United States General Accounting Office 131454

GAO

Briefing Report to the Honorable
Howard M. Metzenbaum
United States Senate

September 1986

FEDERAL ELECTRIC POWER

Pricing Alternatives for Power Marketed by the Department of Energy

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GAO/RCED-86-186BR

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United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-223438

September 30, 1986

The Honorable Howard M. Metzenbaum
United States Senate

Dear Senator Metzenbaum:

As you requested, this briefing report identifies alternatives to current practices used by the Department of Energy's Power Marketing Administrations (PMAs) to price electric power. This report culminates a series of efforts in response to your November 8, 1984, request concerning PMA power pricing. These include an August 1985 briefing on how PMA electric power rates are established, two reports on payment of irrigation project construction costs through PMA power sale revenues, and a report on the PMAs' repayment of the federal investment in power projects.[1]

Any consideration of alternative power pricing practices should be guided by a clear statement of the objective to be achieved. The alternatives discussed in this report are categorized into those that are based on a cost-of-service objective and, as you requested, those that are based on criteria other than cost. The cost-of-service objective is the basis for existing federal and electric industry power pricing practices. It requires that the costs incurred by the government or utility to provide the electric service be recovered through electric rates. In addition to the cost-of-service objective, the PMAs have been guided by legislation and executive policy decisions designed to maintain the long-term stability of power rates at the lowest level consistent with recovering costs.

The alternatives based on cost of service are discussed in section 2 and include alternative methods for (1) computing a power project's interest costs and (2) scheduling payments to

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[1] Recovering a Portion of Federal Irrigation Project Construction Costs Through Revenues From Department of Energy Electric Power Sales (GAO/RCED-85-128, July 26, 1985), Additional Information Concerning Irrigation Project Costs and Pricing Federal Power (GAO/RCED-86-18FS, Oct. 10, 1985), and Additional Information on Repaying Federal Investments in Electric Power Facilities (GAO/RCED-86-44FS, Nov. 12, 1985).

the Treasury to repay the federal investment in power project construction and financing costs. The alternatives based on criteria other than cost of service are discussed in section 3. These include (1) alternative methods for recovering some irrigation project costs through power sale revenues and (2) eight other alternative pricing methods (such as marginal cost pricing, market pricing, and user fees) that generally depart from the traditional electric power industry and PMA approaches to setting power prices. The objectives, scope, and methodology for this report are contained in section 4.

The results of our work show that certain changes to current PMA power pricing practices could more fully identify and recover the government's costs or, in some cases, result in revenues in excess of costs. The cost-of-service pricing alternatives we identify, for instance, would generally reduce or eliminate under-recovery of costs and result in power pricing methods that are more consistent with nonfederal electric utilities. For alternatives based on criteria other than cost of service (such as user fees), revenues in excess of costs could result.

We did not estimate the overall effect of all alternative pricing methods on all PMA projects; rather, we used financial data on Bonneville Dam's second powerhouse to demonstrate some effects of the cost-of-service alternatives. We estimated, for example, that the government could recover an additional $449 million of its future interest costs (present value in 1985 dollars) and increase the reported value of total federal investment (principal) on this one project by $111 million, if changes in the computation of interest were implemented.

The various alternatives to PMA power pricing practices identified in this report provide a starting point for examining federal practices that affect PMA power pricing. However, a number of important factors that we did not address must also be considered. These include the extent to which the price of power affects consumption (price elasticity) and the effects of price increases on power customers, regional economics, and U.S. Treasury revenues. Such factors must be carefully gauged when considering the alternatives discussed in this report.

We discussed with agency officials the information obtained during the course of our work and incorporated their views where appropriate. As you requested, we did not obtain official agency comments on a draft of this report. As arranged with your office, unless you publicly release its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. If we can be of any further assistance, please contact me at 275-1441.

Sincerely yours,

Keith O. Fultz
Associate Director

Contents

ABBREVIATIONS

DOE	Department of Energy
GAO	General Accounting Office
OMB	Office of Management and Budget
PMA	Power Marketing Administration

Section 1

Background

BACKGROUND

The U.S. Department of Energy (DOE) has five Power Marketing Administrations (PMAs) that price and deliver power from 128 hydroelectric power generating facilities to customers in 33 states. These facilities were built and are operated primarily by the Department of the Interior's Bureau of Reclamation and the U.S. Army's Corps of Engineers. The five PMAs are: Alaska, Bonneville, Southeastern, Southwestern, and Western.

The PMAs generally sell wholesale power and give preference for sales to municipalities and other public agencies. All funds used to construct, operate, and maintain the federal power projects are to be repaid from power sale revenues. Construction costs are generally to be repaid, with interest, within 50 years of a project's beginning service. Operation, maintenance, and interest costs are to be repaid annually. As of September 30, 1985, the government had invested approximately $14 billion in PMA hydropower projects, about $3 billion of which has been repaid to the Treasury. For fiscal year 1985, the PMAs' budget request for operation, maintenance, and other power marketing expenses totaled about $410 million.

Federal laws and regulations require PMAs to establish power rates at levels necessary to ensure that power sale revenues are sufficient to recover all power-related costs (and, for Bonneville and Western, some irrigation project costs). The PMAs do not have authority to intentionally establish power rates at levels that would result in revenues that would exceed power-related and irrigation-assistance costs. In other words, the government has not intended that power marketing activities make a profit.

Information contained in this report is based on pricing practices used by Bonneville and Western. These two PMAs represent 94 percent of total PMA power sale revenues.

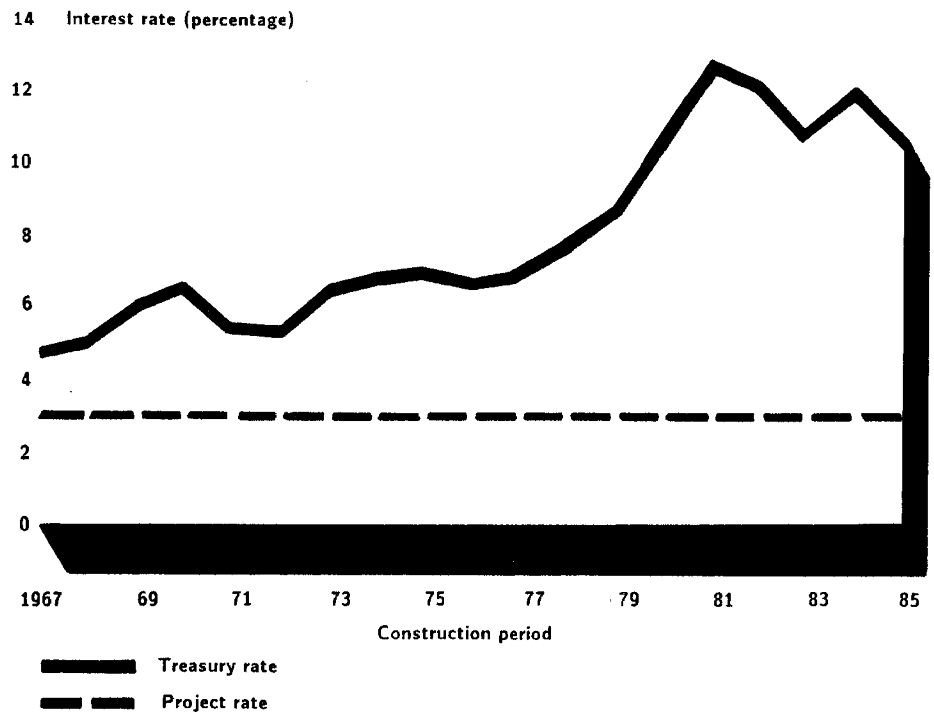
Section 2

Pricing Power to Reflect Cost of Service

Interest During Construction: Past Practices

- Practices for many PMA projects understate the federal investment
  - --Interest rate has usually been below Treasury's borrowing rate

Figure 2.1: Project Interest Rate and Treasury Interest Rate During Construction of Second Powerhouse at Bonneville Dam



- --Interest was not charged on capitalized interest for many PMA projects

- Industry practice
  - --Interest rate is established by market
  - --Interest is charged on capitalized interest

INTEREST DURING CONSTRUCTION

During a federal power project's construction period, annual interest costs are not repaid to the Treasury but are, instead, capitalized. That is, the interest is accrued during the construction period, added to the other construction costs, and considered part of the total federal investment in a project. This total investment is then repaid, with interest, during the repayment period. Therefore, the proper capitalization of interest during construction is important because it affects (1) the total amount of federal investment to be repaid from power revenues and (2) the amount of annual interest expense paid to the Treasury during a project's repayment period.

The federal investment in many Bonneville and Western projects[2] has been understated because the interest accrued during the construction of these projects has not been sufficient to fully recover Treasury's borrowing costs. This has occurred primarily because, for many of these projects, federal laws and/or policies have either required or allowed the constructing agencies (Bureau and Corps) to use

--interest rates that did not reflect Treasury's costs of borrowing funds during the projects' construction periods, and

--a simple (rather than compound) method for computing interest during project construction.[3] The simple interest method does not accrue interest on prior years' capitalized interest costs and results in underpayment of annual interest expense on these projects.

Interest costs below Treasury borrowing costs

Two financial practices, sometimes required by a project's authorizing legislation or other laws, have resulted in the understatement of capitalized interest costs in many Bonneville and Western power projects. One practice has been to establish the interest rate for power project construction funds at a level below Treasury's borrowing rate. A second practice has been to use a single interest rate, established at the start of project construction, for computing both construction period and

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[2]The term "project," as used here, refers to the original power facility and/or any major power additions that later became part of the facility.

[3]Since September 30, 1983, Bureau and Corps policies call for interest during construction to be compounded annually.

repayment period interest.[4] This second practice has resulted in the understatement of capitalized interest costs when projects were built during times of rising Treasury interest rates.

The financing for construction of Bonneville Dam's second powerhouse illustrates these two practices.[5] This major addition to the Bonneville project, built from 1967 through 1985 at a cost of about $621 million, was assigned an interest rate of 3.25 percent, which remained fixed for its entire 19-year construction period. During this time the Treasury borrowing rate ranged from a low of 4.85 percent in 1967 to a high of 12.87 percent in 1981.

Of the 30 Bonneville and Western projects we reviewed, we identified 19 where the use of these practices may have resulted in the understatement of capitalized interest costs. Also, the annual interest expenses paid to the Treasury during the repayment period on the unpaid investment in these projects may be understated because the expenses are computed on understated investment amounts.

The interest rates on money borrowed to finance nonfederal project construction, according to industry and financial-market officials, are usually those rates, established by the market, that are in effect at the time each separate increment of construction funds is borrowed. Additionally, nonfederal utilities generally obtain short-term debt during the construction period and refinance this debt through the sale of long-term bonds when the project is placed into service. The nonfederal project's repayment period interest, therefore, is based on those long-term interest rates in effect after construction has been completed.

In a previous report, we recommended that Congress require the Secretaries of the Army and the Interior to compute interest during construction using interest rates (developed by the Treasury) that more appropriately reflect Treasury's cost of borrowing funds and use the rates in effect during each year that

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[4]These matters are discussed more fully in other GAO reports. See, for example, Change Proposed in Interest Rate Criteria For Determining Financing Costs of Federal Power Program (B-167712, Jan. 13, 1970) and Reforming Interest Provisions in Federal Water Laws Could Save Millions (CED-82-3, Oct. 22, 1981).

[5]We selected this project because it is relatively recent and records on its construction costs were readily available. It may not, however, be representative of other Bonneville or Western projects. The increased Treasury revenues possible by applying the alternative methods to this project may not be representative of the increased Treasury revenues possible from other Bonneville and Western projects.

construction funds are spent.[6] Although Treasury and the constructing agencies generally agreed with our recommendation, current Bureau, Corps, and DOE regulations still require the capitalization of interest during construction using a single interest rate set at the start of project construction.

Simple interest computations understate PMA project costs

The compound-interest method results in the interest costs of prior years becoming principal; interest is therefore earned on these funds in subsequent periods. Under the simple interest method, however, there is no accrual of interest on prior years' capitalized-interest costs. In the 1981 report we stated that the use of the simple-interest method to compute interest during construction resulted in Treasury's borrowing costs not being fully recovered; we recommended that the compound-interest method be used. As discussed earlier, since September 30, 1983, Bureau and Corps policies call for interest during construction to be compounded annually. Most Bonneville and Western projects we reviewed, however, were built or were under construction before 1983 and, according to constructing agency officials, the simple-interest method was used to compute capitalized-interest costs during construction on all 30 Bonneville and Western power projects we reviewed.

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[6]CED-82-3, Oct. 22, 1981.

Interest During Construction: Alternatives

- Alternatives

  1. Set rate for interest during construction at Treasury's borrowing rate

  2. Charge interest during construction on capitalized interest (compound interest)

  3. Combine alternatives 1 and 2

- Effects

  --Federal investment more accurately stated

Table 2.1: Comparison Between Agency Method and GAO Alternatives for Computing Interest During Construction of Second Powerhouse at Bonneville Dam

	Construction costs (excluding interest)	Interest during construction	Total construction investment	Effect of alternative over agency method
	(in millions)			
Agency method: --fixed interest rate of 3.25% --simple interest method	$567.3	$55.6	$622.9	
Alternative 1: --Treasury rates when funds borrowed instead of fixed rate	567.3	150.2	717.6	+ $94.6
Alternative 2: --compound interest instead of simple interest	567.3	58.2	625.5	+ 2.6
Alternative 3: --Treasury rates when funds borrowed instead of fixed rate --compound interest instead of simple interest	567.3	166.8	734.1	+ 111.2

Note: numbers may not add because of rounding.

--PMA revenue requirements increased

Alternatives: use Treasury borrowing rates and compound interest method

We have identified three alternatives for pricing federal power to ensure Treasury's interest costs during a project's construction period are fully recovered: (1) set the interest rate during construction at the long-term Treasury rate in effect during each year of the construction period, (2) capitalize interest during construction using the compound-interest method, and (3) combine alternatives one and two. The interest rates used would be those that the Secretary of the Treasury determines to be most representative of the Treasury's long-term borrowing costs.

Either of the first two alternatives could be implemented individually but Treasury's borrowing costs would be more fully recovered and federal power financing practices closer to those of industry if both were implemented. The impact of these alternatives on Treasury revenues and the level of PMA costs to be recovered through power rates would vary, depending on how the alternatives are applied. For example, both alternatives could be applied to existing projects, or the alternative of applying annual Treasury borrowing rates could be applied to future projects only. (As discussed earlier, the compound-interest method will be used on future projects.)

If the interest-rate and the compound-interest alternatives were applied to existing projects, the unpaid balances of the federal investment in 19 of the 30 Bonneville and Western projects we reviewed would increase. We did not attempt to quantify the impact of these alternatives on all existing Bonneville and Western projects. However, to get a sense of dollar effect, we computed the combined effect of these alternatives on Bonneville Dam's second powerhouse. If these alternatives were applied to this project, the total federal investment as of the end of fiscal year 1985 would be about $734 million--$111 million more than the $623 million we estimated as the federal investment in this project.[7]

The application of these alternatives to existing projects would also affect interest paid to the Treasury during the projects' remaining repayment periods. In general, interest payments during the repayment period would increase because the annual interest expense would be calculated on larger federal investment amounts. The effects of these alternatives are discussed on page 19.

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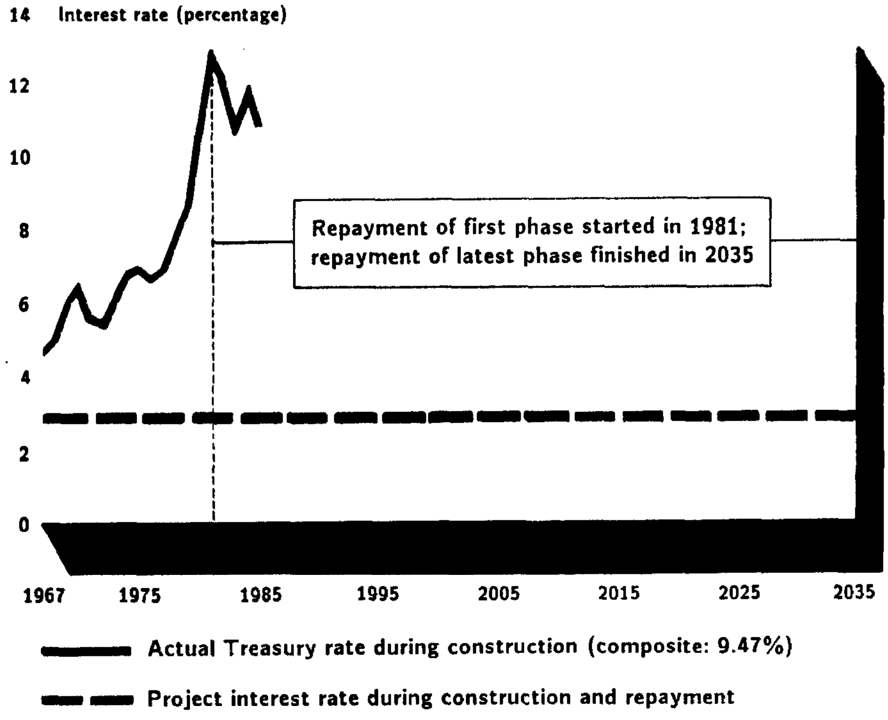
[7]Corps and Bonneville accounting records show a $621 million investment in this project. However, in making comparisons to the alternatives presented in this report, we used the $623 million federal investment estimated by our financial model. See section 5, item 5, page 38.

Interest During Repayment: Current Practice

- **PMA project interest rates are usually below Treasury's borrowing rate and understate annual interest expense**

Figure 2.2: Actual Treasury Interest Rates During Construction and Project Interest Rate During Construction and Repayment for Second Powerhouse at Bonneville Dam



- **Industry practice is that the market establishes the project interest rate at the point when the money is borrowed**

INTEREST DURING REPAYMENT

An interest charge on the unpaid federal investment in projects is normally paid to the Treasury annually during a project's repayment period and is generally computed using the interest rate assigned at or before the start of the project's construction. For Bonneville Dam's second powerhouse, this rate is 3.25 percent. This practice has been used on all 30 Bonneville and Western projects we reviewed. In earlier reports we concluded that the computation of annual interest expense on the unpaid investment--using the interest rates set at or before the start of construction--did not fully recover Treasury borrowing costs. We recommended that an interest rate more representative of Treasury's actual borrowing costs during the construction period be used to compute interest during the repayment period.[8] However, DOE policy for this practice has not changed.

When computing annual interest expense, nonfederal utilities generally use the market rates in effect at the time funds are borrowed. As previously discussed, utilities generally obtain several increments of short-term debt, each carrying its own interest rate during the construction period, and then refinance this debt with new long-term debt at market rates that are current when the project is placed into service.

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[8]B-167712 (Jan. 13, 1970) and CED-82-3 (Oct. 22, 1981).

Interest During Repayment: Alternatives

- **Alternative 1: use composite rate based on Treasury rates in effect during construction**
- **Alternative 2: combine repayment alternative 1 and interest-during-construction alternative 3 from Table 2.1**

- **Effects**

--Annual interest expense more accurately stated

Table 2.2: Comparison Between Agency Method and GAO Alternatives for Computing Interest During Repayment Period for Second Powerhouse at Bonneville Dam

	Total federal investment (principal)	Repayment interest rate	1985 annual interest expense	Present value (1985) of total future interest expense
	(dollars are in millions)			
Agency method	$622.9	3.25%	$19.9	$184.4
Alternative 1	$622.9	9.47%	$59.0	$537.9
Increase over agency method		6.22%	$39.1	$353.4
Percentage change		191%	196%	192%
Alternative 2	$734.1	9.47%	$69.5	$633.6
Increase over agency method	$111.2	6.22%	$49.6	$449.2
Percentage change	18%	191%	249%	244%

--PMA revenue requirements increased

Alternative: use composite interest rate

An alternative method for calculating project interest expenses to be applied during a project's repayment period is to use a composite of long-term Treasury rates in effect during the project's construction period. The composite rate could be an average of Treasury rates, weighted by the amount of construction funds borrowed at each rate. If applied to existing Bonneville and Western projects, which were generally built during times of rising interest rates, this alternative would more accurately reflect Treasury borrowing costs than the methods required by DOE regulations and would make federal and industry practices more consistent.

The impact of this alternative on Treasury revenues and PMA costs to be recovered will depend on how it is applied. For example, it could be applied to the current unpaid federal investment balances of existing projects and to future projects, or be limited to future projects only.

If the composite-rate alternative is applied to existing Bonneville and Western projects, Treasury's borrowing costs will be more fully recovered and the PMAs' annual interest expense will increase. For example, as shown in table 2.2, the 1985 interest expense for Bonneville Dam's second powerhouse would increase by about $39 million (from $20 million to $59 million) if the composite interest rate, which we computed to be 9.47 percent, were used throughout the repayment period. The present value of the total future interest expense to be paid on this project would increase by about $353 million. If this alternative is applied in combination with alternative 3 discussed earlier pertaining to total project construction costs (table 2.1, page 14), the amount of federal investment repaid to the Treasury for this project would increase from $623 million to $734 million, and the present value of the total future annual interest expense would increase from $184 million to about $634 million.

Interest During Repayment: Alternatives

- **Alternative 3: shorten the repayment period**

- **Effects**

  --Treasury costs resulting from the disparity between project interest rate and Treasury borrowing rate reduced

Table 2.3: Effect of a 30-Year Repayment Period on Present Value of Future Principal and Interest Payments on Second Powerhouse at Bonneville Dam

	Current repayment method	30-year repayment method	Difference
	(in millions)		
Present value of future principal payments	$ 12.9	$ 42.5	$ 29.7
Present value of future interest payments	184.4	175.5	(9.0)
Present value of total future payments	197.3	218.0	20.7

Note: numbers may not add because of rounding.

  --PMA revenue requirements increased during the shorter repayment period

Alternative: shorten the repayment period

Repaying federal investments more quickly would not correct the disparity between project and Treasury interest rates but reducing the length of the loan period (currently 50 years) would reduce the effect of below-Treasury-rate borrowing costs associated with most Bonneville and Western projects. While it is not clear to us what time period would be appropriate, we noted that the bonds that Bonneville has sold to Treasury to finance construction of its transmission system had repayment terms shorter than 50 years.[9] Although the repayment terms on those bonds ranged from 5 to 45 years, 30- to 35-year terms were the most typical, according to an official in Bonneville's Division of Financial Requirements. Nonfederal utilities also generally finance power project construction with bonds that are due approximately 30 years from the time the money is borrowed. The 30-year term is common even in instances where the project has a useful life beyond 30 years.

If repayment of existing federal power projects occurred more quickly because the repayment periods were shortened to less than the current 50 years, Treasury's costs associated with the interest rate disparities discussed above would be reduced. For example, as shown in table 2.3, the present value of the principal and interest payments to Treasury for the $623 million federal investment in Bonneville Dam's second powerhouse would be increased by $21 million (from $197 million to $218 million) if the repayment period were reduced to 30 years. Bonneville and Western officials told us that reducing the repayment period would, in the short term, increase PMA revenue requirements and payments to Treasury over current PMA projections. However, in the long term, total payments to Treasury would decrease because less interest would be paid during the shorter repayment period.

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[9]Bonneville was authorized by the Federal Columbia River Transmission System Act (16 USC 838k) to sell bonds to finance its transmission system.

Interest During Repayment: Alternatives

- **Alternative 4: establish a schedule for principal payment**

  A. Repay principal on annual basis

Table 2.4: Effect of Annual Payment of Principal on Present Value of Future Principal and Interest Payments for Second Powerhouse at Bonneville Dam

	Current method	Annual method	Difference
	(in millions)		
Present value of future principal payments	$ 12.9	$122.2	$109.3
Present value of future interest payments	184.4	151.4	(33.1)
Present value of total future payments	197.3	273.6	76.3

Note: numbers may not add because of rounding.

  B. Repay principal on other periodic basis

- **Effects**

  --Reduces Treasury's costs resulting from the disparity between project interest rate and Treasury borrowing rate

  --PMA revenue requirements will vary depending on the type of schedule selected

Alternative: establish a schedule for federal investment repayments

Similar to the previously discussed alternative of shortening the repayment period, establishing a schedule for repayment of the federal investment would not correct the disparity between project interest rates and Treasury borrowing rates. Instead, such a schedule could reduce Treasury's costs associated with the disparity by requiring payments over a period of time in lieu of the presently used method of projecting payments and then not making them if funds are needed for other purposes.

Schedules could involve payments on the federal investment in each power project on an annual or other-than-annual basis. In past reports we have recommended a schedule involving annual payments in connection with Bonneville's repayment practices.[10] Our reports focused on the need for greater assurance that Bonneville would repay the federal investment in a timely manner. We recommended that Bonneville establish a cost-based repayment system involving a fixed annual payment. As of June 1986, Bonneville had not implemented our recommendation. As shown in table 2.4, implementing this recommendation for Bonneville Dam's second powerhouse would increase the present value of payments to the Treasury by over $76 million.

An annual principal repayment requirement for each PMA power project would be more strict than the requirements generally placed on nonfederal electric utilities, which usually repay bonds at the end of the loan's term. Even though the due dates on some bonds may be staggered to provide periodic payments over the term of the loan, nonfederal utilities usually do not have regular annual repayment requirements for each power project.

Annual payments on federal power investments would also be more strict than the repayment requirements that Treasury places on the Bonneville transmission system bonds. For those bonds, Treasury requires payment at the end of the bond's term and does not arrange due dates to provide for a fixed schedule of periodic payments.

Another scheduled-payment alternative is to require some of the debt associated with each project to be repaid periodically--but not necessarily annually--throughout the repayment period. Such a schedule of periodic payments could be based on amounts

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[10] Policies Governing the Bonneville Power Administration's Repayment of Federal Investments Need Revision (EMD-81-94, June 16, 1981) and Policies Governing Bonneville Power Administration's Repayment of Federal Investment Still Need Revision (GAO/RCED-84-25, Oct. 26, 1983).

PMAs currently estimate will be made, as reflected in their repayment studies, and would be more consistent with scheduled payments that Bonneville makes on Washington Public Power Supply System bonds.[11]

A schedule of annual or periodic principal payments would reduce Treasury's costs associated with the disparity between project and Treasury interest rates for those projects where Treasury receives the payments earlier than would have occurred under the current repayment method. When principal payments are received by Treasury earlier in the repayment period, the unpaid balance of the federal investment is reduced more quickly; Treasury's costs for carrying the loans are likewise less.

An annual or periodic payment schedule may increase PMA annual revenue requirements in the first several years after implementation, depending on the payment schedule used. For example, using data provided by Bonneville and Western for fiscal years 1988 through 1991, we calculated that revenue requirements would increase an average of 3.2 percent and 7.5 percent, respectively, if federal investment payments were made on a straight line basis over a 50-year period.

According to officials at Bonneville and Western, a requirement to meet a fixed repayment schedule would mean that they would need some other method to provide cash-flow flexibility. The flexibility is needed to respond to changed conditions when actual costs and revenues differ from those forecast. Ways of providing cash-flow flexibility without increasing costs to the Treasury include

--developing a contingency fund or cash reserve through power revenues,

--obtaining the authority to borrow on a short-term basis at market rates, and

--delaying a scheduled principal payment if short of cash (current method) but paying interest at the current Treasury rate on the delayed payment.

The PMAs have not estimated the added costs of implementing these methods of improving cash-flow flexibility.

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[11]Bonneville has acquired most of the generating capability of three Washington Public Power Supply System nuclear power plants. In exchange, it pays all or part of the annual project budgets, including principal payments. The bond due dates for each project are scheduled so that Bonneville must make annual payments of principal.

Section 3

Pricing Power on Criteria Other Than Cost of Service

Current Practice for Recovering Irrigation Assistance Costs

- Two PMAs currently provide for recovering more than power cost

  --they set rates to also pay for a portion of irrigation project costs

Table 3.1: Estimated Amount of Irrigation Assistance to Be Recovered Through PMA Power Revenues as of September 30, 1984

Projects or project blocks	Bonneville	Western	Total
	(in millions)		
Completed	$ 638.9	$ 603.6	$1,242.5
Under construction	112.7	3,885.0	3,997.8
Authorized--no construction	1,912.8	6,483.8	8,396.6
Suspended	48.3	426.9	475.3
Total	2,712.7	11,399.4	14,112.1

Note: numbers may not add because of rounding.

Source: GAO/RCED-86-18FS, October 10, 1985.

Power revenues pay some irrigation costs

Although PMAs generally price electric power on the basis of cost of service, Bonneville and Western are also responsible for using power sale revenues to repay part of the costs associated with constructing Bureau of Reclamation irrigation projects (this is commonly called irrigation assistance). Irrigation assistance has been allowed by law on some projects and by administrative determination on others. If the Bureau determines that a portion of a project's irrigation construction costs are beyond the irrigation water users' ability to pay and requires the costs to be recovered from power-sale revenues, DOE requires that the irrigation assistance be repaid from power revenues within the same time period as that established for irrigation water users--usually 50 years after water is first delivered. No interest is charged on unpaid irrigation construction costs.

Bonneville and Western are not required to make annual payments on the irrigation assistance. In general, they plan to repay the irrigation assistance costs at or near the end of the repayment periods. As of September 30, 1984, over $14 billion of irrigation assistance was authorized to eventually be recovered from power-sale revenues. Of that amount, $8.4 billion was for projects that had been authorized but not yet built, as shown in table 3.1.

Methods for Recovering More Irrigation Assistance Costs

- **Alternatives**

1. **Amortize irrigation assistance over the repayment period on an annual basis**

Table 3.2: Present Value Comparison Between Agency Method and Equal Annual Installment Method for Irrigation Assistance Payments

Project name	Amount of irrigation assistance	Present value of irrigation assistance using current agency method	Present value of equal annual payments over remaining period	Difference between equal annual payment and current methods
	(in millions)			
Central Unit Project, Bonneville Unit	$ 843.0	$ 2.3	$54.7	$52.4
Colorado River Storage Project, Delores Unit	260.6	4.3	20.5	16.3
Colorado-Big Thompson Project	72.1	15.5	22.3	6.8
Chief Joseph Project, Oroville-Tonasket Unit Extension	57.7	.3	9.0	8.8
Chief Joseph Project, Greater Wenatchee Division	4.0	.1	.9	.9
Total	1,237.5	22.5	107.5	85.1

Notes: The first three projects are in Western's service area, the last two in Bonneville's.
Numbers may not add because of rounding.

2. **Charge interest on unpaid irrigation assistance balance**

- **Effects**

--Treasury's costs reduced

--PMA revenue requirements increased

Alternative: amortize irrigation assistance costs on an annual basis

Since no interest is charged on the irrigation assistance costs, deferring repayment until some point near the end of the repayment period minimizes revenues to the Treasury because of the time value of money. Repaying those costs earlier in the repayment period would result in increased Treasury revenues. As shown in table 3.2, using this alternative on five projects would increase benefits to the Treasury over the life of the projects by about $85 million (present value).

Annual amortization of irrigation costs would also increase PMA revenue requirements over the next several years. For fiscal years 1987 to 1991, the increase in Bonneville's and Western's total annual payments for power and irrigation assistance due to annual amortization of irrigation assistance costs would average about 10 percent.[12] Requiring annual amortization of irrigation assistance costs would be more consistent with the requirements for irrigation water users, who have annual payment requirements for their portion of irrigation construction costs.

Alternative: charge interest on irrigation assistance unpaid balance

This alternative would recognize the interest cost associated with funds used to construct projects. One possible approach to implementing this alternative is to identify Treasury's long-term borrowing rates in effect when funds were provided for each project and apply a composite of those rates to the unpaid balance of irrigation assistance on the project. Charging interest on the unpaid balance of irrigation assistance costs, however, would not be consistent with the requirements for irrigation water users, since Congress has not authorized interest charges on irrigation construction costs.

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[12]The estimated 10-percent increase in principal payments is based on the assumption that amortization of irrigation assistance will not affect the PMAs' schedule of payments on power projects developed using the current repayment study method. Because of the way the repayment study seeks to minimize total costs, however, a corresponding decrease in projected payments on power projects could result if irrigation assistance is amortized. The net effect on principal payments would then be less than 10 percent and the full benefit to the Treasury from amortizing irrigation assistance costs presented in this analysis may not be realized.

Other Alternative Methods

- **These alternatives generally depart from PMA and nonfederal utility cost-of-service pricing practices**

Table 3.3: Alternative Pricing Methods

Pricing method	Description
Retain existing rate after investment repaid	After federal project costs are repaid, retain existing rates to provide revenues above costs
Rate of return on investment	Determine an appropriate rate of return on the investment and include that amount in total costs
Marginal cost pricing	Set power rates equal to the cost of producing the last unit of power
Avoided cost pricing	Set power rates equal to the buyer's cost of generating power or acquiring it from another source
Market pricing	Charge what the market will bear through competitive bids or other arrangements
Cost plus user fee	Add to total costs a user fee based on the difference between the rate as set by the present system and the cost of privately owned power (for example, a user fee could be one-half of this difference)
Regional or national average rates	Set power rates equal to the average of rates set by other utilities
Market interest rates	Include in total costs an annual adjustment to interest costs on outstanding investment to reflect current Treasury borrowing costs

Other alternative methods

In addition to recovering irrigation project costs through power revenues, a number of other methods could provide revenues above PMA power costs. The alternative methods listed in table 3.3 represent a few such possibilities. Unless otherwise indicated below, these alternative power pricing methods generally depart from PMA and nonfederal utility cost-of service pricing practices.

The first alternative--retain existing rate after investment repaid--recognizes that when federal power investments are repaid, total costs and total revenue requirements to be recovered through power rates may decline.[13] At that time, the PMAs (using current cost-recovery criteria) would likely adjust rates downward to reflect the lower costs. However, if the PMAs retained the power rate in effect before the federal investments were repaid and credited that money to the Treasury, revenues above costs could occur. As a result, the Treasury would benefit from decreased power-system costs. This alternative would also increase revenues to the Treasury without increasing PMA revenue requirements. Treasury revenues would increase as the debts for more power and irrigation projects are repaid and then, if rates were not increased, decline as future equipment replacements and increases in annual operation and maintenance costs raise total power-system costs.

The rate-of-return-on-investment alternative is one component of power-pricing methods used by investor-owned utilities. The rate of return approved by regulatory authorities is generally the weighted average cost of debt, preferred stock and common equity. Regulatory authorities consider the rate of return a cost in determining the revenue requirements of investor-owned utilities.

Marginal-cost pricing for PMAs could involve setting power rates equal to the cost of producing power from the last generating unit completed. In times of generally rising costs, this pricing method could produce revenues above costs. Marginal-cost pricing currently has some limited applicability in pricing certain units of power and is sometimes used to differentiate rates based on seasonal or time-of-day usage. Generally, however, utilities do not use this method to set overall revenue requirements.

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[13] Generally, Bonneville and Western plan to repay irrigation assistance costs with power revenues after the power investments have been repaid. Therefore, total revenue requirements may not decline significantly until after irrigation assistance costs have been repaid.

Avoided-cost pricing, like marginal-cost pricing, has some limited applicability in pricing certain units of power. It is used to identify the maximum costs that an electric utility is required to pay for purchases of electric power from co-generators and small power producers. For PMAs, avoided-cost pricing could involve determining the PMA customers' costs of acquiring power from a source other than the PMAs, and using that cost as a basis for pricing the PMA power.

Market pricing uses competition among buyers and sellers to establish prices. The power could be sold to the highest bidder or the price could be negotiated between buyer and seller. The resulting price could be above or below the level necessary to recover all of the seller's costs.

The cost-plus-user-fee method was proposed by the President's Private Sector Survey on Cost Control (Grace Commission). The user fee was intended to raise the rates of PMA power users to partially compensate the federal government for the special benefit of lower power rates available to the power users.

Setting PMA power rates on the basis of regional or national average rates is another alternative that may establish revenue requirements above costs. In general, Bonneville and Western's wholesale power rates have been below national average rates.

Using market interest rates on all outstanding PMA debt was proposed for the PMAs by the Office of Management and Budget. This alternative could result in obtaining revenues above currently defined costs for most existing power projects because those projects were constructed during periods when Treasury's actual borrowing rates were below 1985 market rates. Under this proposal, interest rates would be indexed to Treasury's cost of borrowing and could vary annually (variable interest rates).

Section 4

Objectives, Scope, and Methodology

OBJECTIVES

The objectives of our review were to:

--identify alternative methods for pricing federal electric power that could (1) more fully recognize and recover power project costs and (2) recover more than power project costs, and

--contrast federal pricing practices with the practices used in the nonfederal sector for comparable power.

SCOPE AND METHODOLOGY

We focused our efforts on debt repayment and the determination of revenue requirements and limited our work to the pricing of power by the two largest PMAs, Bonneville and Western. Collectively, they represent 94 percent of PMA power sales and 83 percent of total federal investment in PMA power projects. Except for irrigation assistance costs, which are primarily fiscal year 1984 data, financial data in this report are current as of the end of fiscal year 1985.

To obtain information on power project costs and repayment practices, we reviewed detailed records on federal investments and repayments and interviewed Bonneville and Western officials responsible for financial records and federal repayment analyses. We also obtained information from the Department of the Interior's Bureau of Reclamation and the U. S. Army's Corps of Engineers, the constructing and operating agencies for most Bonneville and Western power projects. Finally, we reviewed reports and studies by the Department of Energy, the Interior and Energy inspectors-general, and our own prior reports on multipurpose federal water projects and federal power marketing.

To obtain information on irrigation project construction costs to be recovered through power-sale revenues, we relied on our work for two previous reports: Recovering a Portion of Federal Irrigation Project Construction Costs Through Revenues from Department of Energy Electric Power Sales (GAO/RCED-85-128, July 26, 1985) and Additional Information Concerning Irrigation Project Costs and Pricing Federal Power (GAO/RCED-86-18FS, Oct. 10, 1985).

To compare power pricing practices at Bonneville and Western with practices in the rest of the electric-power industry, we obtained information on industry practices primarily through interviews with the Edison Electric Institute (an industry association that represents investor-owned utilities), the American Public Power Association (an industry association that represents public utilities), the Federal Energy Regulatory Commission (which regulates interstate sales of wholesale electric power), and the investment firms of Smith Barney and Salomon Brothers. We also obtained information from interviews with selected public accounting firms (Arthur Andersen & Co. and Coopers and Lybrand), investor-owned utilities (Puget Sound Power and Light Company, and Virginia Power), and some Washington State public utilities (Seattle City Light and both the Chelan County and Grant County Public Utility Districts).

To identify and examine alternatives that would (1) more fully reflect the PMAs' cost of service or (2) base power-pricing decisions on criteria other than cost of service, we reviewed recent legislative proposals, our own prior reports, DOE inspector-general report, and the report of the President's Private Sector Survey on Cost Control. We also conducted our own analysis of PMA pricing practices and compared them with industry practices.

Throughout section 2 of the report we use data on Bonneville Dam's second powerhouse to demonstrate the effect on the Treasury of current PMA pricing practices and the benefit to Treasury of alternatives that would more fully recover power costs. These analyses involve a comparison between the present value of principal and interest payments using the current repayment method and alternative methods. Assumptions used in these computations, unless otherwise specified, include the following:

--The base year is fiscal year 1985; all future payments are discounted to 1985 using the 1985 long-term Treasury interest rate.

--The interest rate for the current method of repaying the federal investment is 3.25 percent, the repayment schedule is that projected in Bonneville's 1985 revenue requirements study, and the interest accrued on the government investment during the repayment period is paid off annually in full.

--The rates for interest and principal repayment alternatives are the average of the actual long-term Treasury interest rates in effect during each construction year when the federal investments were made.

--Interest and principal payments are to be made at the end of the year.

Several limitations apply to our work. First, some of the alternatives discussed may not be consistent with current federal law. We did not, however, determine the extent to which each alternative would be permitted under existing laws for federal power projects and power marketing. Second, we did not determine the effects of the alternatives on the PMAs' ratepayers. Third, we did not determine the overall effect of the alternatives on PMA power sales or Treasury revenues. Fourth, we did not independently verify the financial data on federal power investments and repayment. Fifth, since we did not use a statistically valid sampling method to select our project example (Bonneville Dam's second powerhouse), the total amount that the Treasury could recover if the alternatives were applied to all existing Bonneville and Western projects cannot be projected further.

We performed our review between October 1985 and June 1986. We discussed with agency officials the information obtained during the course of our work and incorporated their views where appropriate. As you requested, we did not obtain official agency comments on a draft of this report.

Section 5

Data Sources and Assumptions

DATA SOURCES AND ASSUMPTIONS

Item no.	Amounts in millions	Source/Assumptions
		Figure 2.1
1.		Treasury rates based on annual yield (nominal) for long-term Treasury bonds from Business Conditions Digest, September 1985 and June 1986.
2.		Project interest rate (3.25 percent) based on Corps construction accounting records.
		Table 2.1
3.	$567.3	Actual amount of federal investment placed in service through fiscal year 1985, from Corps accounting records.
4.	$ 55.6	GAO estimate of interest during construction assuming an interest rate of 3.25 percent and simple-interest method. Actual amount of interest during construction transferred to plant-in-service was $53.3 million, per Corps accounting records. We assumed that (1) interest during construction was capitalized for one-half the year for the initial year of investment and for the year an investment transfers to plant-in-service (except the fourth increment, since interest was not capitalized after 1984) and (2) annual investments were applied to the four plant-in-service increments on a first-in, first-out basis, because actual data were not readily available from the Corps. We used the GAO estimate of $55.6 million instead of actual Corps data so that all the figures being compared would be based on the same assumptions.
5.	$622.9	GAO estimate of total capitalized investment, assuming an interest rate of 3.25 percent and the simple-interest method of capitalizing interest during construction. Actual amount was $620.6 million, per Corps accounting records. Difference of $2.3 million is caused by estimating procedure for interest during construction discussed in item 4 above.

Item no.	Amounts in millions	Source/Assumptions
		Table 2.1 (continued)
6.	$150.2	GAO estimate of interest during construction, assuming annual long-term Treasury interest rate in effect during each year of construction period and simple-interest method. First and last year's interest and interest capitalization were computed as described in item 4 above.
7.	$717.6	GAO estimate of total capitalized investment assuming plant-in-service amounts from Corps accounting records and interest during construction costs of $150.2 million, computed as described in item 6 above.
8.	$ 58.2	GAO estimate of interest during construction using the Corps' project interest rate (3.25 percent) and compound-interest method. First and last year's interest and interest capitalization computed as described in item 4 above.
9.	$625.5	GAO estimate of total capitalized investment assuming plant-in-service amounts from Corps accounting records and interest during construction costs of $58.2 million, computed as described in item 8 above.
10.	$166.8	GAO estimate of interest during construction using long-term Treasury interest rates in effect during each year of the construction period and the compound-interest method. First and last year's interest and interest capitalization computed as described in item 4 above.
11.	$734.1	GAO estimate of total capitalized investment assuming plant-in-service amounts from Corps accounting records and interest during construction costs of $166.8 million, computed as described in item 10 above.

Item no.	Amounts in millions	Source/Assumptions
		Figure 2.2
12.		Treasury rates as described in item 1 above.
13.		Composite Treasury rate computed as a weighted average of the long-term Treasury rates in effect during the year when the funds were borrowed. These rates were weighted by the annual construction costs from Corps accounting records plus interest accrued up to the project's in-service date.
14.		Repayment period was based on data from Bonneville's 1985 revenue-requirements study.
		Table 2.2
15.	$622.9	See item 5 above.
16.	$ 19.9	GAO estimate of 1985 annual interest expense. We assumed 1985 investment increment was placed into service in mid-year and therefore the 1985 interest expense on this investment increment was computed at one-half the project interest rate, in accordance with Bonneville procedures. Interest expense on prior years' investment increments was computed using the project interest rate (3.25 percent).
17.	$184.4	GAO estimate of present value (1985) of total future interest payments. Interest payments are discounted to 1985 using Treasury's 1985 long-term interest rate (10.75 percent). We assumed principal payments are made in the years scheduled in Bonneville's 1985 revenue-requirements study and interest expenses are paid annually using the project interest rate (3.25 percent).
18.	$ 59.0	GAO estimate of 1985 annual interest expense, assuming investment data from item 5 above, composite Treasury rate, and annual interest expense calculation method explained in item 16 above.

Item no.	Amounts in millions	Source/Assumptions
		Table 2.2 (continued)
19.	$537.9	GAO estimate of present value (1985) of total future interest expense assuming investment data from item 5, above, composite Treasury rate, and calculation methods and assumptions explained in item 17, above.
20.	$734.1	From table 2.1. See item 11.
21.	$ 69.5	GAO estimate of 1985 annual interest expense, assuming investment data using Treasury rates when funds borrowed, compound-interest method from item 11, above, and composite-interest rate. We also assumed the 1985 investment increment was placed into service in mid-year, and therefore the 1985 interest expense on this investment increment was computed at one-half the project interest rate, in accordance with Bonneville procedures.
22.	$633.6	GAO estimate of present value (1985) of total future interest expense, assuming investment data from item 11, above, and principal payments made in the year scheduled in Bonneville's 1985 revenue-requirements study. We also assumed that interest payments are paid annually, using the composite-interest rate, and interest payments are discounted to 1985 using Treasury's 1985 long-term rate (10.75 percent).
		Table 2.3
23.	$ 12.9	GAO estimate of present value (1985) of total future principal payments. We assumed principal payments are made as scheduled in Bonneville's 1985 repayment study and we discounted the payment to 1985 using Treasury's 1985 long-term interest rate (10.75 percent).
24.	$ 42.5	Same as item 23, above, but assuming principal payments repaid within 30 years.
25.	$184.4	From table 2.2. See item 17.

Item no.	Amounts in millions	Source/Assumptions
		Table 2.3 (continued)
26.	$175.5	GAO estimate of present value (1985) of total future interest payments. Interest payments are discounted to 1985 using Treasury's 1985 long-term interest rate (10.75 percent). We assumed principal payments are made within 30 years of project in-service dates and interest expenses are paid annually using the project interest rate (3.25 percent).
		Table 2.4
27.	$ 12.9	From table 2.3. See item 23.
28.	$122.2	GAO estimate of present value (1985) of total future principal payments. We assumed equal annual principal payments over the remaining years of the repayment period, discounted to 1985 using Treasury's 1985 long-term interest rate (10.75 percent).
29.	$184.4	From table 2.2. See item 17.
30.	$151.4	GAO estimate of present value (1985) of total future interest expense, assuming annual interest payments on a declining principal balance, discounted to 1985 as described in item 28, above.
		Table 3.1
31.		Bureau of Reclamation irrigation project records.
		Table 3.2
32.		GAO estimates as presented in our report, GAO/RCED-86-18FS, Oct. 10, 1985.

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