Implementation Agreement, Inadvertent Overrun and Payback Policy and Related Federal Actions
Draft Environmental Impact Statement
Chapter 3.3 Hydroelectric Power

Prepared by U.S. Department of the Interior
Bureau of Reclamation

3.3 HYDROELECTRIC POWER

3.3.1 Background

Power is the last priority in regard to River operations, as stated in project-specific legislation, and as referred to under the Law of the River as described in section 1.2.2. Reclamation is the Federal agency authorized to generate power at Hoover, Davis, and Parker powerplants. Water released from Hoover Dam generates power through 17 turbines and then flows into Lake Mohave. Downstream, water is released from Davis Dam, generating power through five turbines and then flowing into Lake Havasu. South of Lake Havasu, Parker Dam generates power through four turbines. Parker Dam is the last major United States-owned, Reclamation-administered hydroelectric facility on the Colorado River within the Lower Basin. There is no other significant reservoir and, therefore, no significant storage downstream. All releases scheduled from Parker Dam are in response to downstream water orders or reservoir regulation requirements. In 1954, Parker and Davis Dams were consolidated into a single project, the Parker-Davis Project (P-DP). Headgate Rock Dam and Powerplant (Headgate), which is owned and operated by Bureau of Indian Affairs (BIA) and is located downstream of Parker Dam, is a run-of-the-river hydroplant that generates power through three turbines.

Power production can be considered in terms of capacity and energy. As used in this discussion, powerplant capacity refers to the output that a generator or facility is capable of producing at any given moment. Energy is a measure of the actual electric capacity generated over time. Generally, in a hydroelectric system, there are two factors that are directly related to power production; the head on the generating units and the quantity of water flowing through the turbines.

The head is the difference between the water surface elevation behind a dam and downstream of the dam. The maximum power that can be produced by the generators, at normal head and full flow, is the capacity of a hydroplant and is measured in megawatts (MW). The head of a powerplant is influenced by operating strategies for both the upstream and downstream reservoirs. The maximum operating capacities of the Hoover, Davis, Parker, and Headgate powerplants are 2,074 MW, 236 MW, 108 MW, and 19.5 MW, respectively.

The quantity of water flowing through the turbines (water releases) determines the amount of energy produced, measured in megawatt-hours (MWh). Between Calendar Year (CY) 1987 and CY 2000, the average net energy generated annually for Hoover, Davis, and Parker powerplants was 4,606,820 MWh, 1,154,518 MWh, and 498,666 MWh, respectively. During CY 1996 and CY 1997, the average net energy generated annually for Headgate powerplant was 87,165 MWh. CY 1996 and CY 1997 were the only years available with complete data for Headgate.

3.3.2 Affected Environment

Colorado River

Water is not released into the lower portion of the Colorado River solely to produce power; however, once water orders have been placed by downstream water users, the releases are "shaped" or scheduled to meet power needs based upon contractual obligations and to optimize power generation. After water orders have been received from the downstream water users, Reclamation and Western Area Power Administration (Western) schedule water releases to meet power generation requirements while continuing to satisfy the downstream water delivery orders. Lake Havasu is the southernmost downstream reservoir with any significant storage in the Colorado River system. To the degree storage is available, Mohave and Havasu reservoirs are used to store flows released from Hoover and Davis for power generation purposes until water is required to be released downstream to meet scheduled water deliveries to the Republic of Mexico and downstream water users in the United States.

Project Use Power (PUP) customers have the highest priority for using P-DP power. These customers include Federal projects, whether operated by the Federal government or an operator under an agreement with the United States. Examples of PUP customers include Reclamation-owned and -operated facilities and the Wellton-Mohawk Irrigation Project, a Federal project operated by a non-Federal entity.

Western is the Federal agency authorized to market Reclamation's generation that is surplus to the amount reserved for PUP customers. Under existing contracts, Western delivers Reclamation's 50 percent share of power generated by Parker Dam Powerplant, all the power generated at Davis Dam Powerplant, and all the power generated at Hoover Dam Powerplant. Pursuant to section 302 of Public Law 95-91 (August 4, 1977) and a Joint Operating Agreement between Reclamation and Western dated February 8, 1980, Western enters into electric service contracts on behalf of the United States with private and municipal entities for the Federal government's share of power generated by the P-DP and the Boulder Canyon Project (Hoover). These contracts identify the amount of capacity allocated to each customer and the associated amount of energy on a seasonal and monthly basis.

MWD has transmission and long-term power contracts to help supply its own pumping needs. Due to MWD's role in the construction of Parker Dam and Powerplant, MWD has a perpetual contract right to 50 percent of the electric power generated at Parker Dam. Colorado River water is diverted into the Colorado River Aqueduct via the Whitsett Pumping Plant located along the western shore of Lake Havasu. MWD uses all of its contractual Federal power to pump water from Lake Havasu through the Colorado River Aqueduct to its service area in southern California. MWD pays Reclamation 50 percent of operation, maintenance, and extraordinary maintenance costs for Parker Dam, plus 15 percent of operation and maintenance costs for administrative and general purposes of Parker Powerplant.

BIA provides energy generated by Headgate's three turbines to the Colorado River Indian Tribes (CRIT), and other Indian tribes. Since Headgate is a run-of-the-river hydroplant, which means it is dependent on river flow to generate power, it is unable to store water in excess of the amount capable of flowing through the generator turbines or through CRIT's diversion facilities. Any water that is not diverted by CRIT or passed through the turbines is spilled downstream.

Hoover Dam

Hoover powerplant has 17 generators and 2,074 MW maximum operating capacity. Between CY 1987 and CY 2000, the average net energy generated annually from Hoover was 4,606,820 MWh. Western markets the power to 15 customers in three States (Arizona, California, and

Nevada). Any excess energy generated at Hoover is distributed to Hoover contractors in accordance with their contracts.

Davis Dam

Davis powerplant has five generators and a 236 MW maximum operating capacity. Between CY 1987 and CY 2000, the average net energy generated annually from Davis was 1,154,518 MWh. As explained below, Davis Dam and Powerplant is part of the P-DP, and P-DP power is marketed by Western.

Parker Dam

Parker powerplant has four generators and a 108 MW maximum operating capacity. Between CY 1987 and CY 2000, the average net energy generated annually from the Parker powerplant was 498,666 MWh. MWD has a perpetual contract right to 50 percent of the electric power generated at Parker Dam. As explained below, Reclamation's 50 percent share of power generated by Parker is part of the P-DP, and P-DP power is marketed by Western.

Parker-Davis Project

The P-DP was formed in 1954 by consolidating the Parker Dam power project and the Davis Dam project. P-DP supplies power to five PUP customers and 25 firm electric service contractors. P-DP has 283 MW of capacity under contract to PUP and firm electric service customers. The total annual energy committed to the five PUP and 25 firm electric service customers is 1,345,801 MWh (PUP, 195,266.5 MWh; firm, 1,150,534.5 MWh). The contracted capacity and energy for the P-DP, including system losses and reserves, is based on Davis capacity and energy and Reclamation's half of Parker's capacity and energy. The P-DP firm electric service contracts are in effect until September 30, 2008.

As stated above PUP customers have the highest priority for using P-DP power. The second group of users having access to P-DP power hold firm electric service contracts and are called preference customers. Preference customers are entities that utilize the power for non-profit purposes, such as municipalities, cooperatives, and irrigation districts (other than those operating Federal projects). Some preference customers further distribute power received via these firm electric service contracts to other entities. Both PUP and preference customers buy P-DP power at rates that reflect the actual costs associated with the generation, transmission, and delivery of that power or "at cost." This includes the cost for administering the contracts and operation, maintenance, and replacement of the powerplants and transmission facilities.

Under the existing P-DP firm electric service contracts, the amounts of power per month and per season are guaranteed. This means, if the power is not available, Western would purchase the additional power required to fulfill the contracts. During the rate process, Western estimates the cost for the previous year to purchase power under contract but anticipated not to be available when required. This is called the "purchase power cost." The purchase power cost is then figured into the rate base for P-DP firm electric service customers. If the actual purchase power cost for any given year is more or less than what was estimated, an adjustment is made in the following year's rate process so that the cost of power to P-DP firm electric service contract customers continues to reflect an "at cost" rate.

Power generated by the P-DP, over and above what has been guaranteed to PUP and preference customers having firm electric service contracts, is referred to as surplus energy. A portion of the surplus energy, referred to as excess energy, is offered to P-DP customers for purchase at an "at cost" rate or for "banking" of energy up to the limit of the contractor's contract rate of delivery. Any remaining surplus energy may be sold at market rates to interested parties or may be "banked" for future use.

Headgate Rock Dam

Headgate is owned and operated by BIA for the purpose of satisfying CRIT and other Indian tribe power needs. Headgate powerplant, a run-of-the-river hydroplant, has three generators and a 19.5 MW maximum operating capacity. During CY 1996 and CY 1997, the average net energy generated annually from Headgate powerplant was 87,165 MWh. CY 1996 and CY 1997 were the only years available with complete data for Headgate. Any surplus energy not sold to the CRIT is currently being sold to Fort Mohave Indian Tribe. No power contracts exist with non-Indian users for any portion of the power generated at Headgate.

Off-River

Because CVWD, SDCWA, and the State of Nevada and entities within the State of Nevada do not have hydroelectric power facilities on or off the Colorado River that would be affected by implementation of the proposed action, these entities are not included in the following discussion.

Imperial Irrigation District

IID operates its own power generation and transmission facilities, providing power to more than 90,000 customers in Imperial County and parts of Riverside and San Diego counties. IID operates eight hydroelectric generation plants, one generating station, and eight gas turbines. Five of these hydroelectric generation plants are drop structures on the All American Canal, where the water "falls" through the structure to a lower level canal. These hydroelectric generating plants along the AAC are located at Drops 1, 2, 3, 4, and 5. Two hydroelectric generation plants are located just off the AAC at canal turnouts; one at the East Highline turnout where water is diverted into the IID service area, and one at the Pilot Knob turnout, where water is diverted back into the Colorado River[1].

Electrical power generated within the IID system is sold to district customers and to others via the regional power grid. IID also purchases power from Western and other power wholesalers.

---

1 The channel of the Colorado River from approximately Laguna to Morelos Dam has experienced considerable sedimentation build-up as a result of flood flows from the Gila River in 1993, which has reduced the channel capacity considerably in this area. Reclamation typically routes flows around this reach of the River by diverting some of the excess flows arriving at Imperial Dam into the All-American Canal, and returning flows to the River through both Pilot Knob and Siphon Drop (via the Yuma Main Canal and the California Wasteway). Pilot Knob returns flows to the River just above Morelos Dam, while the California Wasteway returns flows to the River further upstream. Excess flows that are reintroduced into the Colorado River are available to Mexico for diversion at Morelos Dam.

The Metropolitan Water District

As stated in the discussions of Parker Dam above, MWD has a perpetual contract right to 50 percent of the electric power generated at Parker Dam. MWD's share of electric power out of Parker (plus their other percentage of Federal power) is used to pump water through the Colorado River Aqueduct. MWD also purchases power from Western and other power wholesalers.

Arizona

The State of Arizona or entities within the State of Arizona do not have hydroelectric power facilities located on the mainstem Colorado River that would be affected by implementation of the proposed action.

The Yuma County Water Users Association operates the Siphon Drop powerplant, a hydroelectric generation facility located on the Yuma Main Canal at Siphon Drop. The Yuma Main Canal is a turnout of the AAC and diverts water for the Yuma County Water Users Association, the Yuma Project Reservation Division and other water users in the Yuma, Arizona area. Water is returned to the Colorado River via Yuma Main Canal and the California Wasteway. Although the Siphon Drop and the Siphon Drop powerplant are located within the State of California, it is being discussed within the State of Arizona as the operating agency of Siphon Drop is in the State of Arizona.

3.3.3 Environmental Consequences

Impact Assessment Methodology

Estimated Future Energy for Hoover, Davis, and Parker

The potential impact to energy from implementation of the IA from Hoover, Davis, and Parker was evaluated by considering both the No-Action Alternative and the IA using the Riverware model. The Riverware model including model operation and assumptions was used to estimate energy and is discussed in section 3.1 and Appendix G of this EIS. To best depict the water diversions, the median statistic was used. Once the estimate was obtained CY median energy was extracted from the Riverware energy data and converted to MWh for both No Action and the IA. Due to the high degree of uncertainty with respect to future hydrologic inflows, energy figures are estimates at best and are based on the median of all modeled future energy estimates. The final step involved subtracting the IA estimated energy from the No Action estimated energy to determine the potential impact of the IA.

Graphs were created to illustrate the difference between the No Action estimated energy and the IA estimated energy for the 75-year period of analysis. These graphs are included below in the following sections.

Estimated Energy for Headgate

The potential impact to energy from implementation of the IA from Headgate was evaluated by considering both the No-Action Alternative and the IA. The amount of water that would flow through the turbines was estimated by subtracting the CRIT irrigation diversions (diverted above Headgate turbines) from the Parker Dam outflows (there are no other major water diversions between Parker and Headgate Dams). This water was termed the Headgate outflow. Parker outflow and CRIT irrigation diversions were estimated using the Riverware model including model operation and assumptions as discussed in section 3.1 and Appendix G. To best depict the water diversions the median statistic was used. The CY median Headgate outflow was then extracted and converted to energy in MWh for both No Action and the IA. Due to the high degree of uncertainty with respect to future hydrologic inflows, energy figures are estimates at best and are based on the median of all modeled future inflows. The final step involved subtracting the IA from No Action to determine the potential impact of the IA.

Graphs were created to illustrate the difference between the No Action estimated energy and the IA estimated energy for the 75-year period of analysis. These graphs are included below in the following sections.

No-Action Alternative

No Action for Implementation Agreement

Under the No-Action Alternative, Reclamation would continue to operate Colorado River facilities consistent with the Law of the River as described in Chapter 1. Estimated River flows under the No-Action Alternative were determined using the Riverware model, and estimated hydroelectric power production was determined, and is graphically displayed in Figures 3.3-1 through 3.3-5. There would be no change to current River regulation and no impacts to hydroelectric power would occur.

No Action for Inadvertent Overrun Policy

Under the No-Action Alternative the Secretary would apply existing law and not deliver water in excess of a water users entitlement. There would be no change to current River regulation and no impacts to hydroelectric power would occur.

No Action for Biological Conservation Measures

Under this alternative, the biological conservation measures would not be implemented, and no impacts related to hydroelectric power would occur.

Proposed Action

Implementation Agreement

This section discusses the potential impacts of implementation of the IA to hydroelectric power. Potential impacts of the IA are discussed as differences between No Action and the IA. The impacts are based on the difference between median No Action energy and the median IA energy. Any energy figures shown are not meant to be future energy projections, but are only estimates of future energy to assist in the determination of potential impacts from the IA.

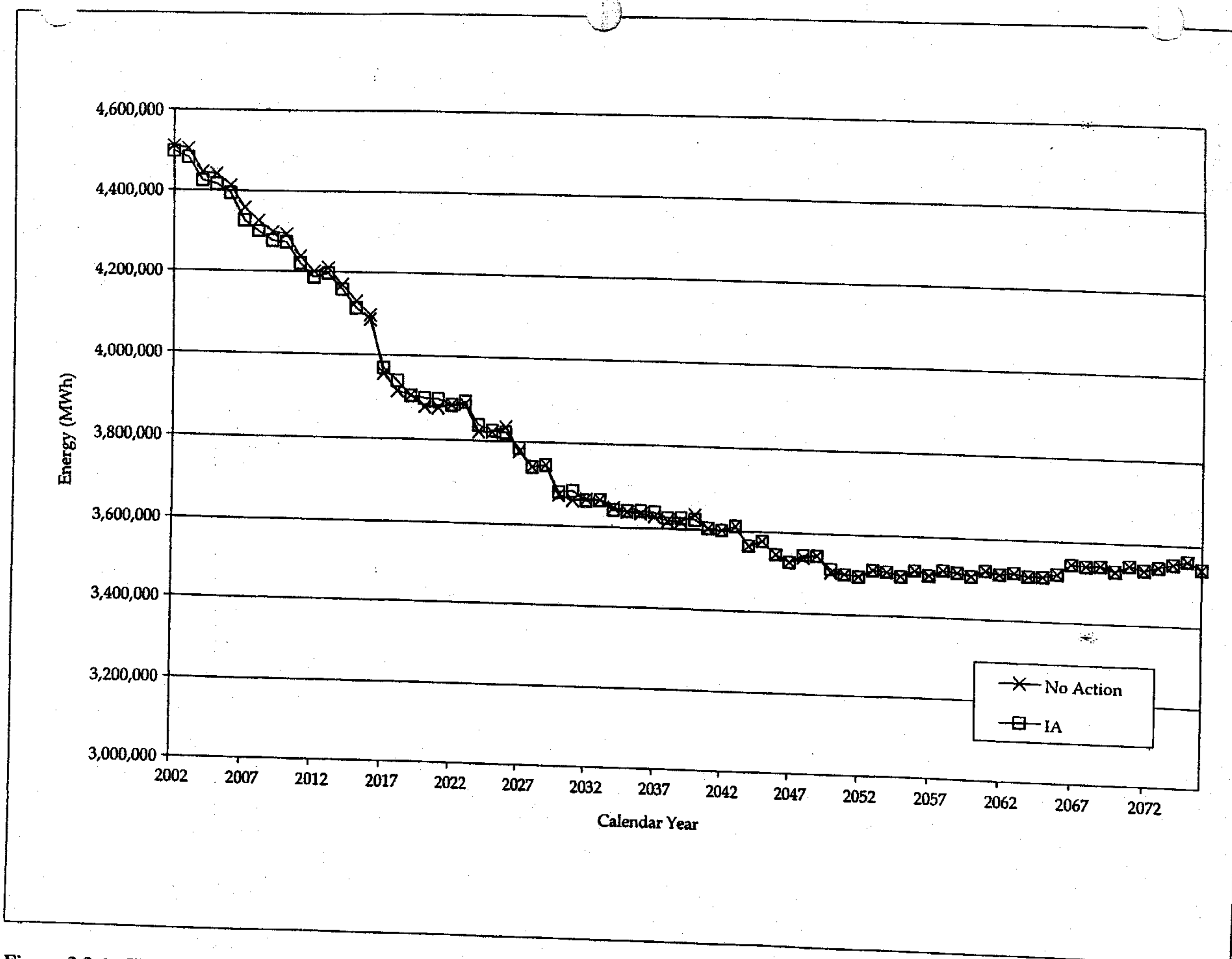

Figure 3.3-1. Hoover Estimated Median Net Energy under No Action and IA

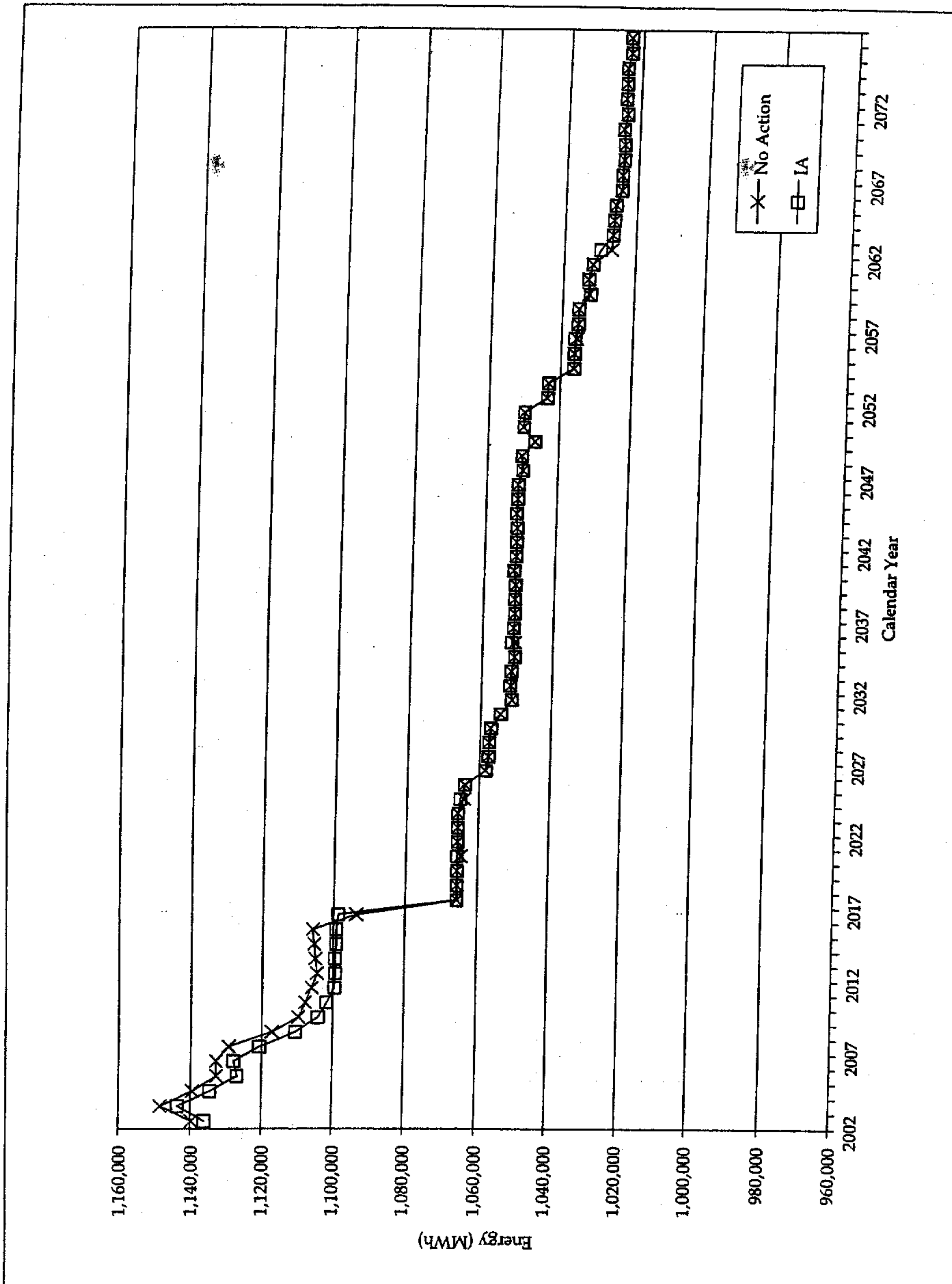

Figure 3.3-2. Davis Estimated Median Net Energy under No Action and IA

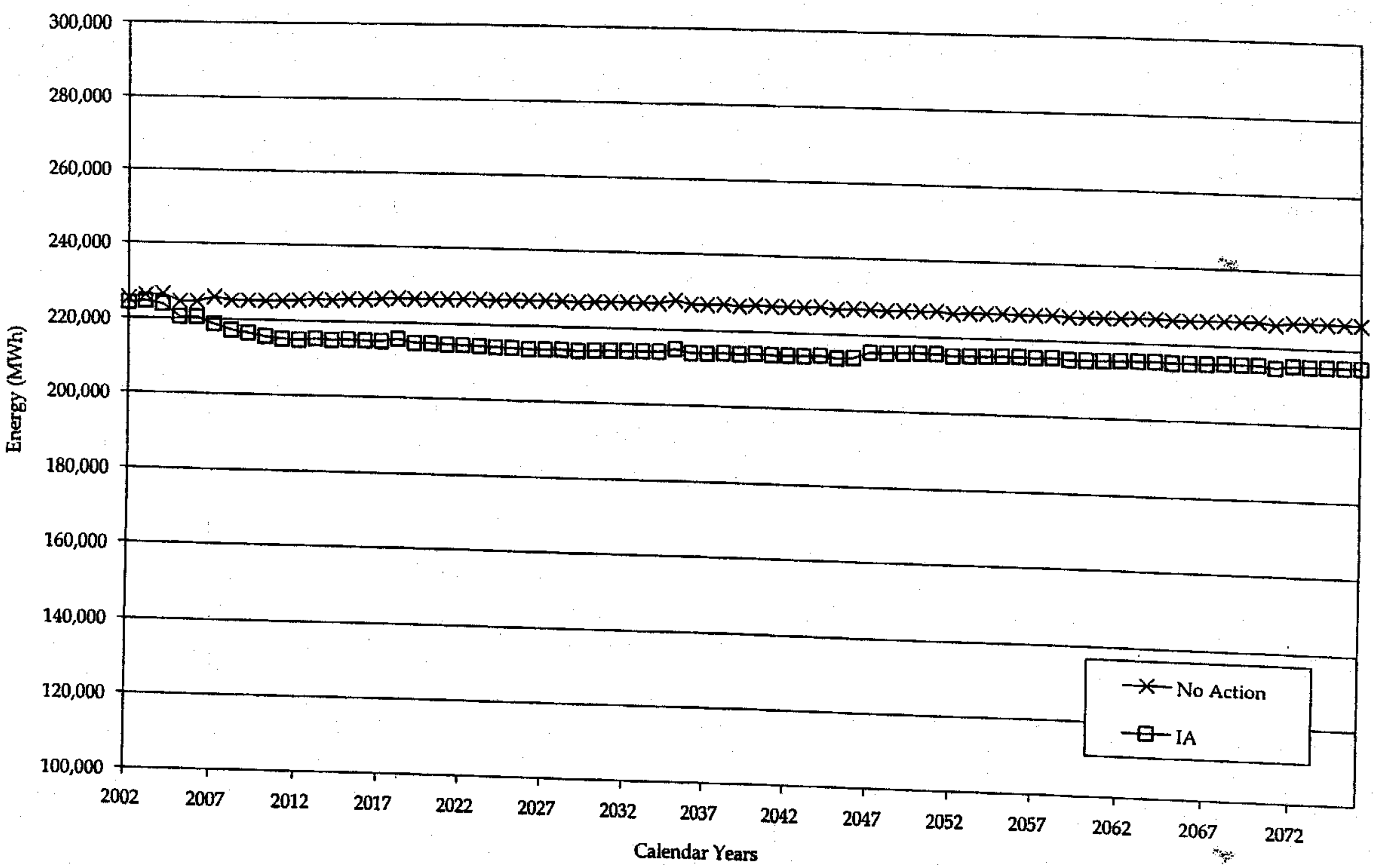

Figure 3.3-3. Half of Parker Estimated Median Net Energy under No Action and IA

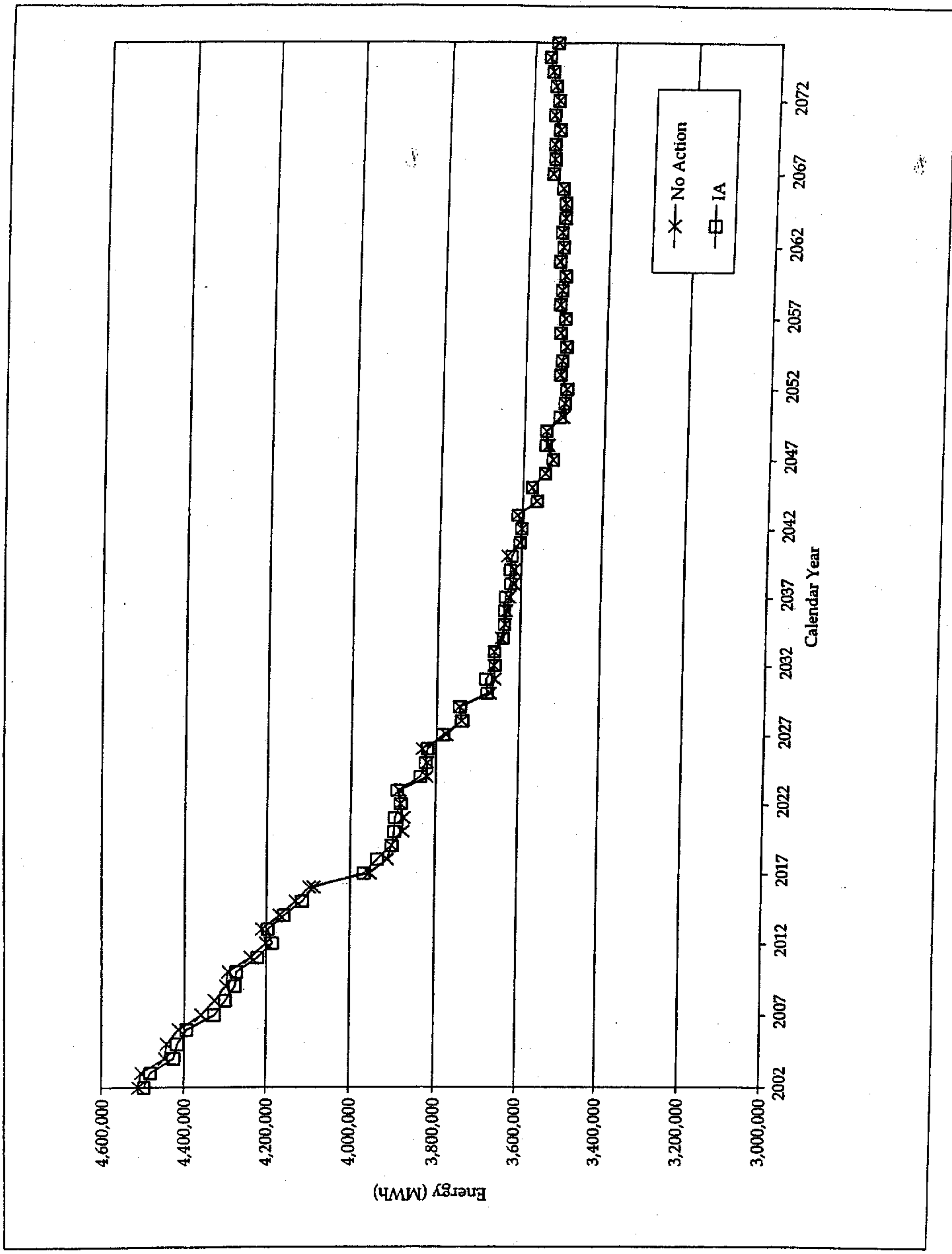

Figure 3.3-4. Parker-Davis Project Estimated Median Net Energy under No Action and IA

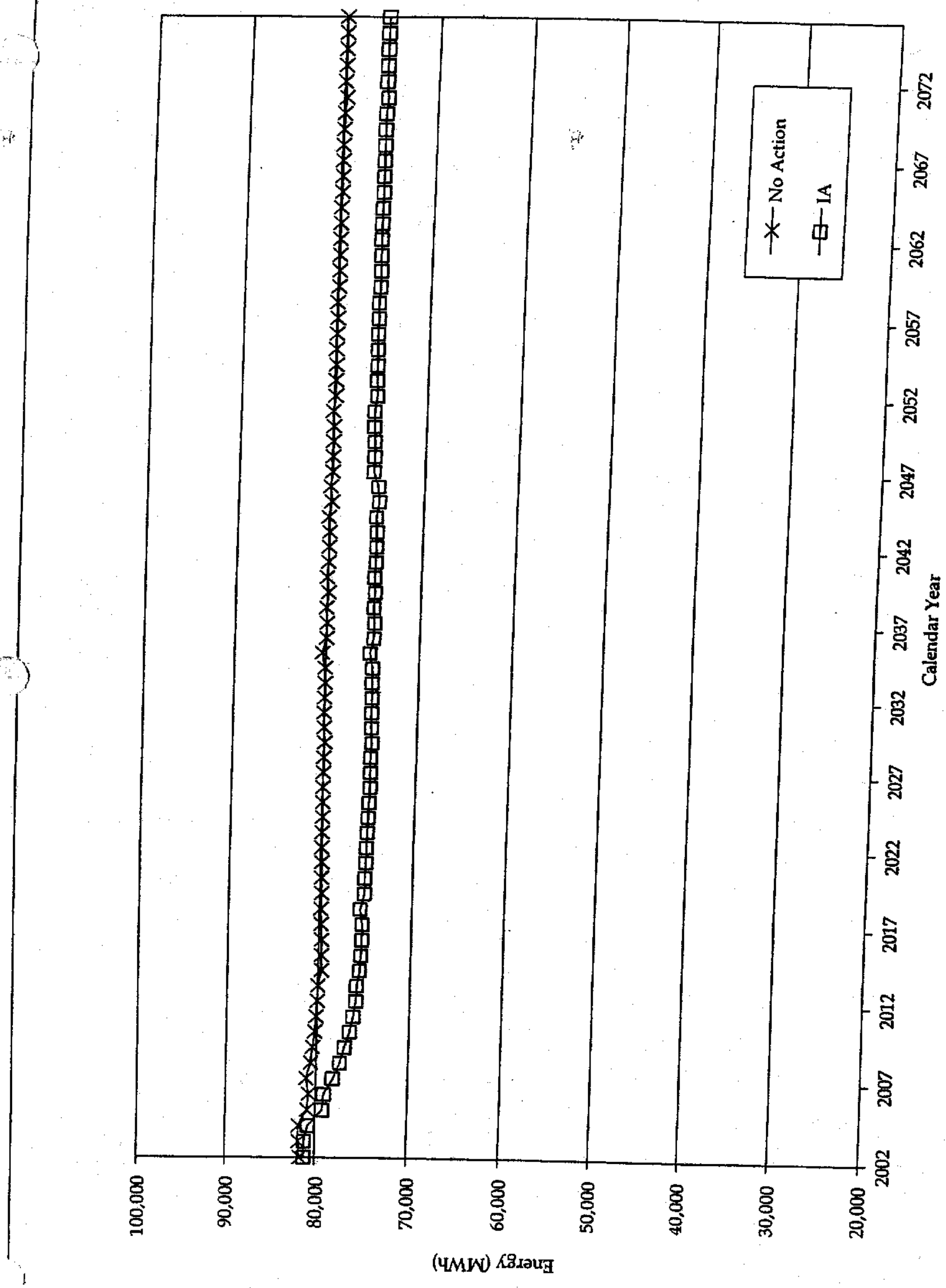

Figure 3.3-5. Headgate Estimated Median Net Energy under No Action and IA

COLORADO RIVER

Capacity. Changing the point of delivery of approximately 388 KAF of Colorado River water per year from Imperial Dam to Lake Havasu would not result in measurable changes to the elevation of Lakes Mead, Mohave, and Havasu. Projected elevations of Lake Mead are discussed in section 3.1 and are expected to be minimal. The water elevation of Lake Mohave would also not be impacted by implementation of the IA due to Reclamation's current operation of Davis Dam. Lake Havasu is the last reservoir used to retain flows released from Hoover Dam and Davis Dam until required for water deliveries to downstream users in the United States and the Republic of Mexico. This use of Lake Havasu to re-regulate flows would not be impacted by the implementation of the IA, and the water elevation behind Parker Dam would not be altered by any measurable extent. Therefore, the capacity of Hoover Dam, Davis Dam and Parker Dam powerplants would not be impacted with the implementation of the IA.

Due to the design and operation of Headgate Dam, implementation of the IA would not result in a change in the water elevation of Lake Moovalya. Although implementation of the IA would result in a reduction in the amount of water flowing through this reach of the River over the course of a year. Therefore, the capacity of the Headgate powerplant would not be impacted with the implementation of the IA.

Since the IA would not have a measurable impact on the capacity of the powerplants along the lower portion of the Colorado River, this analysis is only concerned with the potential impacts to energy.

Energy. Due to the high degree of uncertainty with respect to future hydrologic inflows, energy figures are estimates at best and are based on the median of all modeled future inflows. By comparing the median energy estimated for each operating scenario, the relative difference can be quantified.

Since Western is only responsible for marketing a generated surplus to meet Reclamation needs), at cost and delivering all the energy to contracted points of delivery, Western would not be impacted by the IA. Western's customers could be minimally impacted by the loss of energy at Parker, which is part of the P-DP.

MWD could be economically impacted by implementation of the IA, as the reduction in energy would mean less Federal power to pump Colorado River water through the Colorado River Aqueduct. Refer to the Parker section below for more information.

BIA would be impacted by the IA due to a small percentage of energy forgone at Headgate Rock Dam. Refer to the Headgate Rock Dam discussion below for more information.

Hoover Dam. Hoover's contracts are based on contingent capacity and firm energy; to the extent there are shortages, each contractor would share pro rata of what is available with the other contractors. Under firm energy deficiency conditions, Western is not obligated to purchase energy; however, the contractors can request Western make purchases on their behalf.

The energy estimated for No Action and IA are essentially the same. Over the 75 years modeled, the average difference is less than 1 percent; therefore, impacts would be negligible. Figure 3.3-1 shows Hoover estimated median net energy under No Action and the IA.

Davis Dam. The energy estimated for No Action and IA are essentially the same. Over the 75 years modeled, the average difference is less than 1 percent; therefore, impacts would be negligible. Figure 3.3-2 shows Davis estimated median net energy under No Action and the IA.

Parker Dam. The average percentage of energy foregone due to the IA over the 75-year period is estimated to be 4.84 percent (or 10,967 MWh less than No Action). The maximum percentage of energy foregone due to the IA over the 75-year period is estimated to be 5.67 percent (or 12,845 MWh less than No Action). Half of Parker's estimated median net energy under No Action and the IA is shown graphically in Figure 3.3-3.

As stated previously, Parker energy is divided equally between Reclamation and MWD. If water flows are low, resulting in lower energy production, the loss of Reclamation's share of Parker would impact P-DP by having less excess energy available and possibly causing the need to purchase power. MWD could be economically impacted, because the reduction in energy would mean less Federal hydroelectric energy to pump Colorado River water through the Colorado River Aqueduct.

Parker/Davis Project. The Parker-Davis firm electric service contracts guarantee a specific amount of firm energy will be delivered to the contractors, monthly and per season. If there is insufficient generation available to supply the contracted amount of energy, Western must purchase the required energy. Costs are passed along to the customers.

The average percentage of energy foregone due to the IA over the 75-year period is estimated to be less then 1 percent. The maximum percentage of energy foregone due to the IA over the 75-year period is estimated to be 1.32 percent (or 17,536 MWh less than No Action), which is considered to be minor. Figure 3.3-4 shows P-DP estimated median net energy under No Action and the IA.

The reduction of energy in the P-DP would not impact the ability to meet PUP obligations. Throughout the 75-year quantification period there would be less chance of excess energy being available to P-DP customers. Excess energy is not guaranteed; it is something the contractors should not plan on in future years. Depending on the actual hydrology for CY 2007 and CY 2008 Western would likely have to purchase power and would not have surplus energy available to help offset the costs. This would cause P-DP rates to be increased. Since the existing P-DP contracts expire on September 30, 2008, any energy forgone should be taken into consideration during the next contract period. With that said the major impact to the P-DP could be fewer resources available for contract in October 2008 and out.

The implementation of the IA would potentially impact the P-DP preference customers through excess energy foregone or a percentage of excess energy foregone, a potential increase in rates and a reduction in future contract resources.

Headgate Rock Dam. The average percentage of energy foregone due to the IA over the 75-year period is estimated to be 5.37 percent (or 4,298 MWh less than No Action). The maximum percentage of energy foregone due to the IA over the 75-year period is estimated to be 6.30 percent (or 5,035 MWh less than No Action). Figure 3.3-5 shows Headgate estimated median net energy under No Action and IA.

Currently Headgate generates more energy then is needed by CRIT. Implementation of the IA should not impact Headgate's ability to meet CRIT's current energy demands. However, implementation of the IA could impact BIA's ability to meet CRIT's planned energy growth and BIA's efforts to connect CRIT's additional California reservation energy demand. A reduction in Headgate energy could impact BIA's ability to meet new tribal energy demands. Implementation of the IA could also have a potential impact on Headgate rates if the rates are based on an estimated hundred percent of energy generated at Headgate.

OFF-RIVER (OTHER GEOGRAPHICAL AREAS)

CVWD, SDCWA and the State of Nevada or entities within the State of Nevada do not have hydroelectric power facilities that would be impacted by implementation of the proposed action. Therefore, no hydroelectric power impacts to these entities would occur.

Imperial Irrigation District. For similar reasons as stated above, implementation of the IA would not impact the capacity of the hydroelectric power facilities operated by IID. The IA does have the potential to impact the amount of water that would flow through the powerplant and, therefore, could impact energy production at the hydroelectric power facilities operated by IID.

The flows in the AAC would be decreased by the implementation of the IA, which could decrease the energy production at Drop Nos. 1, 2, 3, 4, 5, and East Highline. Energy production at Pilot Knob is dependent on water routed into the AAC and through Pilot Knob by Reclamation. Implementation of the IA would not change Reclamation's current operation of routing River flows through the AAC.

The Metropolitan Water District. Potential impacts to MWD from implementation of the proposed action are discussed in the Parker Dam section above.

ARIZONA

Energy production at Siphon Drop is dependent upon water orders by Colorado River water users that are serviced by the Yuma Main Canal and water routed into the AAC and through Siphon Drop by Reclamation. Implementation of the IA would not change water orders by users that are serviced by the Yuma Main Canal and would not change Reclamation's current operation of routing River flows through the AAC.

Economic Impacts. Reclamation would not be financially impacted by the water diversions. All of Reclamation's power-related costs are collected from rates, base charges, or advance funding from the power customers. Any reduction in energy from the P-DP would be calculated into the rate process; therefore, Reclamation would not lose any revenues. Hoover's Base Charge would not be affected by the IA; therefore, there would be no financial impact to Reclamation.

Western would not be financially impacted by the water diversions. All of Western's power-related costs are collected from rates, base charges, or advance funding from the power customers. If purchase power were required, the cost would be passed to the customers.

P-DP customers would be financially impacted, because Western is required to purchase power on the open market to fulfill contract requirements (and/or collect reduced surplus sales revenues) and pass the costs to the customers. To the extent excess energy is reduced or eliminated, some of the P-DP customers may have to purchase peaking power on the open market. Excess energy is not guaranteed. Any excess energy the customers receive is a benefit to them, not an obligation of the United States. When the P-DP contracts expire on September 30, 2008, Western and Reclamation could need to reduce the energy available for contracts after 2008. It would be expected that the P-DP customers would be able to contract for any energy shortfall under other long-term arrangements rather than by purchasing on the open market.

BIA presently has a duty to supply energy to Indian tribes that cannot acquire energy themselves. The reduction in Headgate energy by an average of 5.37 percent could impact BIA's ability to meet new tribal energy demands, which would mean that the reduced increment of power would have to be purchased on the open market. If the open market rate is higher than that charged by BIA, this could be an economic impact to the Tribe. BIA could be impacted by having less surplus power to sell, resulting in a reduction in revenue for its operations and maintenance costs.

MWD could be economically impacted by any reduction in energy at Parker as MWD uses all of its Federal hydroelectric energy to pump water from Lake Havasu through the Colorado River Aqueduct. MWD might have to purchase energy to replace any reduction at Parker.

The Central Arizona Project (CAP) may have a financial impact as a result of the water diversions. Pursuant to the Hoover Powerplant Act of 1984, CAP will receive revenues from an added rate (or surcharge) on P-DP energy sales beginning in June 1, 2005; any reduction in energy would reduce this revenue.

Due to deregulation, high natural gas prices, lack of generation supply in California and other market conditions, the price of energy has been extremely volatile since 1999. Like the hydrology estimates, any future estimate for the price of energy is very rough at best. To allow for a rough estimate of what the reduction in energy could cost, the following estimated average costs could be used. At this time an overall average open market price is estimated to be around $35 per MWh based on historic Palo Verde indexes. An average firm energy or long term costs are estimated around $40 per MWh (based on a projection of firm rates in Arizona and New Mexico). For P-DP customers only, it is assumed that the P-DP firm energy rate is $5 per MWh making the net additional cost of $35 per MWh for firm energy.

Adoption of Inadvertent Overrun Policy

The IOP would result in changes to Colorado River flows from year to year, with slightly higher flows in overrun years and slightly lower flows in payback years. Accurately estimating future changes to River flows due to the IOP is not possible as considerable assumptions would be required regarding the timing and magnitude of overruns and paybacks by water users. Therefore, the analysis prepared for the IOP is based on the estimated maximum overrun amount in any one year (313 KAF above Parker Dam and 313 KAF below Parker Dam), the estimated average overrun based on an average of all overruns for both the one-year and three-year payback scenarios (90 KAF above Parker Dam and 90 KAF below Parker Dam), the estimated maximum payback amount in any one year (206 KAF above Parker Dam and 176 below Parker Dam), and the estimated average payback based on an average of all paybacks for both the one-year and three-year payback scenarios (72 KAF above Parker Dam and 63 KAF below Parker Dam) as described in Appendix C.

The IOP would have positive impacts on power production during overrun years and negative impacts during payback years. Power production at Hoover, Davis, Parker, and Headgate Rock Dams would be impacted.

During the 75-year period, the maximum impact to Hoover in any given year could be a 3.6 percent increase in energy (144,401 MWh), or a 2.4 percent decrease in energy (95,037 MWh).

On average, the estimated impact of the IOP to Hoover could be a 1.0 percent increase in energy (37,558 MWh), or a 0.8 percent decrease in energy (30,046 MWh).

During the 75-year period, the maximum impact to P-DP in any given year could be a 3.8 percent increase in energy (47,496 MWh), or a 2.4 percent decrease in energy (30,257 MWh).

On average the estimated impact of the IOP to P-DP could be a 1.1 percent increase in energy (13,609 MWh), or a 0.8 percent decrease in energy (10,586 MWh).

During the 75-year period, the maximum effect to Parker in any given year could be a 4.9 percent increase in energy (20,925 MWh), or a 2.7 percent decrease in energy (11,766 MWh).

On average the estimated impact of the IOP to Parker could be a 1.4 percent increase in energy (6,013 MWh), or a 1.0 percent decrease in energy (4,209 MWh).

During the 75-year period, the maximum effect to Headgate in any given year could be a 5.4 percent increase in energy or 4,060 MWh, or a 3.0 percent decrease in energy or 2,283 MWh.

On average the estimated impact of the IOP to Headgate could be a 1.5 percent increase in energy (1,167 MWh), or a 1.1 percent decrease in energy (817 MWh).

The above analysis is an estimate based on the maximum overrun amount in one year, an average overrun based on an average of all overruns for both the one-year and three-year payback scenarios, maximum payback amount in one year, and an average payback based on an average of all paybacks for both the one-year and three-year payback scenarios, and should not be considered estimates of potential yearly impacts of the IOP.

As stated above, power production at Pilot Knob and Siphon Drop is a function of water routed into the AAC and through Pilot Knob and Siphon Drop power plants by Reclamation. Water routed is used for satisfaction of the U.S.-Mexico Water Treaty and deliveries in excess of the U.S.-Mexico Water Treaty. As discussed in section 3.1, and section 3.12, the IOP may slightly reduce the magnitude and frequency of flood flows to Mexico. This may also slightly reduce the power production at Pilot Knob and Siphon Drop as some of these excess flows may have been routed into the AAC and flowed through the Pilot Knob or Siphon Drop power plants. Although the IOP may reduce the magnitude and frequency of flood flows to Mexico, Reclamation's operation of the River would determine the amount of water that flows through the Pilot Knob and Siphon Drop power plants.

Adoption of the IOP would have a negligible impact to power generation at the various IID drops with a positive or beneficial impact in overrun years with a slight increase in flow of the AAC, and a negative impact in payback years with a slight decrease in flow of the AAC. Over the long term this is not expected to have a measurable impact on IID.

Implementation of Biological Conservation Measures

Implementation of the biological conservation measures would have no impact to hydroelectric power.

Mitigation Measures

Under the Law of the River and under project specific legislation, power production has the lowest priority in terms of Colorado River operations. Reclamation would continue to work closely with Western to schedule water releases for satisfaction of water orders and to optimize power production at the various facilities. However, based on the fact that power production is a result of water releases to meet water orders, no mitigation for hydroelectric power is proposed.

Residual Impacts

There would be a residual impact of about a 5 percent reduction in power produced at Parker and Headgate Rock Dams as a result of the water transfers. More water would be diverted at Lake Havasu and less water would flow downstream through these two powerplants for diversion at Imperial Dam.

Alternative to the Inadvertent Overrun Policy

No Forgiveness During Flood Releases Alternative

The No-Forgiveness Alternative would have similar impacts to hydroelectric power production as the proposed IOP. The No-Forgiveness Alternative would require payback of account balances, which may slightly decrease hydroelectric power generation as water users are delivered less water in a payback year. Although under the No-Forgiveness Alternative there may be a slight increase in power generation as there may be a slight increase in the magnitude and frequency of flood control releases as compared to the proposed IOP. The slight increase and slight decrease in hydroelectric power production is expected to balance out, and impacts of the No-Forgiveness Alternative would be similar to those seen with the proposed IOP.

Mitigation Measures

As discussed above for the proposed action, no mitigation for hydroelectric power is proposed.

Residual Impacts

There would be a residual impact of about a 5-percent reduction in power produced at Parker and Headgate Rock Dams as a result of the water transfers. More water would be diverted at Lake Havasu and less water would flow downstream through these two powerplants for diversion at Imperial Dam.