied to flood control and power. From this point of view it might have been better to defer allocation (which the act did not permit) until full development

had been obtained. However, if allocations were to be made on a dam-by-dam basis as the statute contemplated, a formula would have to be developed which would envisage both main river and tributary storage dams operating on an integrated plan. Such a formula would have to be flexible and capable of progressive application.

Another early step in the development of an adequate allocation technique required that expenditures be segregated into project costs and nonproject costs. Project costs were defined as those expenditures either directly necessary for any one of the functions or jointly necessary because of the coordination of different functions. Nonproject costs pertained to related objectives of silt control, reforestation, soil conservation, and recreational development.

One further troublesome question arose because the speed with which the navigation channel and flood protection was being achieved might have no reference to the rate at which related power facilities would be needed to supply the effective demand for electric power. If such power structures were not included in the original design and construction program, the ultimate economy to which the plans were adjusted would not be achieved. Happily, the accelerated defense program relieved the situation; but such advance expenditures, ultimately chargeable to power, might have been temporarily segregated in some account, labeled "Power installation held for future use."

Theories of Joint Cost Allocation

We come now to a discussion of theories for allocating the joint construction expenditures of multiple-purpose structures. For this purpose we suggest a fourfold classification which distinguishes the different theories according to their basic criterion: (1) Benefit, (2) vendibility or price, (3) use of facilities, and (4) cost.

Benefit theories

Allocations of joint cost based upon some criterion of benefit drew its chief protagonists from the ranks of flood-control engineers. A. E. Morgan, former chairman of TVA, was one prominent advocate. It was recommended in reports by the National Resources Board and its subcommittees, by the Mississippi Valley Committee and by various regional planning committees. Historically, the benefit theory had its origin in the law of special assessments where the cost of drainage or irrigation works, flood-protection works, street improvements and park facilities were assessed against abutters or properties organized into districts in proportion to special benefits conferred. It should be noted, however, that this procedure was used only where a single purpose was involved and all drew the same kind of benefit from the improvement. In such cases the total assessment was limited strictly to the cost of the improvement but assessed to individual beneficiaries in proportion to ascertainable special benefits.

Proponents of the benefit theory proposed to extend the use of this method of allocation to multiple-purpose dams conferring more than one class of benefits. All benefits were to be reduced to the common denominator of economic value as measured by money.

The benefit theory was rejected by the TVA Board over the objection of Chairman A. E. Morgan, and this action became one of the reasons for the controversy which raged inside the Authority. The

controversy led ultimately to the dismissal of Chairman Morgan by President Franklin Roosevelt and to an investigation of TVA in 1939 by a joint committee of the Congress, whose majority report upheld the action of the Board in disapproving the benefit theory.

The benefit theory was rejected for two reasons, one practical, the other theoretical. It was rejected because of the great practical difficulty of securing definite measures of the economic value of benefits in advance of their full realization. It was also rejected because the theoretical infirmity of benefit as a means of cost allocation resides in the fact that the reasoning is circular. To measure the share of joint costs to be borne by power users by a forecast of the future economic value of power was placing the cart before the horse in any measure of cost of service. The relative amounts of other benefits which the public will derive, particularly from navigation and flood control, can only be effectively measured years after the projects have been completed and the traffic or utilization of flood protection develops.

Conservative forecasts of the economic value of the different kinds of benefits to be realized in the future have their place in comparing their dollar or social values with a forecast of the costs of construction and operation, the so-called benefit-cost ratios. These are promoters' ratios by means of which the different projects may be compared with each other in order to determine their relative economic feasibility. They are a part of the authorization and appropriation process which I do not have space to consider. Where the margins of advantage are larger (let us say 2 to 1 as compared with 1.5 to 1), greater economic feasibility may be indicated. They supply a basis for the calculus of probabilities and serve to guide the direction which public or private investment of capital may take. They are useful, probative techniques for the exercise of judgment in securing authorizaitons of projects. They do not have the same validity as an economic test of reasonable allocation of project expenditures already made for purposes of cost reimbursement.

Vendibility theory

Economists have considered the pricing of commodities or services produced at joint cost. Joint products, produced for an open market under conditions of effective competition, will tend to be sold at prices which between them will equal their joint cost of production plus a competitive profit. But the accrual of the total receipts will depend upon the relative demands for each. Should the marketing of one of the joint products entail some special expense, the price for this product must cover at least these special, incremental costs and some share of the joint costs proportional to the relative intensity of the demand for this product. In short, selling joint products is a case of disposal at "all that the traffic will bear."

A Committee on Financial Policy inside the TVA, in making recommendations to the Board, took the following position:

> This theory of pricing joint products is of little assistance to us in suggesting a method of allocation unless the fundmental assumption upon which the theory is based also applies in the disposal of the services rendered by multiple-use dams. This assumption is that the prices of all the joint products are fixed by the interplay of demand and supply in an open market. If that were true, the allocation of joint

costs would be accomplished automatically through market demand. Hence we call this the vendibility theory of allocation.

In applying this theory to the Authority's projects, it should be noted that of the services rendered by multiple-use dams, only two—fertilizer and power—are vendible or partly vendible commodities under the provisions of the Tennessee Valley Authority Act. Navigation and flood control are not subject, or at least not yet subject, to any system of charges or of special assessment against beneficiaries. Even the special costs traceable to navigation and flood control may not be recovered by means of tolls but are regarded (along with joint costs) as a general cost of government.

Under plans adopted by the Authority for distributing fertilizer, even the special costs assignable to fertilizer production will not be recouped. All distribution of fertilizer transcending merely experimental use aims to secure large-scale distribution for purposes of large-scale demonstration. 'The objective is mass education of practical farmers in the use of fertilizer, but under circumstances which will make possible an evaluation of the best procedure. Except, therefore, as fertilizer production consumes power which is paid for through a system of interdepartmental charges, it will not be the source of a dependable income sufficient to liquidate a share of the joint cost. * * * However, since large quantities of electric power are required for the fertilizer program, the Board has taken the position that with respect to such use the fertilizer works is to be given the status of an ordinary commercial customer of the electricity department. In this respect, the fertilizer works makes its contribution to cost liquidation as does any other electrical customer, with this difference; that the production of fertilizer can, in the main, be adjusted to the use of secondary power.

The vendibility theory thus breaks down because there is no open market in which the services produced by the Authority under conditions of joint supply can be sold.

Use of facilities theories

Theories of a third type would distribute joint costs upon the basis of the comparative use of the joint facilities. To each single function would be allocated such share of the joint cost as is measured by the extent of its use. This method is commonly employed by cost accountants. The oldest illustrations are derived from the railroad field where apportionments of common cost between the freight, mail, express and passenger branches of the service are made upon some comparable use units like the car-mile, passenger-mile, ton-mile, or other convenient measure.

A use theory breaks down when there are no common use units or where differences in the use units of different utilizers are so great as to preclude their being reduced to some comparable basis. Since the acre-foot of reservoir capacity or the acre-foot of water released are available as measures of joint use of dams, the applicability of a use theory based upon the acre-foot of storage or reservoir capacity was carefully considered.

I cannot in this summary bring a discussion of details. Nor can I do more than mention certain companion theories based upon equal apportionment where the potentiality of use is approximately the same, or upon differential apportionment where the utilization of stored water can afford some clue as to the comparative use of facilities. It must suffice to state the conclusion of the financial policy committee on this point:

> Division of the cost should not be made solely on the water-use theory since the storage capacity is capable of serving each function, even though it may not be used by one or more of the functions in any year. Thus the method, if applied, should involve a combination of both capacity and water use, such combination being subject to individual interpretation in connection with each project inapplying the method, Because of the fact that the Authority's projects, as outlined in its report on the unified plan for the development of the Tennessee River system, are only partly in process of construction and that, therefore, adequate data for a complete application of a combined reservoir capacity and water-use theory will not be available until much later; the application of this type of use of facilities theory is at present attended with difficulties.

Cost theories

The only cost theory having validity is one which elsewhere I called the alternative-cost-avoidance theory. As is now generally recognized, by constructing dams which serve multiple purposes, the TVA was able to achieve savings in construction expenditures over what these expenditures would have been if single-purpose dams had been constructed. The planning and construction of dams for navigation, flood control and incidental power on a watershed basis thus enables the Authority to achieve the aforementioned economies of joint construction cost.

Since the aim in combining multiple purposes in a series of structures is the savings to be achieved, it is also possible to use the ratio in which these higher expenditures are avoided by joint action as a basis for allocating joint costs. In other words, in applying the principle of alternative cost avoidance, the measure of participation in common expenditures is the alternative cost for which these common expenditures have been substituted.

In applying this method it is necessary to secure estimates of the lowest alternative cost by means of which substantially the same quantity and quality of service for each separate function can be obtained. The fundamental assumptions which underlie the cost estimates for single-use structures must be as reasonable and practical as they can be made. They must be based upon experience and arrived at after adequate investigation. On account of the scarcity of available sites, the construction of a single-use dam at a given site may make impossible the achievement of other purposes for which the given site is likewise most suitable. This practical difficulty does not prevent the use of calculated alternative costs of single-use projects for purposes solely of allocation of multi-use investment.

In order to resolve a difference of opinion between members of the technical staff of TVA, the alternative-cost-avoidance theory was re-

christened "alternative justifiable expenditures." In this more palatable form, suggesting the benefit theory so strongly urged by A. E. Morgan, the committee was able to agree upon a definite mode of allocation procedure.

The TVA Formula of Joint Cost Allocation

The alternative justifiable expenditure theory has been consistently applied by TVA with the beginning of the period of normal operations, and its accounts have been formalized upon the basis afforded by this formula of joint cost allocation. The method was approved by the majority report of the joint congressional investigating committee of 1939 and favorably commented upon, as well as used, by the Reclamation Service. The Federal Power Commission, in response to a congressional resolution, investigated TVA allocation procedures in 1949 and generally approved the method.

In order to illustrate these allocation procedures, we have rearranged the findings of the FPC into a table which summarizes the allocation as of June 30, 1945, when the 9-foot navigation channel required by statute had been achieved. In the table, section A shows the segregation of total cost between joint costs and direct costs. Joint costs of $345,633,150 of the multiple-purpose system must be allocated. This is accomplished in section B. The first step is calculating the costs of alternative single-purpose systems capable of equivalent performance. Subtracting the actual direct costs not avoided provides a measure of alternative costs avoided. A comparison of actual joint costs of $345,633,150 with alternative single-purpose costs avoided of $611,023,099 provides a calculated measure of the economy of joint cost. The allocation is made upon this basis. Section C merely records the total investment costs by adding in other items such as chemical plant, construction in progress, etc.

TVA allocation procedures, 16-project multiple-purpose system, June 30, 1945

A. Total investment costs	$562, 774, 051
Direct navigation cost	41, 278, 423
Flood control	47, 262, 000
Power	128, 600, 478
Joint cost of multiple-purpose system	345, 633, 150
B. Alternative costs avoided:	
Navigation	217, 532, 000
Dredging saved	8, 000, 000
Total	225, 532, 000
Flood control (storage of 11,162,000 acre-feet)	227, 704, 000
Power (capacity of 856,000 kilowatts)	374, 928, 000
Total	828, 164, 000
Subtracting direct costs not avoided leaves alternative costs avoided:	
Navigation (30.16 or 30 percent)	184, 253, 577
Flood control (29.53 or 30 percent)	180, 442, 000
Power (40.13 or 40 percent)	246, 327,522
Total (100 percent)	611, 023, 099

Allocating actual joint costs on preceding percentages:	
Navigation	$103, 689, 945
Flood control	103, 689, 945
Power	[1] 138, 253, 260
Total	345, 633, 150
Total system—adding direct to joint costs:	
Navigation	144, 968, 368
Flood control	150, 951, 945
Power	438, 856, 667
Total	734, 776, 980
C. Total investment all purposes:	
Multiple-purpose reservoirs	562, 774, 051
Single-purpose hydro	43, 828, 484
Fuel-electric plants	27, 816, 789
Other electric plants	100, 357, 656
Chemical plant	10, 620, 451
General plant	13, 004, 172
Construction in progress	29, 637, 650
Unamortized acquisition adjustment	1, 916, 299
Prelim, investigations	136, 398
Total	790, 091, 950

[1] Other power costs to be added, $172,002,929.

Agencies for Coordination and Planning

Closely connected with the foregoing substantive aspect of cost allocations is the question as to who has the primary responsibility under the statutes in making them. One of the criticisms has been that there has been a signal lack of consistency with respect to the application of principles and methods.

The greatest degree of uniformity has been achieved by TVA where the Board of Directors make the cost allocations. They become final for accounting purposes with the approval of the President. Under reclamation law as amended by the Reclamation Project Act of 1939 the Secretary of the Interior has the responsibility of making them for projects concerned with irrigation, water supply, power, navigation, and flood control. The only other agency which has been given a major share of responsibility has been the Federal Power Commission. It was specifically named to allocate costs to power in the Bonneville Project Act and the Fort Peck Act. Inferentially the Commission also has responsibility under the Rivers and Harbors Act of 1945 with respect to the McNary project on the Columbia River and certain projects on the Snake River. The Flood Control Act of 1944 provides that the FPC approve rates for the sale of surplus power from dams constructed by the Corps of Army Engineers but that the actual sale of the energy be in the hands of the Department of the Interior. Inferentially again this may give the Commission some jurisdiction over cost allocations since these are the basis for the general level of rates. On the other hand, it has been pointed out by the Commission and others that with respect to Missouri River projects and projects throughout the country constructed by the Army engineers no provision has been made with respect to cost allocations

to power development. This dispersion of responsibility is an important factor in importing a great amount of uncertainty and instability into the economics of water resources. The Jones subcommittee which investigated this specific subject in 1952 came to the conclusion that proposed allocations be initiated by the construction agency but that the Bureau of the Budget be designated as the executive agency to approve final allocations.

A perplexing aspect associated with this generic problem has to do with reimbursement policy as was recognized by the Cooke Commission in 1950. Cost allocations, rate policies and reimbursement are tied together in making a decision as to who should be the paying partners. Multiple-purpose projects that involve the allocation of reimbursable costs in the form of water and power rates, special assessments and fees, and that involved also the determination of subsidies from the Federal Treasury are hard projects to deal with.

Irrigation projects have been most troublesome so far as fixing the length of the repayment period is concerned. To assure that a given project be classed as economically feasible, it was provided from the very beginning of Federal investment that these funds be made repayable by means of repayment contracts but without interest. First fixed at 10 years in 1902, the repayment period was extended to a maximum of 20 years in 1914, to 40 years in 1926, and in 1939 to 50 years with a 10-year development period added. Special statutes have expanded the reimbursement schedule to 68 years, including a development period. In the case of "sick projects," Congress has brought relief by providing for payments of over 100 years with additional chargeoffs where lands proved to be nonirrigable. Among the reimbursables, the irrigation function has had the poorest history.

Among the nonreimbursables, the navigation function has long been a thorn in the flesh of land transport agencies, particularly of the railways. The historic policy has been to provide these waterways toll-free to users whether they be common carriers, contract carriers, or private carriers. Recently there have been some significant exceptions in the case of the Panama Canal and the St. Lawrence seaway. With present-day standards of construction and operation, bulky and heavy raw materials and commodities important for agricultural and industrial production have found inland navigation to be the cheapest mode of transport. Again, historically, waterway improvements have been used to secure reductions in railroad rates which the carriers by rail were willing to grant to keep the traffic on the rails. This loss in revenues has been recouped by charging higher rates on noncompetitive traffic. Railway management has long recognized that this "erosion of the rail rate structure" has been a serious consequence of free waterways. This reduction in the price of rail transport has been regarded and measured as one of the "benefits" justifying the cost of waterway improvements by the Army engineers. But waterways have also created traffic, particularly on the Great Lakes and the upper Ohio River, which could only move by water.

Such wrong-headedness of our historic transport policies is finally being recognized in a growing demand that the "inherent advantages" of water transport, to quote the Cooke Commission, "be integrated into a broader program designed to provide the Nation with an economical and efficient coordinated transportation system, including railroads, motor transport, waterways, and airways. In such a coor-

dinated system all forms of transportation should be considered as complementary rather than competitive with each other." In this attempt at coordination, the Cooke Commission suggested the imposition of user charges or tolls based upon full costs, thereby yielding a return on these Federal expenditures. The second Hoover Commission of 1955 makes the more moderate proposal "that Congress authorize a user charge on inland waterways except for smaller pleasure craft, sufficient to cover maintenance and operation and authorize the Interstate Commerce Commission to fix such charges."

It is my conviction that the diverse and conflicting nature of the public and private interests involved in Federal, State, and local expenditures for water resource development make them a proper subject for a series of congressional inquiries with due recognition of all the conflicting interests involved.

Some Issues From Current Projects

In the space that remains, I will state my own position as to some of the issues that arise out of current projects.

The most important issue is that in adopting the river basin, multiple-purpose approach, we do nothing to subvert that approach for transitory or temporary reasons. For best results the operation of these projects must be hydraulically and electrically integrated.

The Tennessee Valley Authority has achieved the status of a going concern, with benefits accruing both nationally and locally. It is carrying out the allocation, ratemaking, and reimbursement policies laid down by Congress in the Tennessee Valley Project Act as amended. In the course of the development of these policies, TVA achieved complete control of the territorial market in which its surplus waterpower must be sold, in order to reimburse power costs and help liquidate other costs attributable to other public purposes. Because it is definitely in the wholesale power business with its distributors dependent upon it for economical supply, TVA should be authorized to function as a public utility. It should be authorized to issue revenue bonds because its power operations are being carried on under the proprietary power of the Federal Government. In that way TVA can relieve the Federal budget of expenditures that are truly reproductive. It makes payments to local and State governments in lieu of taxes and it can make similar payments into the Federal Treasury. It should be able to amortize a portion of the Federal investment from taxation in order to establish corporate equity which will support its bonded indebtedness. TVA is not a conspiracy directed against the surrounding private utilities. It grew up and was nurtured in the soil of ineffective regulation which characterized the predepression period, particularly in the South.

The Pacific Northwest, with its dependence upon the water resources of the Columbia River, provides an opportunity for testing the efficacy of what may be loosely called the partnership plan of natural resource development. The significant rise of public power agencies even before Columbia River development began, like the cities of Eugene in Oregon and Seattle and Tacoma in Washington, provide, together with the previously existing private utilities, a solid base for regional participation. Subsequently, the setting up of public-utility districts and cooperatives, the organization of the Bonne-

ville Power Administration as a marketing agency, and the creation of the Northwest Power Pool during World War II as an integrating device, have further enlarged the base for cooperation between the public and private sectors of this regional power and water resource economy.

Evidence that such cooperation can be worked out is found in the licensing by the Federal Power Commission of the Grant County Public Utility District to construct the Priest Rapids project on the Columbia River. To attain this end, the preference clause in the Federal Power Commission Act of 1920 was indispensable. Power from this dam will be sold to 8 public agencies and 4 private utilities, with 36½ percent of the total output reserved for the Grant County Public Utility District.

With respect to the nonpower purposes of this multipurpose project, the license provides that the district must so construct the dam as to make possible the addition of a navigable lock at a future date. It also provides that the district must at its own expense provide flood-control storage equivalent to the flood protection now provided by the natural constriction of the channel. The district must also provide flood control by advance release of water from its reservoirs if requested by the Corps of Engineers, though for this operation the Federal Government will pay compensation to make up for the lost electric energy. It remains to be seen whether these somewhat complex arrangements can be made to function as effectively as does the unified control exemplified by TVA.

Another example of the partnership policy in action is the Puget Sound Utilities Council whereby the cities of Seattle and Tacoma, the Snohomish and Chelan Public Utility Districts and the Puget Sound Power & Light Co. are cooperating in the construction of multipurpose dams that are a part of the unified plan for the development of this watershed. The principal criticism that has been and can be made of this arrangement is that the Bonneville Power Administration and the other Federal agencies will lose their power to plan and initiate projects thereby failing to control the pace and sequence of development.

In the Pacific Southwest where the compact approach was used in the development of the water resources of the Colorado River, further promotional activity, in the lower basin at least, is moribund because the parties to the compact must await the outcome of litigation over water rights. The original weakness in the plan was that the apportionment of water to the States in the lower and upper basins had been made with inadequate records of the quantity of runoff in the river. Although much in the way of physical development has actually been accomplished, further programs under the compacting procedure will be slow and costly.