Appendix F

Analysis of Effects of Mitigation on Power Generation

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Introduction

This appendix provides a brief analysis of the effects of project mitigation on power generation. Historically, the Farad Power Plant would operate approximately 350 days per year and produce 13.3 x 10^6 kilowatt-hours (kWH) per year. To begin generating power, Sierra Pacific Power Company (SPPC) has needed approximately 175 cubic feet per second (cfs) (100 cfs for the turbine, 25 cfs for transportation losses, and 50 cfs for fish). Mitigation restricting SPPC's operations by limiting withdrawals and leaving a specific instream flow would result in reduced power generation. The mitigation, methodology for this analysis, and effects on power generation are described below.

Mitigation

The State Water Resources Control Board is exploring a variety of mitigation measures to minimize and compensate for project effects; these measures include maintaining instream flows and ramping flows for recreational users (see table S-1). 150 cfs is the preferred minimum instream flow considered in this analysis because it will likely provide the basis for the mitigation of project effects (see Mitigation Measure 6-3 in chapter 6); 100-cfs flows are also provided here for comparative purposes. Similarly, ramping of flows to provide a range of recreational flows (2 and 4 days) is also considered.

Methodology

This analysis was conducted by evaluating a 32-year hydrologic record (January 1968–August 2000) and comparing potential power generation to power generation forgone because of various mitigation requirements. The total number of days that SPPC was able to generate power based on its historic 175-cfs operating constraint was first determined. Next, higher thresholds for other mitigation were analyzed to determine the number of days SPPC would be

able to generate power; for example, requiring 150 cfs instream would require instream flows of 275 cfs (100 cfs for generation, 25 cfs for transportation losses, and 150 cfs instream) for minimum power generation and 575 cfs (400 cfs for generation, 25 cfs for transportaton losses, and 150 cfs instream) for maximum power generation. By calculating the days of operation with restrictions, the total power generated can be calculated, and this can then be subtracted from total possible power generated to arrive at a reduction in power generation. Boating mitigation flows were determined by calculating the total number of days flows would meet the suitable flow criteria (400 cfs) for the recreation months of April through September for 2 and 4 days of mitigation.

The reductions in overall power generation with recreational restrictions assume that the DFG ramping periods would be in effect, requiring 2 days to ramp up and 2 days to ramp down for each recreation weekend. These restrictions were calculated based on the number of days per month power generation could be reduced, then added as an additional percent restriction from April through September. Power generation opportunities during flows greater than 1,700 cfs were included in the analysis.

Effects on Power Generation

The effects on power generation of implementing various mitigation measures are depicted in table F-1. During the period analyzed, there were 12,075 days in the period of record. During this time, SPPC was capable of operating 89% of the time at minimum power generation and 59% of the time at maximum power generation.

Implementing a 150-cfs minimum flow would result in approximately a 3% reduction in power generation at minimum generation levels (100 cfs) and approximately a 16% reduction in power generation at maximum generation levels (400 cfs). Recreation flows of 615 cfs were achieved 54% of the time between April and September over the period of record. Implementing 2 recreation days per month of mitigation would reduce power generation an additional 11% during April through September. Implementing 4 recreation days per month of mitigation would reduce power generation an additional 21% during April through September.

Implementing a lower 100-cfs minimum flow would result in approximately a 1% reduction in power generation at minimum generation levels and approximately a 10% reduction in power generation at maximum generation levels. Implementing 2 recreation days per month of mitigation would reduce power generation an additional 11% during April through September. Implementing 4 recreation days per month of mitigation would reduce power generation an additional 21% during April through September.

Implementing a higher 250-cfs minimum flow would result in approximately a 12% power reduction at minimum generation levels and a 24% power generation

reduction at maximum generation levels. Implementing 2 recreation days per month of mitigation would reduce power generation an additional 11% during April through September. Implementing 4 recreation days per month of mitigation would reduce power generation an additional 21% during April through September

Table F-1. Mitigation Measures and Effects on Power Generation

Flow Rates and Mitigation	Days River Is at a Specific Flow and Operation Is Possible over the Period of Record	Percent of Time River Is at Specific Flow	Percent Reduction in Power Generation
Year Round			
185 cfs	10,687	89%	NA
485 cfs	6,930	57%	NA
400 cfs	8,729	72%	NA
285 cfs (150 cfs mitigation)	10,346	86%	3%
585 cfs (150 cfs mitigation)	5,009	41%	16%
235 cfs (100 cfs mitigation)	10,571	88%	1%
535 cfs (100 cfs mitigation)	5,685	47%	10%
385 cfs (250 cfs mitigation)	9,270	77%	12%
685 cfs (250 cfs mitigation)	4,187	35%	24%
April–September			
400-1,700 cfs (150 cfs + 1 weekend)	5,462	45%	11%
400-1,700 cfs (150 cfs + 2 weekend)	5,462	45%	21%