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WATER MARKETS

Increasing Federal Revenues Through Water Transfers

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Resources, Community, and
Economic Development Division

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The Honorable Bill Bradley
Chairman, Subcommittee on Water and Power
Committee on Energy and Natural Resources
United States Senate

Dear Mr. Chairman:

While over 80 percent of the water in the arid western United States is used for agricultural purposes, the demand for water for urban, recreational, and environmental uses is growing. The federal government plays a role in water management in the West primarily through water resource projects. Using federal funds, the Department of the Interior's Bureau of Reclamation plans, constructs, and operates these projects to provide irrigation water to arid and semiarid lands in the 17 western states. The Bureau's projects also provide water for municipal and industrial purposes; hydroelectric power generation; recreation; and what are termed fish and wildlife purposes, such as providing habitat. The Bureau provides most of its irrigation water to water and irrigation districts that obtain the use of the water through contracts. Through service or repayment charges to water contractors, the Bureau, over time, recoups a portion of the federal government's investment in providing the water.

Water transfers, in which rights to use water are bought and sold, are seen by many resource economists as a mechanism for reallocating scarce water to new users by allowing those who place the highest economic value on it to purchase it. Those who want more water—such as municipalities—often are willing to pay considerably higher prices for it than the current users. Irrigators who receive subsidized water from federal projects may want to transfer this water to a municipality at a higher price if they can profit from the transaction. At the same time, such transactions may allow the Bureau of Reclamation to share in the profits, thereby reducing the costs to the government of providing the subsidized water.

In response to your request, we have examined how federal revenues might be increased through market transfers of water provided from the Bureau's projects. Specifically, we examined (1) whether water transfers will increase revenues, (2) how the Bureau could increase its revenues from transferred water, and (3) what issues the Bureau should consider in

establishing how much to charge for transferred water. We did not examine how additional revenues should be used.

Results in Brief

Water transfers from irrigation to municipal and industrial uses can increase federal revenues because municipal and industrial users pay rates based on their full share of the project's construction costs plus interest. In contrast, many irrigators pay only a portion of their share of the construction costs and are exempt from paying interest. Revenues may not increase when water is transferred for irrigation, fish and wildlife habitat, or recreation because users do not usually pay the full share of the project's construction costs for these purposes.

The Bureau's current guidance does not specify how charges for transferred water will be determined. The Bureau could use several methods to increase its proceeds from transfers to municipal and industrial uses, which better reflect the government's costs of providing the water. Under existing law, the Bureau can (1) charge interest at current Treasury borrowing rates in some cases, (2) compound interest charges, (3) recover subsidies associated with irrigation water that is transferred to municipal and industrial uses, (4) recover costs throughout the useful life of the project, and (5) charge amounts that are higher than necessary to recover costs or charge transfer fees. In addition, changes in reclamation law could allow the Bureau to charge new municipal and industrial users interest at current Treasury borrowing rates even when a lower interest rate is specified in the water project's authorizing legislation.

The key issue in deciding how much the Bureau should charge for transferred water is the need to balance increasing federal revenues with retaining incentives for water transfers to occur. Increasing federal revenues will reduce the net benefits to the buyers and sellers, thereby discouraging some transfers. Charges that discourage transfers therefore preclude any gains in the efficiency of water use and economic efficiency made possible by the transfers. Because the factors affecting transfer incentives vary for each transaction, the amount that can be charged without discouraging transfers will differ case by case.

Background

Under the Reclamation Project Act of 1939, as amended, (43 U.S.C. 485h) the Bureau allocates a federal water project's construction costs among the project's uses, including irrigation, municipal and industrial uses,

power generation, fish and wildlife purposes, and flood control. Different users are required to pay different amounts of the construction costs allocated to their purpose. Under section 9, the act provides two options for users to pay for the water—repayment contracts and water service contracts. Repayment contracts require the repayment of construction costs within the contract period. Under water service contracts, the Bureau can set water charges at levels that will produce revenues at least sufficient to recover an appropriate share of the annual operation and maintenance (O&M) costs and an appropriate share of fixed charges that the Secretary deems proper. Both contracts cannot exceed 40 years in length, but water service contracts can be renewed at the end of the contract period.[1]

Some irrigators have transferred water provided from the Bureau's projects to other users. As discussed in our May 1994 report,[2] water markets facilitate voluntary transfers of water by providing users with financial incentives for reallocating water. Buyers will enter into transactions only if they provide a less expensive supply of water than alternative sources, and sellers will enter into transactions only if they provide greater net income than the current uses of the water. Markets increase economic efficiency by allowing those who place the highest economic value on the water to purchase rights to use it.

Moreover, as water becomes more valuable and prices rise, markets provide water users with incentives to conserve water, thereby freeing up water for other uses. The conservation of irrigation water can also reduce environmental degradation caused by agricultural runoff and drainage. Environmental quality can be protected if those concerned, such as government agencies and private conservation groups, can purchase water rights for this purpose. However, water transfers can cause adverse economic, social, and environmental impacts on parties not involved in the transfers by changing water use patterns. For example, rural agricultural economies may decline if significant amounts of water are transferred from irrigators to cities. Existing laws and procedures may not fully protect third parties from these impacts. We discuss these issues and impediments to transfers in our May 1994 report.

[1]Irrigation contracts allow for a development period of up to 10 years in addition to the contract period.

[2]Water Transfers: More Efficient Water Use Possible, If Problems Are Addressed (GAO/RCED-94-35, May 23, 1994).

Transfers of water provided from federal projects must be approved by the federal government. Many transfers of Bureau-provided water—particularly long-term transfers—will require amending contracts. For example, if an irrigation contractor agrees to transfer water to a municipality, the Bureau would modify the irrigation contract to reduce the deliveries to the irrigator and establish a new contract to deliver water to the city purchasing it. The new contract would include the amounts to be paid to the government for the municipal and industrial water. In addition to the amounts owed to the government, the purchasing city would also likely pay the irrigation contractor for giving up contractual rights to the water—otherwise, the irrigation contractor might have no incentive to give up these rights.

In December 1988, Interior issued its principles governing voluntary transfers of water that involve facilities it owns or operates. The principles indicate that Interior will serve as a facilitator for water marketing proposals between willing buyers and sellers if the proposals satisfy certain conditions. The principle relating to repayment obligations to the federal government states that the agency will not burden a proposed transfer with extra costs, but will ensure that the government is financially, operationally, and contractually in the same or a better position once a transfer is made. This principle indicates that Interior will try not to discourage transfers through extra costs owed the government, which would increase the costs to the buyers and reduce profits to the sellers. The Bureau issued criteria and guidance to implement Interior's principles in 1989.

The Bureau is currently reviewing the principles to identify barriers to the transfer process and to ensure that its guidance is consistent with administration policies.

Revenues Will Often Increase Through Transfers to Municipal and Industrial Uses

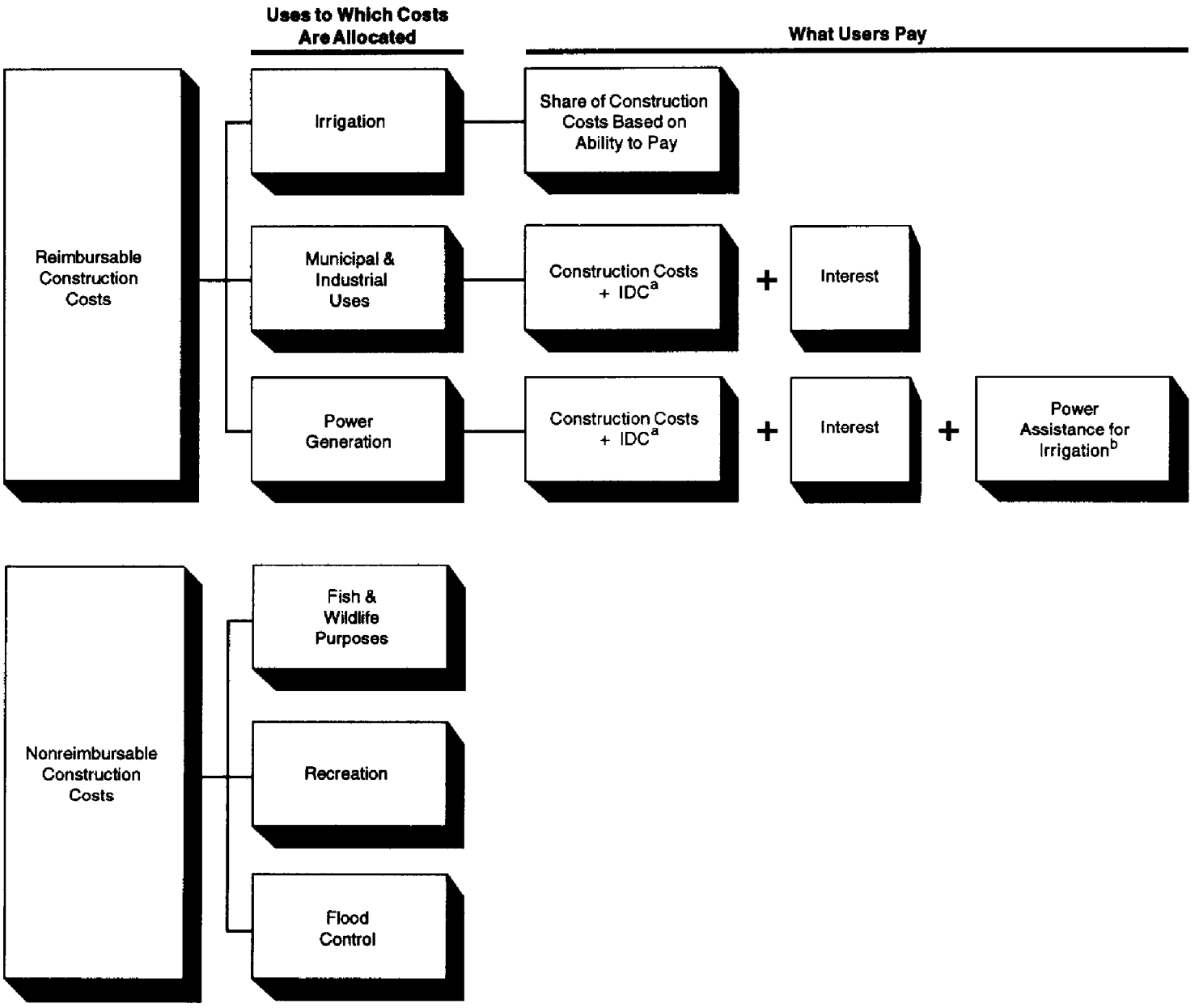
Under existing reclamation law and the Bureau's procedures, in many cases federal revenues will increase when water is transferred from irrigation to municipal and industrial uses because municipal and industrial users are required to pay higher rates based on their full share of the project's construction costs plus interest. If water is transferred from one irrigation contractor to another, or for recreation or fish and wildlife habitat, then revenues may not increase. The revenues to the federal government change because the Bureau charges different costs for different uses of the water.

Municipal and Industrial Users Generally Pay More for Water From the Bureau's Projects

As figure 1 illustrates, irrigators pay an allocated portion of a project's construction costs that is based on a determination of their ability to pay. By law, irrigators within specified acreage limitations pay no interest charges. Because of this, irrigation water is considered to be subsidized. In contrast, municipal and industrial users pay all of the construction costs associated with water they use and pay interest charges. Revenues generated through the sale of hydroelectric power produced by federal projects are used to pay not only the construction costs and interest associated with power generation, but also the portion of the irrigators' construction costs deemed beyond the irrigators' ability to pay. This amount, referred to as power assistance, is paid without interest generally in the final year of the project's repayment period.[3] Irrigators, municipal and industrial users, and power users also must pay annual O&M expenses. Other purposes of water projects, such as providing recreation, fish and wildlife habitat, and flood control, often are nonreimbursable in whole or in part—that is, the associated costs are not repaid by project users.

[3]For some projects, similar assistance is provided by municipal and industrial users.

Figure 1: Typical Repayment Obligations for the Users of the Water From Federal Projects



[a]IDC is interest during construction.

[b]These costs are paid at the end of the repayment period. All other costs are paid on an annual basis.

When water is transferred from irrigation to municipal and industrial uses, the Bureau charges the higher amount owed for the water, which increases federal revenues in many cases.[4] The Bureau has indicated in its criteria and guidance governing water transfers that subsidies associated with the original use of the water are not transferable to a different use of the water. That is, the irrigation subsidies of the power assistance and the waived interest charges cannot be applied to water once it is transferred to municipal and industrial uses.[5] However, water transferred from one irrigation use to another would retain the subsidies associated with irrigation, and federal revenues would not increase.

If water is transferred for fish and wildlife habitat or recreation, then revenues may not increase.[6] The Bureau's transfer criteria and guidance indicate that when a change in use occurs from a reimbursable use, such as irrigation, to a nonreimbursable use, such as providing fish and wildlife habitat, unless special legislation is enacted, the new contracts must ensure that the repayment to the government will be no less than before the transfer. According to Bureau officials, however, to increase federal revenues, the Bureau may negotiate a price with water purchasers who are willing to pay more.

The Emery County Project's Transfers Increased Federal Revenues

We reviewed two transfers that took place in the Bureau's Emery County Project in Utah, which was built primarily to deliver 28,100 acre-feet[7] of water per year for irrigation. The first transfer involved 6,000 acre-feet of irrigation water transferred to the Utah Power and Light Company in 1972. The second transfer involved 2,576 acre-feet of irrigation water to the same company in 1987. In both cases, the Bureau charged new amounts for the water that included interest payments and an adjustment in the power assistance.

[4]Under the Reclamation Reform Act of 1982, as amended, (43 U.S.C. 390aa to zz-1), however, irrigators who exceed specified acreage limitations are required to pay full cost for their irrigation water, which includes construction costs and O&M deficits with interest. In these cases, the amounts charged for water transferred to municipal and industrial uses may not increase federal revenues.

[5]Water that is transferred to electric utilities is considered municipal and industrial water. Power as described here refers to power generated by the project that is sold directly to federal contractors, rather than water that is transferred to electric utilities.

[6]Water generally would not be transferred for flood control because water is not needed to meet this purpose.

[7]An acre-foot is the amount of water needed to cover 1 acre of land to a depth of 1 foot—or about 326,000 gallons.

We compared the 1993 present value[8] of the government's revenues if all the water had remained in irrigation with the present value of revenues resulting from the transfers, based on the amounts actually charged by the Bureau for the water transferred to municipal and industrial uses.[9] If the transferred water had remained in irrigation and irrigators had continued repaying the construction costs allocated to them without interest for the entire 50-year repayment period, the government's financial loss on its initial investment would have been about $76.8 million, with less than 8.6 cents being paid back for each dollar spent by the government. With the transfers to municipal and industrial uses, the government's loss was reduced to $67.7 million of its initial investment—$9.1 million less—with about 19.5 cents being repaid for every government dollar spent. Our calculations are explained in more detail in appendix I.

The Bureau Could Further Increase Federal Revenues

The Bureau's current guidance on water transfers limits cost recovery and does not specify how charges for municipal and industrial water will be determined. Under current law, the Bureau could enhance revenues by charging amounts that better reflect the costs to the government of providing the water. The Bureau could do this by (1) charging interest rates based on Treasury borrowing rates in some cases, (2) compounding interest charges, (3) recovering past subsidies associated with transferred water, (4) recovering costs throughout the useful life of the project, and (5) charging amounts higher than necessary to recover costs or charging transfer fees. Changes in reclamation law would be needed to charge current Treasury borrowing rates for projects whose authorizing legislation specified certain interest rates for repayment. The Bureau has stated in its guidance that it will avoid charges for costs owed the government that might cause financial or economic disincentives to transfers.

[8]All reported values are calculations based on the 1993 present value, unless otherwise indicated, using interest rates on 10-year Treasury bonds. Present value is used to compare dollar values over time because it recognizes the value that money earns over time as it is invested. The present value was calculated at annual discount rates equal to the 10-year Treasury bond rates through 1993. After 1993, we used a forecast of the same rate as given by Data Resources Incorporated in Review of the U.S. Economy: Long-range Focus (Winter 1992-93), pp. a100-a101. This approach results in the equivalent of a variable rate loan based on a 10-year Treasury bond rate.

[9]We based our calculations of repayment on the Bureau's initial figure for construction costs, $11,255,678, which includes $10,583,526 in construction costs at the time of the project's completion in 1970 plus interest during construction. The present value of these construction costs in 1993 dollars is about $84,044,000. We did not include in our estimate additional construction expenditures incurred in later years.

Revenues Can Be Increased Using Water Service Contracts

Under the Reclamation Project Act, the Bureau has two options for contracting municipal and industrial water that affect the amounts it can charge. Section 9(c)(1) of the act authorizes the Bureau to enter into repayment contracts to recover costs allocated to the municipal and industrial purpose and limits the interest rate in such contracts to 3.5 percent per year. In contrast, section 9(c)(2) authorizes the Bureau to enter into water service contracts and set water charges at levels that will produce revenues at least sufficient to recover an appropriate share of annual O&M costs and an appropriate share of fixed charges that the Secretary deems proper. It is at the discretion of the Secretary to determine what form of contract is used. However, because of the flexibility provided under water service contracts, the Bureau can increase revenues in the following ways:

1. Charging higher interest rates. Interior's Solicitor has indicated that section 9(c)(2) does not set a limit on the interest rates that can be charged in water service contracts.[10] As a result, under water service contracts, the Bureau can charge current Treasury borrowing rates, which better reflect the government's costs—these rates have been between 6 and 10 percent (nominal)[11] since 1986—rather than the 3.5 percent charged under repayment contracts. The Bureau's transfer guidance does not indicate when repayment contracts, with their fixed interest rate, or water service contracts, with no specified interest rate, should be used for transferred water. Regarding interest rates, the guidance simply indicates that a current repayment interest rate should be used, unless otherwise provided by law, but the guidance does not define what is meant by a current repayment interest rate.

The interest rate the Bureau uses in determining charges can greatly affect federal revenues. For example, the Bureau used the authorized interest rate of 3.046 percent, compounded, in calculating the amount charged for Emery County water transferred in 1972. We calculated the increased revenues that the federal government would have received if the Bureau had used a more current interest rate for repayment. If the amounts charged had been based on a 7-percent interest rate, the government would have received about $8.35 million more (in 1993 present value) than it will receive from the actual charges.

[10]Memorandum from the Associate Solicitor, Energy and Resources, to the Commissioner, Water and Power Resources Service, Oct. 15, 1980.

[11]Nominal interest rates are not adjusted for inflation.

Low interest rates may be justified on the grounds that federal water projects result in benefits that extend beyond the direct benefits to the water users. For example, historically, water projects were an essential part of settling the arid western states and promoting economic development. However, current national interests, such as water conservation, environmental protection, and federal cost recovery, raise the question of whether low interest rates should be maintained for water transferred to new users.

2. Compounding interest charges. The Bureau's guidance does not indicate when or whether interest rates should be compounded. Compounding interest rates can significantly increase federal revenues and better reflect the government's actual costs in constructing water projects. Interest charges are compounded if they are added to the principal periodically and future interest charges are then based on this larger principal. Compounding more accurately represents the government's costs than simple interest because interest is routinely compounded in the private sector—federal money spent on a federal project could have been reinvested elsewhere, such as in a bank, and earned compound interest. Moreover, in cases in which the government borrows money to construct a project, it has to pay compound interest to the lenders.

In the 1987 transfer in Emery County, the Bureau made a one-time charge based on Treasury borrowing rates, but the amount charged was not based on compound interest. To demonstrate the effect of compounding interest rates, we calculated how much the government's charge for the 1987 transfer would have been if it was based on compound instead of simple interest. Our calculations show that federal revenues would have been about $2.8 million more than the actual charge of $2.9 million—about $4.44 million more in 1993 present value.[12] Since there is no legal limit on interest charged through water service contracts, compounding interest, which increases the interest costs, is permissible under the Reclamation Project Act of 1939.

3. Recovering subsidies associated with irrigation. The Bureau could increase federal revenues by charging the full interest and power assistance costs associated with water transferred from irrigation to municipal and industrial uses. In August 1992, Interior's Inspector General

[12]The Bureau offered Utah Power and Light a price that included the Bureau's calculation of compounded interest rates, to be paid over 30 years rather than in a lump sum. However, this price was offered after the Bureau and the utility had negotiated a price that included simple interest, and the utility protested the change. The water was sold to the utility for the price that included simple interest.

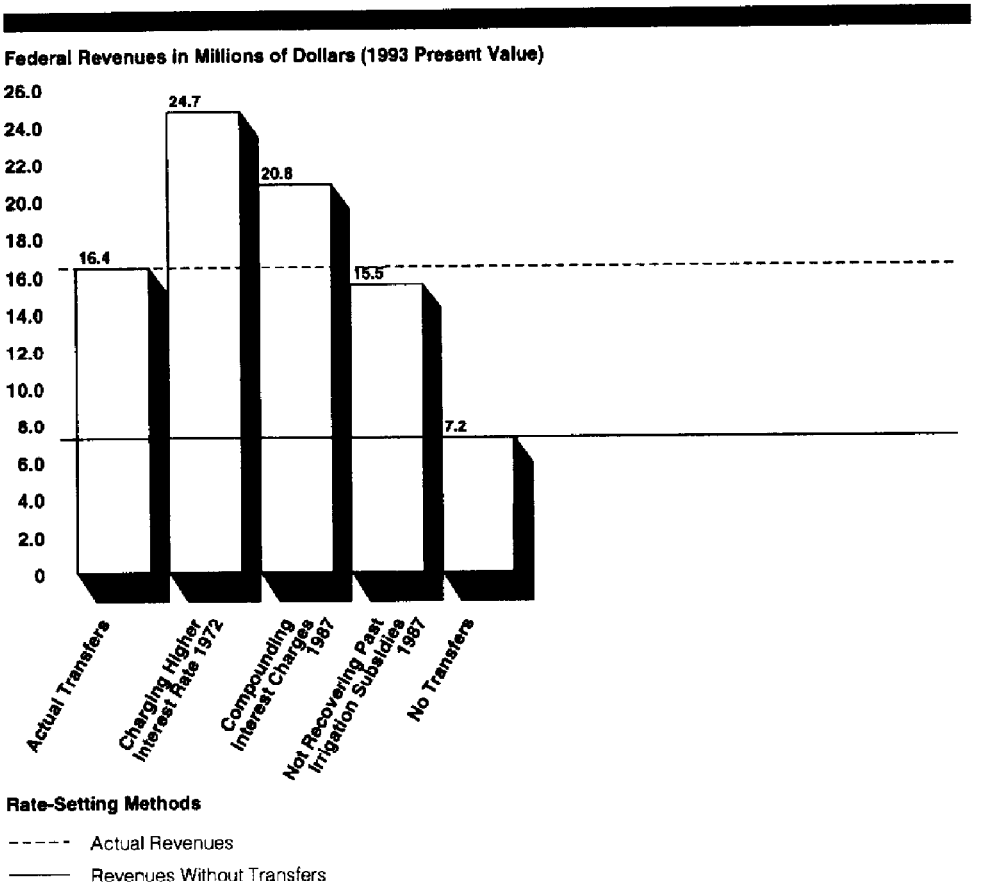
reported[13] that the Bureau was not fully recovering the costs associated with water that was converted from irrigation to municipal and industrial uses in part because it only charged interest from the date the water was transferred, rather than from the date of the project's completion. The Bureau's guidance states that the Bureau will only include interest charges on transferred water for the remaining years of the project's repayment period; it will not recover interest associated with the transferred water for the time it was used for irrigation. The Bureau has indicated that it does not intend to recover subsidies originally allocated to the transferred water during the time it was used for irrigation. The Inspector General recommended that the Bureau's guidance be revised to recover an equitable share of the financing costs incurred from the date of a project's completion. The Bureau currently is examining this issue at the request of Interior's Assistant Secretary for Policy, Management, and Budget.

Before Interior's principles were issued in 1988, the Bureau charged the purchaser in the 1987 transfer from the Emery County Project an amount that included simple interest at current Treasury rates as well as the power assistance amount associated with the transferred water, calculated from the date of the project's completion rather than the date of the transfer. If the Bureau's guidance had been in place at the time of this transfer, and the Bureau had not charged interest on the power assistance amount from the date of the project's completion but from the date of the transfer, we estimate that the federal government would have received $566,000 less in 1987 than it did from the transfer—about $888,000 in 1993 dollars.

Figure 2 summarizes the impact of each of the different rate-setting methods discussed above on federal revenues received for the Emery County Project. The first bar shows how much revenue the government has received for repayment for the Emery County Project, which includes the actual charges for the 1972 and 1987 transfers. The second and third bars show, respectively, how much more revenue could have been obtained had the Bureau used a higher interest rate in the 1972 transfer and had compounded interest charges in the 1987 transfer. The fourth bar presents revenues that would have been received had the Bureau not recovered interest and power assistance charges for the time the water was used for irrigation. The last bar presents how much revenue the government would have received if no transfers had occurred.

[13]Repayment of Municipal and Industrial Water Supply Investment Costs, Bureau of Reclamation, U.S. Department of the Interior Office of Inspector General, Rpt. No. W-IN-BOR-005-91 (Aug. 1992).

Figure 2: Differences in Federal Revenues From Different Rate-Setting Methods for the Emery County Project



4. Recovering Costs After the Repayment Period. In its August 1992 report, Interior's Inspector General explained that the Bureau does not recover any of the government's financing costs related to municipal and industrial uses when changes to these uses occur after the repayment period for the project. The Bureau limits its cost recovery in these instances to O&M expenses.

The Inspector General suggested that when transfers occur after the repayment period is complete, financing charges should be based on the useful life of the project—typically 100 years—rather than be limited to the repayment period. Under this approach, interest charges would be based on the proportion of all water delivered for municipal and industrial uses over the project's useful life. If, for example, 10 percent of the water delivered was used for municipal and industrial purposes, then interest

costs for 10 percent of the water should be charged, starting from the first day of the project's completion.

The Bureau currently is examining various approaches for determining charges for water transferred to new uses after the end of the repayment period. According to the Bureau, using water service contracts to charge beyond the initial repayment period is permissible under existing law. We agree that this appears permissible under the broad authority of the Reclamation Project Act, so long as there is a reasonable basis for the charges and contracts are not prohibited by specific projects' authorizing legislation.

5. Assessing higher charges and transfer fees. Under existing law, the Bureau could also obtain additional revenues by charging amounts that are higher than necessary to recover project costs or by charging a fee as a condition for approving a transfer. In some cases, irrigators may realize large profits by transferring federally subsidized water. Charges for transferred water other than those for project cost recovery are one way for the Bureau to receive a portion of such profits. Such charges could also be viewed as a means of addressing the adverse impacts of transfers on local economies and the environment.

Interior's Solicitor has indicated that the Reclamation Project Act of 1939 does not set a limit on how much can be charged for municipal and industrial water under water service contracts so long as there is a reasonable basis for the amount.[14] As a result, the Bureau can charge amounts for municipal and industrial water that are higher than necessary to recover construction costs plus interest and O&M costs. However, the law does limit how these revenues can be used. According to the Solicitor, these additional revenues can be used to accelerate the repayment of the costs allocated to municipal and industrial uses,[15] assist the repayment of the costs allocated to irrigation, or be used for other purposes in cases in which there is a basin account, as there is for the Colorado River Storage Project.[16] In addition, the Secretary has general authority under which the

[14]Memorandum from the Assistant Solicitor, Water, to the Commissioner of Reclamation, Sept. 27, 1974.

[15]Current municipal and industrial charges typically are based on costs amortized over a 40-year repayment period. Higher charges can allow these costs to be recovered in a shorter time.

[16]A basin fund was established for projects authorized as part of the Colorado River Storage Project. Revenues collected in connection with the operation of this project and all participating projects are credited to the fund and can be used to defray the costs of operation, maintenance, and replacement, as well as repay costs and interest charges allocated to power and municipal and industrial users for participating projects and costs allocated to irrigation.

Secretary might require that profits received by water users who resell their water be paid to the Bureau for deposit into the reclamation fund[17] as a condition for approving a transfer—in effect, charging a transfer fee.[18]

Charging new water users fees for transfers is not unprecedented. The Congress, in passing the Central Valley Project Improvement Act in 1992, included an annual charge of $25 per acre-foot to be applied to all transfers of water from the project to municipal and industrial users who did not receive water from the project prior to the date of the act. The fees will be deposited in a fund to be used for restoring fish and wildlife habitat.

Changes in Reclamation Law Could Further Increase Federal Revenues

While the Secretary has wide discretion in setting rates, reclamation law can restrict the Secretary's flexibility to increase federal revenues. For some projects, the authorizing legislation specifies the interest rate the Bureau can use in charging water users. Often established decades ago, these rates typically are lower than current Treasury borrowing rates. In these cases, the Secretary can only mandate that the authorized rate be charged. Changes in the law would be needed to charge current Treasury borrowing rates for transfers from some projects.

Balancing Increasing Federal Revenues With Retaining Transfer Incentives and Considering Impacts on Water Users

Increasing charges for transferred water can discourage some transfers by decreasing buyers' and sellers' net gains—that is, the benefits buyers realize from paying less for water and the profits sellers realize from selling the water. Eliminating the net gains removes the incentives for transfers, and transfers do not occur, so there are no gains in economic efficiency, water is not used more efficiently, and federal revenues are not increased. Even if some incentive remains, by charging higher amounts for transferred water the federal government may increase the price that municipal and industrial users pay for water and reduce the profits to irrigators. Determining municipal and industrial charges that will increase federal revenues without discouraging transfers is difficult because the factors affecting buyers' and sellers' incentives vary case by case.

[17]The reclamation fund is a fund in the Treasury established under 43 U.S.C. 391 to be used for the construction and maintenance of projects for the storage, diversion, and development of water in the western states.

[18]See 43 U.S.C. 373 for the Secretary's general authority under which the Secretary might place conditions for approving transfers. Under 43 U.S.C. 392a, known as the Hayden-O'Mahoney amendment, when not contrary to law or contract, revenues received by the Bureau in connection with irrigation projects are to be deposited in the reclamation fund.

The amount the government can charge for transferred water without discouraging transfers falls between (1) the maximum amount the buyer is willing to pay for the water and (2) the minimum amount the seller will accept. The maximum amount a buyer is willing to pay is determined by the least-cost alternative—the buyer will be better off purchasing the transferred water rather than finding an alternative source only if the transferred water costs less than the alternative. The minimum amount the seller will accept is determined by the net value of the water in its current use, such as crop production—the seller will be better off selling the water only if it generates more revenue through sale than in its current use.

Even if some incentive remains for a transfer, higher charges can require municipal and industrial users to pay more for federally provided water and can reduce the profits realized by irrigators. The buyer, the seller, or both are always better off because of a transfer; otherwise, the transfer would not occur. This means that if a transfer occurs, new water users are receiving water at the least expensive price available. However, the lower the amount the government charges, the better off the buyer and seller are. Policymakers need to balance (1) the desire to increase federal revenues from transfers and (2) the incentives for transfers to occur and the impacts on water users.

Options for Establishing Municipal and Industrial Charges

The amount that can be charged for transfers to municipal and industrial uses without discouraging them varies case by case because the cost of alternative water supplies and transaction costs can vary greatly and because the returns on the water from crop sales vary by crop, by farm, and by year. Therefore, establishing such a charge would require determining the value of alternative water sources, the value of crop production, and transaction costs for each transfer. Such determinations can be difficult and time-consuming.

While it is not feasible to determine how much the government can charge without discouraging transfers in every case, we identified three general approaches the Bureau can choose from to establish municipal and industrial charges that minimize potential losses in efficiency while increasing federal revenues. These approaches are (1) case-by-case negotiation of individual transfers, (2) a set rate or rate formula based on estimates of the factors affecting the incentives for transfers, and (3) a set rate or rate formula based on a predetermined level of cost recovery or fee. The most appropriate approach will vary depending on the transfer

and the information available about the buyers' and sellers' incentives. These options are discussed in more detail in appendix II.

Establishing Charges for Transfers to Uses Other Than Municipal and Industrial

The amount that the Bureau can charge for transfers from one irrigator to another or from an irrigator to use for fish and wildlife habitat or recreation varies case by case as well. However, the factors affecting the incentives for these transfers often differ somewhat from those affecting transfers to municipal and industrial uses, and the amounts purchasers are willing to pay will vary.

Municipal and industrial users often place a high economic value on water, and therefore the price they are willing to pay for water is often high. Irrigators may not be willing to pay as high a price because the transferred water may generate less economic value in agriculture than in municipal and industrial uses. Therefore, transfers from one irrigator to another are more likely to be discouraged by higher charges than transfers from irrigators to municipal and industrial users. Under current reclamation law and the Bureau's guidance, water transferred from one irrigator to another would retain the subsidies associated with irrigation. In this way, charges remain low and fewer transfers are discouraged. Federal revenues may not increase in these cases, but gains in efficiency will still be realized.

Natural resource agencies and nonprofit conservation groups are the likely buyers of water for what are termed instream uses, such as providing fish and wildlife habitat, providing recreation, and ensuring water quality. As with irrigators, however, these organizations are not likely to realize the financial gain from water transfers that municipal and industrial users can. Rather, these organizations often provide public goods that benefit others, and the water may have nonmarket value. Therefore, the price these organizations are willing to pay may be less than the market value of the water to municipal and industrial users, so high charges may also discourage these transfers.

Water used for fish and wildlife habitat and recreation often does not carry any repayment obligations. However, the Bureau's guidance on transfers indicates that when a change in use occurs from a reimbursable function, such as irrigation, to a nonreimbursable function, contracts must ensure that the repayment to the government will be no less than before the transfer. As a result, new instream users will have to pay the irrigators' share of the costs that are subsidized by power assistance. This occurs because power assistance can only be paid for irrigation under existing

law, not for other purposes. Therefore, for projects with power assistance, the amounts charged to instream users would be higher than those charged to irrigators.

Conclusions

Water transfers are not only a valuable tool for improving the efficiency of water use and environmental quality, but transfers from irrigation to municipal and industrial uses are a promising way to increase federal revenues for water development projects. Current reclamation law provides the Secretary a great deal of discretion in establishing municipal and industrial charges to recover some of the costs of constructing the projects. However, Interior's principles governing water transfers and the Bureau's implementing guidance do not encourage increasing federal revenues as much as possible. They focus on placing the government in the same or a better financial condition after a transfer is made and facilitating transfers, rather than on charging the highest amounts possible without discouraging transfers. Moreover, the guidance does not specify how the rates for water transferred to municipal and industrial uses will be determined, leaving a crucial factor affecting the profitability of transfers unclear to potential buyers and sellers. The Bureau's current review of the principles provides an opportunity to consider ways to further increase federal revenues while retaining incentives for transfers.

Changes in reclamation law would further enhance the Secretary's ability to increase revenues through water transfers. Many reclamation projects have specified interest rates in authorizing legislation that limit interest charges below current levels.

Recommendations

The Secretary of the Interior should direct the Commissioner of the Bureau of Reclamation, in reviewing the principles governing water transfers, to examine ways in which federal revenues may be increased while retaining incentives for transfers. In examining ways in which federal revenues may be increased, the Secretary should direct the Commissioner to consider charging amounts that (1) are based on Treasury borrowing rates, (2) include compound interest, (3) recover interest and power assistance subsidies, (4) recover costs throughout the useful life of the project, and (5) are higher than necessary to recover costs or constitute transfer fees, when such amounts are consistent with current law, are appropriate, and will not discourage transfers. The Secretary should also direct the Commissioner to consider the factors affecting the incentives for transfers, to the extent feasible, and consider

various approaches for determining charges, including case-by-case negotiation and set rates and rate formulas.

Matter for Congressional Consideration

To allow the Bureau of Reclamation greater flexibility in recovering the costs of federal water projects, the Congress should consider allowing the use of current Treasury borrowing rates in establishing charges for transferred water, regardless of the interest rates included in some authorizing legislation.

Agency Comments

As requested, we did not obtain written agency comments on this report. However, we discussed the factual information in the report and the implications of these facts with Bureau and Interior officials, including the Bureau's Chief, Division of Program Analysis, and representatives from Interior's Office of the Solicitor and the Assistant Secretary for Water and Science. In general, the officials said the information was accurate and concurred with the statements in the report. They noted, however, that the Bureau currently is reviewing Interior's principles governing water transfers to identify barriers to the transfer process and to ensure that the Bureau's guidance is consistent with the administration's policies. They also stressed that the Bureau is working with the Assistant Secretary, Office of Policy, Management and Budget, to develop a pricing policy for municipal and industrial water in response to the Inspector General's recommendations. We incorporated changes where appropriate.

Scope and Methodology

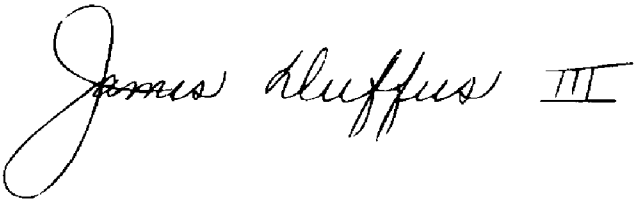
We reviewed reclamation law, Interior's principles for approving water transfers, the Bureau's criteria and guidance for implementing the principles, and the Bureau's rate-setting guidance. We also reviewed repayment obligations resulting from transfers of water in the Emery County Project and estimated changes in federal cost recovery resulting from different rate-setting practices. We met with officials from the Bureau's Upper Colorado and Mid-Pacific Regional Offices. We also reviewed reports completed by the Department of the Interior's Inspector General, the Western Governors' Association, and the Natural Resources Law Center at the University of Colorado and discussed rate-setting options with authors of these and other reports on water markets.

Our work was conducted between September 1992 and June 1994 in accordance with generally accepted government auditing standards.

Copies of this report are being provided to the Secretary of the Interior, the Commissioner of the Bureau of Reclamation, and other interested parties.

If you or your staff have any questions, please contact me on (202) 512-7756. Major contributors to this report are listed in appendix III.

Sincerely yours,



James Duffus III
Director, Natural Resources
Management Issues

Contents

Abbreviations

IDC	interest during construction
O&M	operation and maintenance

Estimating Increases in Federal Revenues for the Emery County Project's Transfers

To evaluate the impact of water transfers on the federal revenues received for repayment of investment costs in the Bureau of Reclamation's projects, we analyzed actual transfers of water from irrigation to municipal and industrial uses in Utah's Emery County Project. Our analysis estimated federal revenues if transfers had not occurred, estimated revenues under the actual terms of the transfers, and estimated revenues had the Bureau used alternative methods of calculating charges for the transferred water.

General Background

The Bureau's water projects often serve many purposes, including irrigation, flood control, recreation, hydroelectric power generation, and municipal and industrial uses. In determining the repayment of project capital costs, the Bureau estimates the portion of the total project capital costs attributed to each of the functions that a particular project serves. It then calculates repayment rates owed by project users on the basis of the costs attributed to each purpose. Different project users are treated differently with respect to repayment depending on how they use the water.

The costs associated with some purposes, such as recreation, flood control and fish and wildlife purposes, such as providing habitat, are nonreimbursable. The costs associated with irrigation and municipal and industrial uses are reimbursable, but repayment costs owed by water users differ. Irrigation rates are considered to be subsidized. In determining irrigation rates, the Bureau does not include interest costs during construction, and in some cases, construction costs are reduced on the basis of the Bureau's determination of irrigators' ability to pay. The Bureau also does not include interest on the construction costs owed.

When irrigation costs are reduced because of irrigators' inability to pay, power users are required to pay the remaining portion of the capital costs allocated to irrigation. This is generally referred to as the power assistance. Power users generally make this payment in one lump sum, without interest, at the end of the repayment period. This payment is separate from those for the capital costs that are attributed to the electric power generation function, which power users pay in annual installments, with interest, over the project's repayment period. Municipal and industrial users are required to pay all of their capital costs with interest, including the interest during construction (IDC).

In some cases, the Bureau has allowed voluntary transfers of a project's water from irrigators to municipal and industrial users. In such a transfer,

the municipal and industrial purchaser may pay the irrigator to stop receiving a certain quantity of water, which the Bureau then delivers to the new municipal and industrial user. The Bureau no longer is paid an irrigation rate for the water transferred, but charges users a higher municipal and industrial rate. This results in greater revenues for the government. The extent to which the government's revenues increase depends on the following factors:

1. The interest rate chosen for the calculation of the municipal and industrial rate. The higher the interest rate, the higher the repayment obligations of the municipal and industrial purchaser to the government.

2. Whether simple interest or compound interest is used. Compound interest results in higher repayment obligations for the purchaser.

3. The treatment of past subsidies associated with the water in its previous use in irrigation. If the value of the interest and power assistance subsidy for the period from the date of the project's completion through the date of the transfer is included in the rate for transferred water, then the government's revenues will be higher.

Background for the Case Study at the Emery County Project

In order to illustrate the effect of water transfers and different rate-setting policies on federal revenues, we analyzed the effect on revenues of actual water transfers from irrigators to a municipal and industrial user in the Bureau's Emery County Project. We also calculated how different methods of determining municipal and industrial repayment obligations would have affected federal revenues for the Emery County Project. We based our analysis on the following:

- The Bureau completed major construction in 1966 and started receiving irrigation payments in 1970. Water initially was allocated only to irrigation, providing 28,100 acre-feet per year.
- On the basis of the Bureau's documents, we used the figure of $10,583,526 as the project's construction costs allocated to irrigation as of 1970.
- The repayment period for irrigation is 50 years, between 1970 and 2019, and the interest rate for the project is 3.046 percent.
- IDC on irrigation's share of the capital costs was estimated by the Bureau at about $24 per acre-foot—about $672,000 for the project's water supply function. This amount does not enter into the Bureau's calculation of irrigators' repayment obligation, as irrigators are exempt from paying IDC but represents a portion of the government's loss on its investment.

- The Bureau determined that the irrigators' ability to pay for irrigation water was $2,935,000—a reduction of over 70 percent of the construction costs allocated to irrigation. Irrigators signed a contract to repay the $2,935,000 in annual installments over the repayment period without interest.
- The difference between irrigation's allocated construction costs ($10,586,625) and irrigators' "ability-to-pay" amount ($2,935,000)—about $7.7 million—was shifted to power users in the Colorado River Basin. We assumed that it would be paid in one lump sum in the year 2013.[19]
- In 1972, the Bureau approved a permanent transfer of 6,000 acre-feet per year from a group of irrigators to Utah Power and Light (UP&L). The Bureau and UP&L agreed to a schedule of annual payments based on the construction costs allocated to irrigation plus interest prorated for the amount of water transferred. The Bureau used the rate of 3.046 percent, compounded, for calculating UP&L's repayment schedule to the government.
- Some additional construction costs allocated to irrigation were expended after 1973—$1,730,368 (not adjusted for interest or inflation).
- In 1987, the Bureau approved another permanent transfer of 2,576 acre-feet per year from irrigators to UP&L. In this case, UP&L was charged a single payment of $2,917,809 (in current 1987 dollars).[20] The Bureau based the calculation on all capital costs allocated to irrigation with interest, prorated for the transferred amount, and reduced by the amount of money that the irrigators paid on the water before it was transferred. For this transfer, the Bureau used the 10-year Treasury bond rate, which is considerably greater than the project's interest rate of 3.046 percent, but calculated interest on a simple basis rather than on a compound basis.

Methodology and Results Under Different Scenarios

We compared federal revenues without the transfers to revenues with the transfers. We also studied the effects of alternative methods of calculating the purchaser's obligations to the government, including (1) using a higher interest rate, (2) using compound instead of simple interest, and (3) deducting past subsidies associated with the transferred water for the period before the transfer took place. All present value figures reported

[19]This amount was later reduced because of transfers to Utah Power and Light, which does not receive a power assistance subsidy. By law, the power assistance may be paid anytime within the project's repayment period of 50 years. As it is exempt from interest costs, the payer has an incentive to delay payment as much as possible.

[20]In addition to paying the federal government, UP&L paid the irrigators an average of about $600 per acre-foot for the transferred water and associated land.

below were made using Treasury's 10-year bond rate.[21] We used the actual 10-year rate for the years 1970 to 1993. We relied on rates developed by Data Resources Incorporated, a leading independent forecaster, for the years 1994 to 2019.

No Transfers

We first examined the impact on federal revenues if no transfers from irrigation to municipal and industrial uses had occurred and all of the water had remained in irrigation. Irrigators were to pay a total of $2,935,000. We assumed payments were to be made in equal annual installments of $58,700 between 1970 and 2019 for the use of all 28,100 acre-feet of irrigation water. Assuming a 50-year repayment period, this amounts to an annual payment of about $2.09 per acre-foot for irrigation water. We assumed that power users would pay the balance of the irrigators' share of construction costs, about $7.6 million, in one lump sum payment in 2013; this is the power assistance.

We calculated the 1970 present value of payments for the 28,100 acre-feet over the entire period of 1970 to 2019 at about $964,000. This corresponds to repayment of less than 8.6 percent of the sum of the construction costs allocated to the irrigators plus IDC ($10,583,526 plus about $672,000). This means a loss to the government of about $10.3 million. In 1993 present value, this represents a loss of about $76,844,000.

Actual Transfers to Municipal and Industrial Uses

This scenario is based on the actual terms of the 1972 and 1987 transfers from irrigators to UP&L. Irrigators' payments are based on the rate of $2.09 per acre-foot per year from 1970 to 2019, but this rate applies to less and less water as more gets transferred to UP&L, as indicated below:

- Irrigators pay for all 28,100 acre-feet of irrigation water for the first 2 years.
- In 1972, 6,000 acre-feet are transferred to UP&L, so irrigators pay for 22,100 acre-feet between 1973 and 1987.
- In 1987, an additional 2,576 acre-feet are transferred to UP&L, so irrigators pay for 19,524 acre-feet between 1987 and 2019.

As a result of the transfers, UP&L pays a total of about $4.4 million in annual installments from the period 1972 to 2013 for 6,000 acre-feet and also pays a lump sum of about $2.92 million in 1987 for 2,576 acre-feet.

[21]We used a Treasury bond rate to reflect the government's cost of borrowing. The 10-year rate was chosen partly for convenience, as the Bureau used it in calculating the amount it charged UP&L for water transferred in 1987.

Power users pay a lump sum of about $4.9 million in the year 2013. This is the power assistance subsidy, reduced to reflect the amount of water transferred to municipal and industrial uses. (Since municipal and industrial water users do not receive power assistance, the power assistance amount is reduced proportionately to the amount of the transfer.)

We calculated the 1970 present value of all of these payments at about $2.19 million, which is 19.5 percent of the construction costs allocated to irrigation plus IDC of about $11.3 million (in 1970 dollars). In 1993 present value, this amounts to a loss to the government of about $67.7 million.

Using a Higher Interest Rate

In this scenario, we calculated the difference in revenues if the government used interest rates based on the 10-year Treasury bond rate, instead of the project's considerably lower rate of 3.046 percent,[22] in calculating charges for the 1972 transfer.[23] Using a 7-percent interest rate would increase UP&L's payments on 6,000 acre-feet to a total of over $8.6 million in nominal dollars for 1973 to 2012. This is twice the total amount actually paid by UP&L. The higher amount would raise the 1970 present value of all repayments to the government to about $3.3 million—about 29.4 percent of the government's total cost. This would increase federal revenues by about $8.35 million in 1993 present value.

Using Compound Instead of Simple Interest

In this scenario, we calculated the increase in federal revenues if the Bureau used compound instead of simple interest in calculating the capital cost on the water transferred from irrigators to UP&L in 1987. In the 1987 transfer, the Bureau charged a one-time payment instead of annual payments. This payment was based on the full capital cost of the 2,576 acre-feet involved, reduced by the amount that irrigators paid on this water between 1970 and 1986. The Bureau used the 10-year Treasury bond rate, but applied interest on a simple basis. We made a similar calculation, but used the same 10-year rate on a compound basis. The calculation yielded a figure of about $5,755,000 instead of the $2,917,809 (both in 1987 dollars) that the Bureau actually charged UP&L. Using compound interest would have increased federal revenues by $4,444,279 in 1993 present value.

[22]This interest rate was compounded.

[23]We used the rate of 7 percent; the 1973 figure for the 10-year Treasury bond rate was 6.58 percent.

Although the higher figure would have better reflected the government's costs, including interest, UP&L may not have been willing to pay such a high price.[24] The Bureau offered a price to UP&L that included the Bureau's calculation of compound interest. However, this price was offered after the Bureau and UP&L had negotiated and agreed on a lower price that included simple interest. UP&L protested the late change in the negotiated price, and the water was sold to UP&L for the lower price that included simple interest.

Charging the Interest Subsidy Before the Transfer

In this scenario, we calculated how much less the federal government would have received if the Bureau had not included past power revenue assistance and interest charges associated with the transferred water. Under the Bureau's current transfer criteria and guidance, past subsidies associated with transferred water cannot be recovered. Had the Bureau not charged UP&L power revenue assistance for the time the transferred water was used for irrigation, UP&L's payment would have been about $403,000 less in 1987 dollars (about $632,000 in 1993 present value). We also calculated how much less the government would have received had it deducted the interest on irrigation payments for the period before the transfer. This would have lowered UP&L's payment by about $163,000 in 1987 dollars (about $256,000 in 1993 present value).

[24]According to the Bureau, the higher price plus the average of about $600 per acre-foot that UP&L paid irrigators for the transferred water would have put the cost to UP&L higher than the market value of water rights in the Colorado Basin.

Options for Establishing Municipal and Industrial Rates

GAO identified three approaches for establishing municipal and industrial charges to minimize potential losses in efficiency while increasing federal revenues: (1) case-by-case negotiation of individual transfers, (2) a set rate or rate formula based on estimates of the factors affecting the incentives for transfers, and (3) a set rate or rate formula based on a predetermined level of cost recovery or fee. The most appropriate approach will vary depending on the transfer and the information available about the buyers' and sellers' incentives.

Negotiation with transferring parties to determine a mutually agreeable charge may be desirable for large, long-term transfers. These transfers may provide greater opportunity for significant revenues, while leaving sufficient opportunity for buyers and sellers to realize economic gains. It may be worthwhile for the Bureau and transferring parties to negotiate the terms of such significant transactions. However, this approach requires aggressive negotiating skills and considerable time and effort to ensure that the government is receiving the highest rates that it can while leaving the buyers and sellers incentives for transfers to occur. The Bureau is more likely to successfully negotiate such a charge if it has information about the factors affecting the incentives for transfers, namely, the least-cost alternative water sources available to the buyer and the value of the water to the seller in its current use.

Conversely, a set rate or rate formula may be appropriate for small and short-term transfers.[25] Negotiation may be too time-consuming and expensive and require too much effort for frequent small transactions. Moreover, a set rate or rate formula allows buyers and sellers to form secure expectations about the costs owed the government and reduces uncertainty about the value of their transfers.

In some locations, reasonable estimates of the factors affecting incentives can be determined and used to establish the amount to charge within a certain area. The maximum amount a municipal and industrial buyer is willing to pay is often reflected in a local market price for water—that is, the price that others have paid to purchase water recently. These figures may not be available in some locations with little market activity but in other areas are generally well known. For example, for many years, the City of Albuquerque, New Mexico, has had a standing offer of $1,000 per acre-foot to purchase permanent water rights. The city of Fort Collins, Colorado, has paid about $1,800 per acre-foot for recently acquired water.

[25]The Bureau may need to be flexible in distinguishing large from small transfers. If there is a set cutoff amount, some large transfers may be broken into numerous smaller transfers to avoid negotiation.

In addition, estimates of the value of crop production may exist or could be determined for crops commonly produced in an area. When estimates of the factors affecting incentives are available, the Bureau could base charges on a set percentage of the difference between the market price and the value of the water in its current use, while considering likely transaction costs. Using estimates as the basis for charges reduces the possibility that the amount charged will discourage many transfers.

If estimates are not available, then the Bureau may have to establish set rates primarily on the basis of a predetermined level of cost recovery or a fee or surcharge. These rates may discourage transfers in some cases if the charge is too high and may limit cost recovery unnecessarily in other cases. In general, the smaller the government's charge, the fewer transfers will be discouraged.

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