United States General Accounting Office

GAO

Testimony

Before the Subcommittee on Water and Power Resources, Committee on Resources, House of Representatives

For Release
on Delivery
Expected at
10 a.m., EDT
Thursday
May 2, 1996

FEDERAL POWER

Recovery of Federal Investment in Hydropower Facilities in the Pick-Sloan Program

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GAO/T-RCED-96-142

Mr. Chairman and Members of the Subcommittee:

Thank you for the opportunity to discuss the results of our work on the Department of Energy's (DOE) power marketing administrations. Our focus today is on the requirements under the Pick-Sloan Program for the Western Area Power Administration (Western) to repay the federal investment in the program's hydropower facilities. At your request, we reviewed the effect of policies under which repayment of a portion of the federal investment is deferred. Specifically, we are presenting information on (1) the amount of this investment that may not be recovered under the current repayment criteria and (2) potential actions for recovering the investment.

You also asked us to report on two related issues concerning the maintenance of federal hydropower facilities at the Department of Energy's Southeastern Power Administration and the accounting and ratemaking practices of the power marketing administrations. We will be reporting on these issues separately over the coming several months.

In summary, Mr. Chairman, our principal points about the Pick-Sloan Program are as follows:

- Under the current repayment criteria, approximately $454 million of the federal investment in the Pick-Sloan Program's hydropower facilities and water storage reservoirs is unrecoverable because a portion of these completed facilities were intended for use with irrigation facilities that have not been completed and are no longer considered feasible. In addition, as the overall federal investment in the other aspects of the completed hydropower facilities increases because of changes such as renovations and replacements, the amount of the federal investment that is unrecoverable will increase.
- Changing the terms of repayment to recover any of the $454 million investment would require congressional action. Consistent with previous congressional action concerning the program, the Congress could direct Western to recover the investment through power revenues and to take action to minimize any impact on power rates. Estimating the potential impact on the rates of recovering the investment through power revenues is speculative and could vary significantly depending on, among other things, the terms of repayment and the amount Western passes on to its customers. Assuming that Western passes the entire amount on to its power customers, the wholesale power rate could increase by as much as 14.6 percent. Recognizing that the program incorporates agreements

reached decades ago, any changes between the program's power and irrigation purposes may also necessitate reviewing other aspects of the agreements—specifically, the agreements involving areas that accepted permanent flooding from dams in anticipation of the construction of irrigation projects that are now not likely to be constructed.

Background

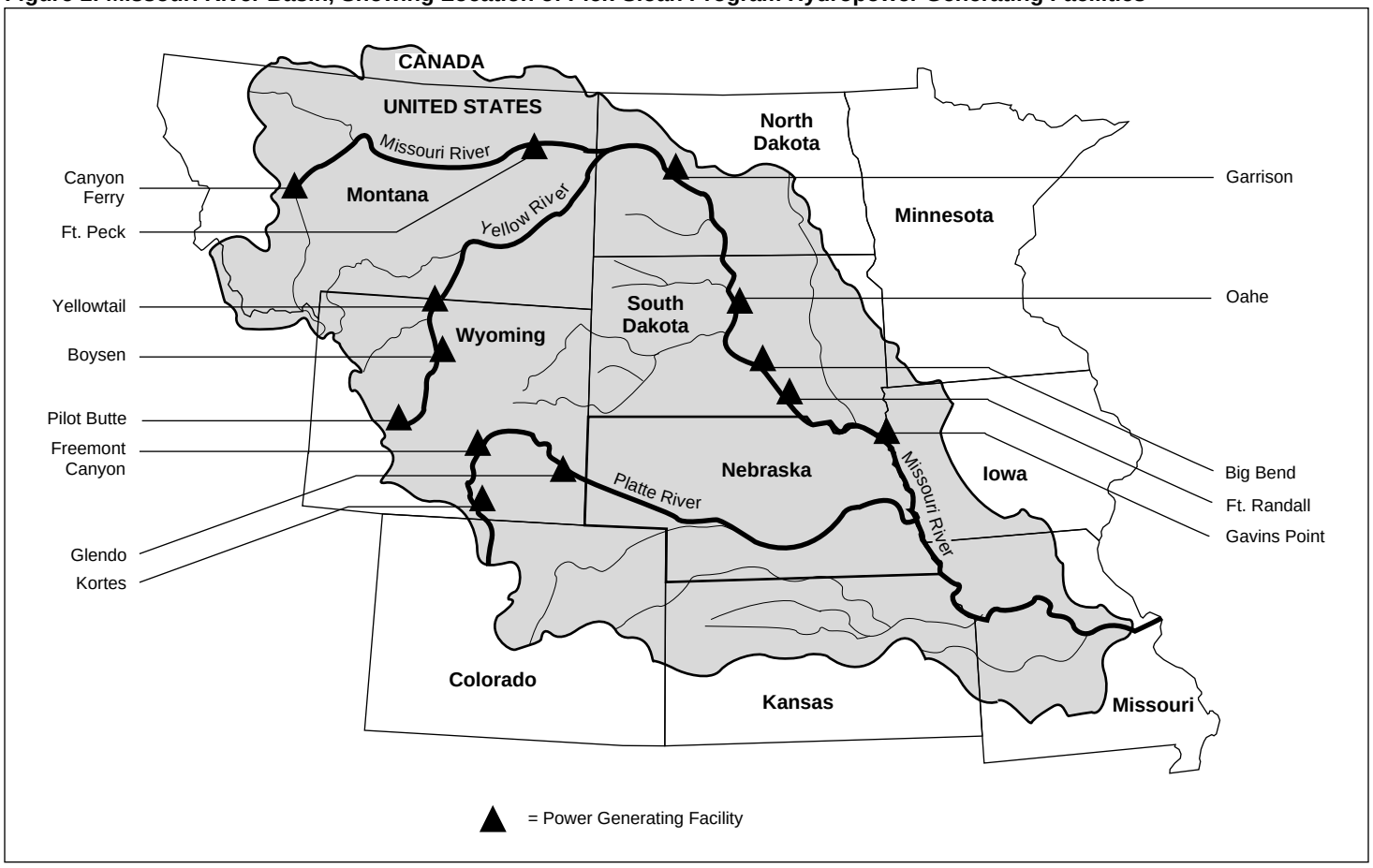
The Pick-Sloan Missouri Basin Program was authorized by the Flood Control Act of 1944 as a comprehensive plan to manage the water and hydropower resources of the Missouri River Basin.[1] The act was a combination of two plans: (1) the Sloan Plan, developed by the Department of the Interior's Bureau of Reclamation (Bureau) and designed primarily to irrigate lands in the Upper Missouri River Basin and (2) the Pick Plan, developed by the Department of the Army's Corps of Engineers (Corps) and designed primarily to control floods and provide for navigation on the Lower Missouri River Basin.

The program encompasses an extensive network of multipurpose projects that provide for, among other things, flood control, navigation, irrigation, municipal and industrial water supply, and power generation. (Fig. 1 shows the location of the program's hydropower generating facilities and the overall program area.) To accomplish these multiple purposes, the plan required compromise among the program's participants. For example, in exchange for having their land permanently flooded by dams to produce such benefits as electricity and flood control, some participants anticipated the construction of irrigation projects. The program is administered by three federal agencies: (1) the Bureau, which operates seven multipurpose projects and is responsible for the water supply functions of the program's projects, (2) the Corps, which operates six multipurpose projects and administers the flood control and navigation aspects of the program's projects, and (3) Western, which markets the hydropower generated at the program's generating facilities and constructs, operates, and maintains the program's power transmission system.[2]

[1]The Pick-Sloan Missouri Basin Program encompasses those parts of Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, and Wyoming from which water drains into the Missouri River.

[2]Our report Federal Electric Power: Operating and Financial Status of DOE's Power Marketing Administrations (GAO/RCED/AIMD-96-9FS, Oct. 13, 1995) provides additional information on Western and the other power marketing administrations.

Figure 1: Missouri River Basin, Showing Location of Pick-Sloan Program Hydropower Generating Facilities



Source: GAO's illustration based on information from the Bureau and Western.

The federal investment in the Pick-Sloan Program has nonreimbursable and reimbursable components. The nonreimbursable component consists of the capital costs of constructing, among other things, the program's flood control and navigation facilities. The reimbursable component consists of the capital costs of constructing the program's power generation and transmission, irrigation, and municipal and industrial water supply facilities. The reimbursable federal investment is further divided into investments repaid with interest (for power facilities and municipal and industrial water supply facilities) and investments repaid without

interest (for irrigation facilities).[3] Irrigation fees, power revenues, and other revenues are used to repay the federal investment in constructing irrigation facilities. Irrigation fees repay the portion of the investment in irrigation facilities that the Secretary of the Interior determines to be within the irrigators' ability to pay. In general, power revenues are used to recoup both power costs and that portion of the investment determined to exceed the irrigators' ability to pay.[4]

The Pick-Sloan Program accounted for about 33 percent of the operating revenues generated during fiscal year 1994 by the 14 separate programs from which Western markets and transmits power. In annual revenues from the sale and transmission of electric power, Pick-Sloan is Western's second largest program. The total federal investment in the program as of September 30, 1994, was about $4.5 billion. About $2.6 billion of the federal investment in the program is reimbursable through power revenues, and about $898 million of that amount had been repaid through September 30, 1994.

Infeasibility of Some Irrigation Projects Makes Repayment of Some Costs Unlikely

Because certain of the Pick-Sloan Program's irrigation facilities will not be completed as planned, a portion of the federal investment is unrecoverable. As originally authorized in 1944, portions of the program's power facilities and water storage reservoirs were intended for use with irrigation facilities. The federal investment for these portions was thus considered an investment in irrigation, and repayment was to be made without interest and deferred until the irrigation facilities were completed. As a result of this deferral, power customers would not be obliged to repay the investment in facilities that were ultimately intended for irrigation.

Under the original plan, about 33 percent of the program's generating capacity was to be used to irrigate about 5.3 million acres. As the program progressed, only about 15 percent of the program's power capacity would be needed for irrigation because the acreage planned for irrigation was

[3]The portion of the federal investment in an irrigation facility in the Pick-Sloan Program that is repaid through power revenues is generally repaid, without interest, within 50 years of the facility's being placed in service following a "development period," where applicable, of up to 10 years. The federal investment in a power facility is generally repaid, with interest, within 50 years of the facility's being placed in service.

[4]Repayment of the capital costs expended for the construction of irrigation facilities through power revenues is referred to as irrigation assistance. About $643 million of the costs of irrigation construction in the Pick-Sloan Program had been incurred and were scheduled to be repaid through power revenues as of September 30, 1994—the most recent data available at the time of our analysis. In addition, completion of future irrigation facilities could result in the expenditure of over $5 billion in additional irrigation assistance, according to Western's repayment information.

reduced to about 3.1 million acres.[5] As of September 30, 1994, the federal investment in power facilities intended for use with existing and planned irrigation facilities was $286 million, or about 15 percent of the approximately $1.9 billion total for that purpose. In addition, a portion of the program's water storage reservoirs were intended for use with existing and planned irrigation facilities. As of September 30, 1994, the capital cost associated with this portion of the reservoirs totaled about $224 million. Although the program's power facilities and storage reservoirs have been largely completed as planned, most of the planned irrigation facilities have not been constructed. As of September 30, 1994, only about 25 percent of the acreage planned for irrigation had been developed.

Some of the program's power facilities and reservoirs are now being used in conjunction with those irrigation facilities that have been completed.[6] As a result, the associated federal investment is now scheduled for repayment. Power facilities representing about $7 million of the federal investment are now being used to provide irrigation pumping service to about 212,000 acres, and water storage reservoirs representing about $49 million of the federal investment are now being used to provide irrigation water to about 182,000 acres. These investments are scheduled for repayment between 2042 and 2047, according to Bureau officials. These officials also stated that the remaining portions of the program's power facilities and reservoirs, which are intended for use with future irrigation facilities, are currently used to generate electricity for sale to power customers.

The Bureau now considers all but one of the program's incomplete irrigation facilities to be infeasible and believes that these projects will likely not be constructed.[7] According to Bureau officials, the costs of developing the remaining acreage planned for irrigation outweigh the benefits that would accrue from irrigating that acreage. They said that although their conclusions are based on preliminary estimates, a more expensive and time-consuming analysis would probably not change their

[5]Not all irrigation facilities require the use of pumping equipment or water storage reservoirs. Because of their proximity to the Missouri River or its tributaries, some irrigation facilities can operate without using pumping equipment or relying on the program's reservoirs. Depending on their location, other facilities may require the use of pumping equipment and/or water from the program's reservoirs.

[6]Approximately 772,000 acres have been developed, requiring about 14 megawatts in generating capacity. In addition, according to Western officials, approximately 7 megawatts of generating capacity are available to Native American tribes for irrigation.

[7]According to Bureau officials, the portion of the Glendo irrigation unit located in Wyoming is largely complete and may be used when certain environmental issues are resolved.

conclusions. As a result, the remaining federal investment—$454 million—is deferred.

In addition, the amount of the federal investment that is considered unrecoverable will increase over time. As mentioned earlier, the portion of the power facilities planned for use with irrigation facilities represents about 15 percent of the program's overall power capacity. As the overall federal investment in power increases, the amount of the investment associated with irrigation increases correspondingly. For example, while the total federal investment in power facilities increased from about $1.6 billion at the end of fiscal year 1987 to about $1.9 billion at the end of fiscal year 1994, the corresponding 15-percent portion of this investment that was associated with irrigation increased from about $249 million to about $286 million.

Congressional Action Would Be Needed to Recover Costs

Legislation currently precludes reallocation of the investment by the Bureau and Western from one purpose of the program to another without congressional authorization. The DOE Organization Act of 1977 precludes revision by the Bureau of the cost allocations and project evaluation standards without prior congressional approval. The Water Resources Development Act of 1986 directed that the program proceed to its ultimate development. According to Western officials, these acts preclude changes in the program's repayment criteria.

The Congress reallocated a portion of the federal investment in power facilities and storage reservoirs intended for irrigation when it passed the Garrison Diversion Unit Reformulation Act of 1986. The act implemented recommendations in the Garrison Diversion Unit Commission's Final Report, submitted to the Congress and to the Secretary of the Interior on December 20, 1984. The Commission was created by the Congress to review North Dakota's needs for water development and to propose modification to the Garrison Diversion Unit. Among other things, the act terminated the development of about 876,000 of the acres planned for irrigation under the program. Also as a result of the act, Western scheduled repayment of the existing federal investment in the power facilities and storage reservoirs intended for use in irrigating this acreage. Thus, about $147 million in federal investment was reallocated for recovery through power revenues. The act directed that Western (1) attempt to minimize any rate increase and (2) phase in any such increase over a 10-year period. According to Western officials, because the

investment is to be repaid over 50 years, the power rate was not appreciably affected by this reallocation of the federal investment.

The impact of recovering the $454 million investment through power revenues could vary significantly depending on many factors, including the amount Western passes on to its power customers. Consistent with the way investments in power are typically repaid (within 50 years and with interest), recovering the full amount through power revenues could result in an increase in Western's wholesale power rate of as much as 14.6 percent, according to Western's calculations.[8] Western officials said the following about this scenario:

- The potential rate increase of 14.6 percent assumes that the entire amount of the increased financial requirement would be passed through to existing power customers, without any offsetting reductions in the operating expenses of Western, the Corps, or the Bureau (any offsetting reductions could lessen the need for a rate increase). Western officials noted that such expenses could decrease as a result of Western's ongoing restructuring efforts.
- Since Pick-Sloan's power customers purchase power wholesale and resell it to retail customers, it is difficult to estimate accurately to what extent, if any, the retail customers would be affected by a rate increase at the wholesale level.
- Changes in the terms of repayment, such as phasing in a rate increase as was done in 1986, would lessen the effect of the increase.
- The estimated rate increase assumes repayment of the $454 million through power revenues without an overall assessment of the program. Any general assessment of the program could lead to changes in the current cost allocations and rates.
- Factors outside of Western's control, such as the amount of water available for power generation, could affect any potential impact on the rates.
- The amount of the federal investment in storage reservoirs that would be redirected for repayment through power revenues is uncertain because some of this investment could be assigned to other program purposes, thereby lessening any effect on the rates.

[8]In preparing the estimate, Western officials assumed a composite 4-percent interest rate. The wholesale power rate could thus increase by 0.212 cents per kilowatt hour, a 14.6 percent increase over the 1.454 cents per kilowatt hour rate in effect as of September 30, 1994. This potential effect on the rate includes the annual principal payment to recover the $454 million and an annual interest payment.

The Department of the Interior's Inspector General reported in 1993 on the unrecoverable federal investment in the Pick-Sloan Program attributable to infeasible irrigation projects.[9] Recognizing that the majority of the program's irrigation facilities were infeasible and thus would likely never be completed, the report was critical of the Bureau's continuing assumption that the project would ultimately be developed as planned. The Inspector General recommended, among other things, that the Bureau request that the Congress deauthorize—that is, terminate from the program—the infeasible acreage and reallocate the federal investment in the power facilities and storage reservoirs intended for planned irrigation facilities for repayment through power revenues.

The Bureau concurred with the Inspector General's recommendations and agreed to a target date of February 1995 for submitting information to the Congress in response to these recommendations. The Bureau provided us with a draft copy of the list of the infeasible irrigation facilities that it developed in response to the Inspector General's report, but as of April 18, 1996, the Bureau had not yet submitted this information to the Congress.[10] According to Bureau officials, the Bureau is continuing to analyze the potential alternatives for recovering the portion of the federal investment that is currently unrecoverable. For example, the Bureau is assessing the impact of reallocating the investment on the basis of the current use of the program's facilities rather than on the program's planned long-term development.

The Inspector General's 1993 report also identified another impact of recovering the $454 million through power revenues. Based on 1992 data, the Inspector General calculated, using a 7.25 percent interest rate, that carrying the unrecoverable federal investment in power facilities and storage reservoirs as an investment in irrigation facilities results in an interest cost to the Treasury of about $30 million annually because the investment is carried without interest. Repaying the unrecoverable federal investment through power revenues would necessitate an annual interest charge. Western officials noted that such an interest payment would likely be less than that calculated by the Inspector General because Western would expect to use a lower interest rate (likely 4 percent) that is based on the weighted average of the interest rates associated with the program's outstanding debt.

[9]Audit Report on the Pick-Sloan Missouri Basin Program Cost Allocation, Bureau of Reclamation, Department of the Interior, Office of Inspector General, W-IN-BOR-007-92, Sept. 30, 1993.

[10]The information in app. IV is taken from the Bureau's draft list.

We provided a draft of this statement to and discussed its contents with the Bureau's Regional Director of the Great Plains Region; the Bureau's Washington Director, Policy and External Affairs; Western's Acting Area Manager for the Pick-Sloan Program; and the Deputy Assistant Administrator from the Department of Energy's Power Marketing Liaison Office. They clarified several points about the estimate of the potential impact on the power rate of recovering a portion of the federal investment through power revenues. These officials also suggested several technical revisions to our statement, which we incorporated as appropriate. We conducted our review between December 1995 and April 1996 in accordance with generally accepted government auditing standards.

This concludes our prepared statement. It also concludes our work on this issue. Appendix I shows the operating characteristics of the Pick-Sloan Program's hydropower generating facilities, appendix II shows the allocation of the reimbursable and nonreimbursable federal investment among the program's purposes, appendix III shows the status of the federal investment reimbursable through power revenues, appendix IV shows the status of the program's irrigation facilities. We will be glad to answer any questions you may have.

Operating Characteristics of Hydropower Generating Facilities in the Pick-Sloan Program, as of September 30, 1994

Operating agency	Facility[a]	Number of generating units	Nameplate capacity (MW)[b]	Fiscal year of initial operation
Eastern Division[c]				
Bureau	Canyon Ferry	3	60	1954
Bureau	Yellowtail[d]	4	288	1966
Corps	Big Bend	8	538	1965
Corps	Fort Peck	5	218	1943
Corps	Fort Randall	8	387	1954
Corps	Garrison	5	546	1956
Corps	Gavins Point	3	122	1956
Corps	Oahe	7	786	1962
Subtotal		43	2,945	
Western Division[c]				
Bureau	Boysen	2	15	1952
Bureau	Fremont Canyon	2	66	1961
Bureau	Glendo	2	38	1959
Bureau	Kortes	3	36	1950
Bureau	Pilot Butte	2	2	1925
Subtotal		11	157	
Total		**54**	**3,102**	

[a]Not shown here are the generating facilities of the Bureau's Colorado-Big Thompson, Kendrick, Shoshone, and North Platte projects, which have been integrated with Pick-Sloan's Western Division for marketing and operating purposes.

[b]The nameplate capacity refers to the full-load, continuous rating under specified conditions, usually indicated on a plate attached physically to the equipment. Because stream flow largely dictates the amount of water available for generation, the average megawatts available for power generation from a hydropower generating facility may be well below the nameplate capacity. These numbers are rounded to the nearest megawatt (MW). A megawatt is 1 million watts.

[c]For operational purposes, the Pick-Sloan Program is divided into two divisions. The Eastern Division markets power from eight hydropower generating facilities. The Western Division, which was operationally and contractually integrated in 1989 with Western's Fryingpan-Arkansas project, markets power from five hydropower generating facilities. For financial reporting, the Fryingpan-Arkansas project and Pick-Sloan's Western Division are separate. The power rates and financial statements for the Pick-Sloan Program reflect the costs and repayment requirements for both the Eastern and Western Divisions.

[d]The Eastern and Western Divisions each market a portion of the power generated at the Yellowtail Dam in Montana.

Allocation of Reimbursable and Nonreimbursable Federal Investment by Program Purpose, as of September 30, 1994

Dollars in thousands

Program purpose	Federal investment
Reimbursable investment	
Power	$1,870,236[a]
Irrigation	1,497,969[b]
Municipal and industrial water supply	256,398
Subtotal	**3,624,603**
Nonreimbursable investment	
Flood control and navigation	529,839
Recreation	70,158
Fish and wildlife	80,298
Highway improvement	13,388
Safety of dams	23,263
Cultural resources	1,297
Other	115,647
Subtotal	**833,890**
Total	**$4,458,493**

[a]This amount differs from the corresponding figure shown in app. III. Western and Bureau officials attribute the differences between the figures to variations in the manner in which the agencies report interest during construction and construction work in progress.

[b]This amount reflects the cumulative federal investment in constructing irrigation facilities. As shown in app. III, the portion of these costs that is currently scheduled by Western for recovery through power revenues is $643 million.

Source: Based on information provided by the Bureau.

Status of Federal Investment Reimbursable Through Power Revenues, as of September 30, 1994

Dollars in thousands

Reimbursable federal investment	Amount
Power	$1,936,000[a]
Nonpower (irrigation assistance)	643,000[b]
Total reimbursable investment	2,579,000
Investment repaid	898,000
Unpaid investment	**$1,681,000**

[a]This amount differs from the corresponding figures shown in app. II. Western and Bureau officials attribute the differences between the figures to variations in the manner in which the agencies report interest during construction and construction work in progress.

[b]This amount is the portion of the overall federal investment in irrigation facilities that is recoverable through power revenues.

Source: Based on Western's 1994 Annual Report, Statistical Appendix.

Status of Irrigation Projects in the Pick-Sloan Program, as of September 30, 1994

The following four tables provide information on the status of the Pick-Sloan Program's existing, planned, and reauthorized irrigation facilities as provided by the Bureau in its draft list. Table IV.1 summarizes all these facilities. Tables IV.2, IV.3, and IV.4 provide details on existing, planned, and reauthorized units, respectively. The benefit-cost ratios that appear in these tables reflect the Bureau's calculation of the feasibility of developing the irrigation facilities. The ratio for an individual facility results from dividing the benefits expected to be derived from developing a facility by the expected cost of constructing and operating that facility. The Bureau considers a ratio exceeding 1.0 to indicate feasibility and a ratio of less than 1.0 to reflect infeasibility. We did not assess the accuracy of the information in the tables or in the notes, which were also provided by the Bureau.

Table IV.1: Summary of Irrigation Facilities

Status of facility	Number of irrigation facilities	Acres to be fully irrigated[a]	Acres to be partially irrigated[b]	Capacity (kW)	Irrigation-related power investment	Irrigation-related reservoir investment	Total irrigation-related investment
Planned	95	838,400	243,629	122,269	$84,210,328	$74,894,665	$159,104,993
Reauthorized	9	940,840	263,100	281,331	194,361,079	100,321,296	294,682,375
Subtotal	**104**	**1,779,240**	**506,729**	**403,600**	**$278,571,407**	**$175,215,961**	**$453,787,368**
Existing	30	623,800	148,171	14,423	7,301,915	49,101,827	56,403,742
Total	**134**	**2,403,040**	**654,900**	**418,023**	**$285,873,322**	**$224,317,788**	**$510,191,110**

[a]Fully irrigated acres are those irrigated using only federal irrigation water.

[b]Partially irrigated acres are those irrigated using federal water to supplement other sources.

Table IV.2: Existing Irrigation Facilities

Existing facility	State	Year unit was placed in service	Fully irrigated acres[a]	Partially irrigated acres[b]	Capacity (kW)	Irrigation-related power investment	Irrigation-related storage reservoir investment	Benefit-cost ratio for irrigation and date of analysis
St. Francis (Armel)[c]	CO	1951	6,000		1,988	$1,369,195		0.55, Jan. 1967
Almena	KS	1967	5,400					1.02, Dec. 1962
Cedar Bluff[d]	KS	1963	6,200					1.82, Oct. 1961
Glen Elder	KS	1970	21,000					1.26, Aug. 1958

(continued)

Existing facility	State	Year unit was placed in service	Fully irrigated acres[a]	Partially irrigated acres[b]	Capacity (kW)	Irrigation-related power investment	Irrigation-related storage reservoir investment	Benefit-cost ratio for irrigation and date of analysis
Kirwin[e]	KS	1957	11,500					0.90, June 1952
Webster	KS	1960	8,500					2.00, Dec. 1960
Crow Creek[f]	MT	1955	5,000		2,000	1,377,460	$86,682	1.96, Aug. 1950
East Bench	MT	1965	21,800	28,000			222,992	1.47, Mar. 1956
Helena Valley	MT	1959	14,100	3,500			184,823	1.50, Dec. 1956
Lower Marias	MT	1979	127,000		3,435			1.80, July 1971
Savage	MT	1950	2,200		386		202,000	N/A[g]
Dickinson	ND	1954	400					1.20, Oct. 1947
Fort Clark	ND	1954	1,900		485	334,034	171,133	1.10, May 1949
Heart Butte	ND	1952	6,700		1,601	1,102,657		N/A
Ainsworth	NE	1965	34,000		160	110,197		2.34, Jan. 1964
Farwell	NE	1966	52,500		600	413,238		2.03, Sep. 1955
Frenchman-Cambridge	NE	1952	54,700	9,600				1.92, Oct. 1961
Glendo	NE	1958		23,500				1.40, Dec. 1952
Sargent	NE	1957	13,700					1.67, Mar. 1952
Bostwick	NE/KS	1953	86,200		640	440,787	46,436,600	2.01, Dec. 1958
Angostura	SD	1953	12,100					1.22, Apr. 1956
Belle Fourche[h]	SD	1914						[i]
Rapid Valley	SD	1948		8,900				1.66, Dec. 1952
Shadehill	SD	1976	9,000					1.23, Jan. 1964
Keyhole	SD/WY	1976		57,200				1.06, Oct. 1949
Glendo	WY	1958		4,371				N/A

(continued)

Appendix IV
Status of Irrigation Projects in the Pick-Sloan Program, as of September 30, 1994

Existing facility	State	Year unit was placed in service	Fully irrigated acres[a]	Partially irrigated acres[b]	Capacity (kW)	Irrigation-related power investment	Irrigation-related storage reservoir investment	Benefit-cost ratio for irrigation and date of analysis
Hanover-Bluff	WY	1957	7,000		2,002	1,378,837	1,379,854	1.44, Nov. 1953
Owl Creek	WY	1957		13,100	1,126	775,510	417,743	1.04, June 1950
Riverton	WY	1925	64,300					[i]
North Loup	NE	1989	52,600					1.30, Feb. 1971
Total			**623,800**	**148,171**	**14,423**	**$7,301,915**	**$49,101,827**	

[a]Fully irrigated acres are those irrigated using only federal irrigation water.

[b]Partially irrigated acres are those irrigated using federal water to supplement other sources.

[c]In 1967, the benefit-cost ratio for this facility (0.55) indicated that the irrigation development was infeasible, and the irrigation storage in the Bonny Reservoir was sold to the state of Colorado for recreation purposes. The project was authorized for completion on the basis of all of its benefits.

[d]The Reclamation Projects Act deauthorized funding for irrigation at Cedar Bluff because of a lack of water. The irrigation district was relieved of its obligation, and the state of Kansas paid the costs of irrigation storage on a discounted present-value basis. The available water is used by the state for recreation, fish and wildlife, and supplemental municipal water supply.

[e]The Kirwin Unit Definite Plan Report (June 1952) showed a benefit-cost ratio of 0.9. Correspondence in September 1952 from the Acting Commissioner and the Regional Director, Lower Missouri Region, requested that intangible (indirect) benefits be included in the justification. Subsequent correspondence from the Regional Director provided the requested benefits that were included to justify the construction.

[f]The facility is part of the Three Forks Division, which has a total pumping demand of 3,199 kilowatts.

[g]N/A = not applicable.

[h]Since Boysen storage is designated for water service, irrigation assistance reflects the currently unassigned storage costs for the reservoir.

[i]This facility has been integrated as part of the Bureau's Rehabilitation and Betterment Program.

Table IV.3: Planned Irrigation Facilities

Planned facility	State	Year facility was placed in service[a]	Acres to be fully irrigated[b]	Acres to be partially irrigated[c]	Capacity (kW)	Irrigation-related power investment	Irrigation-related reservoir investment	Irrigation benefit-cost ratio
North Republican	CO/NE		2,400	2,700				0.18
Wilson	KS		25,000					0.10
Alzada	MT		9,000					0.10
Battlefield	MT		1,200		94	$64,741	$2,603,800	0.05
Benteen Flat	MT		1,600				3,473,300	0.07
Bonanza	MT		800		58	39,946	72,056	0.33
Brush	MT		1,000		70	48,211	90,070	0.46
Cameron Bench	MT		4,000	3,100				0.07
Chestnut Valley	MT		4,600					0.05
Clarkston	MT		1,000		134	92,290		0.09
Cracker Box	MT		1,600		106	73,005		0.07
Crow	MT		1,200		69	47,522	2,603,800	0.05
Diamond Ranch	MT		900				81,063	0.39
Dunmore	MT		11,400				24,740,800	0.10
Elm Coulee	MT		2,000		445	306,485		0.18
Farmer Creek	MT		1,600		187	128,793	144,112	0.39
Gallatin	MT			59,100	3,064	2,110,269		0.79
Glasgow Bench	MT		59,400		15,300	10,537,569	5,350,158	0.37
Haley	MT		2,400		703	484,177		0.19
Hardin[d]	MT		42,600	1,000	13,300	9,160,109		0.06
Hardscrabble	MT		2,200		273	188,023	198,154	0.41
Hobson Unit	MT			6,000				0.02
Huntley Extension[e]	MT		1,800		52	35,814		0.03
Jefferson	MT		47,400	15,200				0.06
Lewistown	MT		4,000					0.07
Madison	MT		12,600	13,600				0.08
Marsh	MT		2,800		716	493,131		0.03
Medicine Lake North	MT		14,700		7,440	5,124,151	1,324,029	0.13
Medicine Lake South	MT		24,700		10,130	6,976,835	2,224,729	0.15
Missouri Diversion	MT		92,800		28,720	19,780,326	8,358,496	0.17
N-Bar-N	MT		7,200		739	508,971	648,504	0.22

(continued)

Planned facility	State	Year facility was placed in service[a]	Acres to be fully irrigated[b]	Acres to be partially irrigated[c]	Capacity (kW)	Irrigation-related power investment	Irrigation-related reservoir investment	Irrigation benefit-cost ratio
Newlan	MT		3,900					0.03
Nickwall	MT		2,800		245	168,739	252,196	0.29
Nohle	MT		1,700		242	166,673	153,119	0.34
Rock Creek	MT		1,000	200				0.06
Ross Fork	MT		3,000					0.08
Saco Divide	MT		3,400		1,800	1,239,714		0.10
Seven Mile-Sitting Bull	MT		6,500		941	648,095		0.08
Seven Sisters	MT		3,200		1,462	1,006,923		0.13
Shoestring	MT		1,200		109	75,072	108,084	0.27
Shotgun (privately developed)	MT							
Sidney	MT		1,000		266	183,202		0.12
Stipek	MT		2,900		1,211	834,052		0.12
Sun-Teton	MT		53,200	3,700	1,422	979,374		0.01
West Bench	MT			6,700				0.12
Whitehall	MT		6,700	3,900				0.07
Wyola	MT		3,600				7,816,100	0.09
Yellow Bluff	MT		1,300		118	81,270	117,091	0.35
Bismarck	ND		8,500		514	354,007	765,595	0.11
Broncho	ND		15,400					0.08
Burnt Creek	ND		1,300		64	44,079	117,091	0.12
Hancock Flats	ND		5,400		1,202	827,853	486,378	0.12
Horsehead Flats	ND		6,500		1,494	1,028,963	585,455	0.07
Manley	ND		1,200		47	32,370	108,084	0.21
Nesson	ND		7,400		591	407,039	666,518	0.38
Oliver-Sanger	ND		8,300		2,109	1,452,532	747,581	0.14
Painted Woods	ND		2,800		601	413,927	252,196	0.11
Square Butte	ND		1,900		94	64,741	171,133	0.09
Williston	ND		8,500		1,689	1,163,265	765,595	0.33
Winona	ND		4,500		686	472,469	405,315	0.08
Wogansport	ND		1,600		172	118,462	144,112	0.09
Albion Division	NE		16,900	1,900	364	250,698		0.05
Cedars Rapids Division	NE		29,800		97	66,807		0.05
Little Blue	NE		20,000					0.03

(continued)

Planned facility	State	Year facility was placed in service[a]	Acres to be fully irrigated[b]	Acres to be partially irrigated[c]	Capacity (kW)	Irrigation-related power investment	Irrigation-related reservoir investment	Irrigation benefit-cost ratio
Mirage Flats Extension	NE		5,900					0.04
Belle Fourche	SD		5,000		290	199,732		0.06
Crazy Horse	SD		500		32	22,039	45,035	0.11
Culdesac	SD		5,400		1,848	1,272,773	486,378	0.08
Fort Thompson	SD		7,500		1,841	1,267,952	675,525	0.19
Grass Rope	SD		4,300		1,366	940,805	387,301	0.09
Greenwood	SD		4,900		472	325,081	441,343	0.18
Iron Nation	SD		1,700		503	346,431	153,119	0.06
Joe Creek	SD		4,400		1,649	1,135,716	396,308	0.08
LaRoche	SD		1,800		551	379,490	162,126	0.03
Pine Ridge	SD		12,700		1,695	1,167,397		0.02
Rousseau	SD		2,200		566	389,821	198,154	0.06
Tower	SD		2,000		100	68,873	180,140	0.29
Yankton	SD		1,100		58	39,946	99,077	0.05
Edgemont	SD/WY		4,700					0.02
Bighorn	WY		1,700		426	293,399	374,054	0.15
Boysen[f]	WY							0.00
Buffalo	WY		3,000	7,100				0.09
Crazy Woman	WY		5,700	6,400	280	192,844		0.10
French Creek	WY		800	2,500				0.07
Glendo[g]	WY			9,729			1,417,865	1.75
Greybull Flat	WY		1,000		343	236,234	211,281	0.17
Hudson Bench	WY		5,700				513,399	0.16
Kaycee	WY		23,100	5,600	2,529	1,741,798		0.08
Little Wind	WY			34,000				1.09
Lower Powder	WY		58,500		4,290	2,954,652		0.23
Piney	WY		4,000	16,000	56	38,569		0.21
Sheridan	WY			38,100				0.20
Shoshoni	WY		16,600		2,210	1,522,093	3,578,846	0.31
Tongue Pumping	WY		26,100		1,800	1,239,714		0.12
Ucross	WY		2,800	7,100	224	154,276		0.04
Total			**838,400**	**243,629**	**122,269**	**$84,210,328**	**$74,894,665**	

(Table notes on next page)

[a]The on-line date is indeterminate pending a finding of feasibility and reauthorization or, in the case of reauthorized but suspended facilities, a determination of the facility's status or the disposition of the facility's construction appropriations.

[b]Fully irrigated acres are those irrigated using only federal irrigation water.

[c]Partially irrigated acres are those irrigated using federal water to supplement other sources.

[d]Under the latest plan, the facility would use a hydraulic turbine from the Yellowtail Dam instead of electric pumps for irrigation pumping.

[e]Unit 2 is infeasible.

[f]Since Boysen storage is designated for water service, the irrigation assistance reflects the currently unassigned storage costs for the reservoir.

[g]Storage assignment for unsold water out of Glendo. The sale of Glendo water is being impeded by unresolved environmental concerns.

Table IV.4: Reauthorized Irrigation Facilities

Reauthorized facility[a]	State	Year facility was placed in service[b]	Acres to be fully irrigated[c]	Acres to be partially irrigated[d]	Capacity (kW)	Irrigation-related power investment	Irrigation-related reservoir investment	Benefit-cost analysis and date of analysis[e]
Pollock-Herried[f]	SD		15,000		6,060	$4,173,704	$1,351,050	1.70, Jan. 1968
Garrison Diversion[g]	ND		115,740		72,298	50,753,288	20,357,702	0.70, 1992
Lake Andes-Wagner[h]	SD		45,000		23,900	16,460,647	4,053,150	0.56 & 1.02, 1986
Shoshone Extension	WY		36,600	37,300	522		200,660	2.08, June 1967
Narrows	CO			225,800				1.62, Jan. 1967
Kanopolis[i]	KS		16,500				29,774,084	1.50, Dec. 1971
Nebraska-Mid State	NE		140,000		16,800	11,570,664		1.40, Jan. 1960
O'Neill	NE		77,000		4,515	3,109,616		1.53, Apr. 1971
Oahe	SD		495,000		157,236	108,293,150	44,584,650	1.70, Jan. 1965
Total			**940,840**	**263,100**	**281,331**	**$194,361,069**	**$100,321,296**	

[a]These facilities were individually reauthorized by acts of Congress.

[b]The date a facility will be placed in service is indeterminate pending a finding of feasibility and reauthorization or, in the case of reauthorized but suspended facilities, a determination of the facility's status or the disposition of the facility's construction appropriations.

[c]Fully irrigated acres are those irrigated using only federal irrigation water.

[d]Partially irrigated acres are those irrigated using federal water to supplement other sources.

[e]Applying the current benefit-cost methodology and new economic parameters would render the reauthorized units infeasible today. The benefit-cost ratios for the reauthorized facilities shown in table IV.4 were calculated using previous benefit-cost methodologies. These methodologies resulted in ratios that tended to be higher than those calculated using current methodologies because the previous methodologies (1) counted specialty crops, which are more lucrative as a benefit; (2) used historic prices, which are higher in real terms than the current ones; and (3) incorporated both direct and indirect benefits while current methodologies use only direct benefits (indirect benefits have a high multiplier of 1.7 or 1.8). In the early 1970s, the Water Resource Council (established under the Water Resources Planning Act of 1965) recommended the use of a benefit-cost methodology that would have resulted in ratios indicating infeasibility had it been applied to the Pick-Sloan reauthorized irrigation facilities. Specifically, the new methodology (1) used only direct benefits; (2) used more recent prices based on U.S. Department of Agriculture estimates; (3) excluded specialty crops; (4) incorporated recent, higher interest rates (7 or 8 percent now versus the 2 or 3 percent used during the 1950s and 1960s); and (5) discounted for inflation. These new "principles and standards" became effective in 1979. They were replaced by less rigid "principles and guidelines" (which allowed some exceptions; for example, the inclusion of specialty crops as benefits). The Bureau has not reassessed the benefit-cost ratios for the reauthorized facilities because some federal investment in irrigation equipment has already occurred at these facilities (the amounts invested are shown in the notes for the individual reauthorized units) and because the Congress specifically decided to reauthorize the facilities. This investment in these irrigation facilities requires a careful consideration of the decision to terminate or proceed and the manner in which these sunk costs will be handled.

[f]The appropriation was deauthorized by P.L. 100-516, which authorized the Mni-Wiconi Rural Water Supply Project. No studies were conducted to determine the facility's feasibility, but local interests suggested deauthorizing the irrigation development as a trade-off for developing a rural domestic water supply and distribution system to serve the needs of the Native American and non-Native American populations in the area. The power allocation for the facility was made available for the municipal and industrial system, and funding for irrigation was deauthorized. The irrigation facility was to remain as a planned facility of the Pick-Sloan Program. Approximately $1.1 million in federal investment in irrigation-related equipment had been expended on this facility as of September 30, 1994. This investment is currently categorized as construction-work-in-progress.

[g]The acreage for the Garrison Diversion Unit was reduced from 1,000,007 acres to 130,940 acres by P.L. 99-294 and to 115,740 acres by P.L. 102-575. At the time of the reformulation in 1986, it was recognized that the reduced scope of the project would result in economic infeasibility because of the loss of economies of scale and other factors. The reformulation was a compromise. Subsequent to the reallocation of the project's costs, it was determined that the project was also financially infeasible because the annual operation and maintenance costs exceeded irrigators' ability to pay. A team appointed by the Secretary of the Interior recommended a halt to further development of the project. Approximately $132.9 million in federal investment in irrigation-related equipment had been expended on this facility as of September 30, 1994. This investment is currently categorized as construction-work-in-progress.

[h]The facility was reauthorized by the Lake Andes-Wagner/Marty II Unit Act of 1992 (P.L. 102-575). The benefit-cost ratio for this unit was based on post-1979 methodologies. The Bureau employed "customized procedures" in calculating the ratio that allowed the consideration of a specialty crop (potatoes) as a benefit. The Planning Report/Draft Environmental Impact Statement (1985) included a benefit-cost ratio of 0.56. Under the customized procedures that included specialty crops, livestock intensification, and alternative price normalization, the benefit-cost was calculated at 1.02. On this basis, the Congress reauthorized the project.

[i]Approximately $3.7 million in federal investment in irrigation-related equipment had been expended on this facility as of September 30, 1994. This investment is currently categorized as construction-work-in-progress.

[j]Suspended; the assigned cost is for a Corps reservoir.

[k]Approximately $3.0 million in federal investment in irrigation-related equipment had been expended on this facility as of September 30, 1994. This investment is currently categorized as construction-work-in-progress.

[l]Approximately $7.1 million in federal investment in irrigation-related equipment had been expended on this facility as of September 30, 1994. This investment is currently categorized as construction-work-in-progress.

Source: Based on information from the Bureau of Reclamation, Great Plains Region, Billings, Montana.

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