UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Pat Wood, III, Chairman;
Nora Mead Brownell, Joseph T. Kelliher,
and Suedeen G. Kelly.

PPL Montana, LLC Project No. 2188-097

ORDER MODIFYING AND APPROVING FINAL PULSE FLOW PROTOCOL

(Issued December 21, 2004)

1. PPL Montana, LLC, licensee for the 327- megawatt Missouri-Madison Project No. 2188, has requested approval of its final pulse flow protocol for the project, which is required by Article 413 of the project's license. The project is located on the Madison and Missouri Rivers in Gallatin, Madison, Lewis and Clark, and Cascade Counties, Montana. This order approves the licensee's final protocol with modifications. This order is in the public interest because it resolves issues regarding the spill flow protocol.

## Background

2. The original license for the Missouri-Madison project was issued in 1956.[1] The lower Madison River downstream from the project's Madison development is classified by the Montana Department of Fish and Wildlife as one of the premier trout streams in the country.[2] In the summer of 1988, a fish-kill of trout and whitefish occurred in this reach of the river during a drought and extreme hot weather. Although the fish-kill did not demonstrably damage the downstream fishery, it prompted the licensee, government agencies, conservation groups, and other entities to consider the causes and possible impacts of elevated water temperatures on the fishery in the lower Madison River.

[1] 15 FPC 1330.

[2] *See* Environmental Impact Statement (EIS) prepared by Commission staff in the relicensing proceeding (published September 1999) at 3-42.

3. In 2001, the Commission issued a new license for the Missouri-Madison Project.[3] Addressing concerns over the project's potential to increase water temperatures, resulting in adverse impacts on downstream trout fishery resources, Article 413 of the new license requires the licensee to develop a three-year plan for continued thermal monitoring of water temperatures and a pulse flow protocol for the lower Madison River downstream from the project's Madison development.[4] The article requires the licensee, at the end of the three-year monitoring period, to submit to the Commission for approval a final pulse flow protocol, developed in consultation with state and federal resource agencies and other interested entities. The purpose of the protocol is to use pulse flows when necessary to reduce water temperatures in the lower Madison River for the benefit of fishery resources.[5] Pulse flow project operation reduces the amount of heating that occurs in waters downstream from the project by increasing the volume of water released at certain times from the project. A pulse flow protocol would dictate when pulse flows are released based on downstream water temperatures.

4. In an October 15, 2001 Order on rehearing, the Commission upheld the requirements of Article 413 and other provisions of the license as appropriate mitigation and enhancement measures for the project.[6] On December 7, 2001, the Commission staff approved with modifications the licensee's Article 413 plan for developing a pulse flow protocol.[7] Under the three-year plan, the licensee was to collect water temperature data, test pulse flows, and monitor water temperatures in the lower Madison River in order to validate the computer model for its final pulse flow protocol. By March 27, 2004, the licensee was to file for Commission approval a summary of the work performed and a final protocol.

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[3] 92 FERC ¶ 61,261 (2001).

[4] The Missouri-Madison Project consists of nine developments. The most upstream development is the Hebgen development, a storage facility at river mile (RM) 103 of the Madison River. The next downstream development is the Madison development, a generating facility at RM 40. Below it are the project's seven other downstream developments.

[5] *See* EIS, Appendix A, section A.2.

[6] 97 FERC ¶ 61,060.

[7] 97 FERC ¶ 62,207.

5. On March 19, 2004, the licensee filed with the Commission a final pulse flow protocol for the project, developed in consultation with the U.S. Fish and Wildlife Service, the Montana Department of Fish, Wildlife, and Parks, and the Montana Department of Environmental Quality.

6. The Commission issued public notice of the filing on May 13, 2004. The Hebgen Lake Preservation Coalition (Coalition) intervened in the proceeding. The Coalition and several other commenters, representing the interests of shoreline recreation users of Hebgen reservoir and shoreline property owners, oppose a pulse flow protocol for the reservoir, arguing that pulse flows lower water levels at the reservoir. They assert that low water levels have since 2001 made docks along Hebgen reservoir unusable during the summer, created sandbars, weeds and agal blooms, and generally impaired fishing and other recreational activity at the reservoir, as well as navigability.

**Discussion**

7. The purpose of the licensee's final protocol is to use pulse flows to prevent lethal summer water temperature conditions for cold-water fish species in the lower Madison River by maintaining summer water temperatures at or below 80 degrees Fahrenheit. Under the protocol, pulse flows would be triggered and released only on days when extreme hot weather and streamflow conditions combine to potentially raise water temperatures in the lower Madison River to levels considered lethal for brown and rainbow trout. To manage temperatures, the final protocol uses a state-of-the-art Thermal Decision Support System (TDSS), developed in consultation with resource agencies, that calculates the need for, and the duration and magnitude of, required pulse flows, based on weather service data.

8. The TDSS monitors upstream reservoir, dam release, and downstream conditions; provides for internet control of its systems; and maintains an emergency notification system that automatically alerts project powerhouse operators of impending meteorological conditions dictating changes in project water discharge for protection of the downstream fishery from thermal impacts. It also provides for near real-time public internet access to system information. In the event of a TDSS failure, the final protocol includes a manual protocol as a back-up to govern releases.[8]

9. According to the licensee's March 19, 2004 filing, testing of pulse flows and recalibration of the computer model for the TDSS enabled it, in the summer of 2003, to

[8] *See* licensee's final pulse flow protocol, Exhibit I, p.1, for a general description of the TDSS.

successfully maintain river temperatures below the protocol's target maximum temperature of 80 degrees Fahrenheit.[9] During the summer of 2003, low flows and high water temperatures in the lower Madison River were more severe than those of the summer of 1988 in which a major fish kill occurred in the same reach of the river.

10. Questioning whether there actually is a downstream thermal impact problem that needs to be addressed, the Coalition asserts that the Commission's pre-licensing environmental analysis of the project failed to establish what, if any, adverse thermal effects from the project's Madison development have occurred. It asserts that Article 413's pulse flow requirements appear to be based on the unfounded conclusion that high water temperatures in the Lower Madison River caused the 1988 fish-kill.

11. The 2001 license, including Article 413, is final. Thus, objection to the basis for, or terms of, Article 413 is an untimely collateral attack on the license order. In any event, as mentioned earlier, the cold water fishery in downstream Madison River is recognized as a natural resource of national importance.[10] Prompted by the possibility that a fish-kill more serious than the 1988 event might occur in the downstream reach, government agencies and other entities during the relicensing proceeding identified thermal impacts to fisheries in the lower Madison River as the most significant of the hundreds of resource issues identified in the proceeding.[11] On rehearing, no party objected to the pulse flow protocol required by Article 413. On the contrary, several entities asserted that in fact the pulse flow protocol did not go far enough.[12]

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[9] Data submitted with the licensee's final pulse flow protocol indicate that the TDSS's computer model accurately predicts temperatures resulting from pulse flows. *See* Final Pulse Flow Protocol at 33.

[10] *See* EIS at 3-42.

[11] *See* licensee's March 15, 2004 letter to the Commission at 2 (submitted with the final pulse flow protocol).

[12] The Commission in its October 15, 2001 Order on rehearing responded that, while the project's precise contribution to downstream chronic thermal effects had not been established, there was an adequate record to support Article 413's requirement of post-licensing studies and, as additional data warrant, adjustments of project operations on behalf of improved downstream water temperatures, irrespective of the causes of any such effects. 97 FERC ¶ 61,060 at 61,320.

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12. Moreover, rather than being caused primarily by pulse flows, the exposed docks, sandbars, diminished navigability, and other adverse impacts to the Hebgen reservoir cited by the Coalition were largely due to unusual conditions beyond the licensee's control -- the extreme drought and hot summer weather that occurred in the project area from 2000 through 2003. During this period, inflows into the project's Madison development fell to 60 percent of their normal non-drought levels.[13]

13. Minimum flow releases required by the project license to meet downstream resource needs also reduce reservoir levels. Balancing of the unique value of the downstream fishery with upstream reservoir-related recreational opportunities and other values, the Commission required that Hebgen Reservoir be drawn down annually from September through March to ensure that downstream brown trout spawning habitat is not dewatered. In so doing, the Commission acknowledged that such drawdowns may result in adverse impacts to reservoir shoreline recreation facilities.[14] License Article 403 additionally provides that flows and water surface elevations required under it may be temporarily modified to enable water stored in the project's reservoirs to be used to enhance downstream power production if extreme drought conditions persist for an extended period.

14. Over the past four years, emergency withdrawals for the benefit of downstream power production have combined with drought conditions, hot weather, and the effects of the required September through March drawdown of Hebgen reservoir to adversely impact recreational and water resources at the reservoir.[15] As the licensee notes in the

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With regard to the assertion that high water temperatures did not cause the 1988 fish-kill, data collected during the fish-kill suggest otherwise. Recorded water temperatures during the 1988 fish-kill in June reached 82.94 degrees Fahrenheit. *See* March 15, 2004 letter at 2. The EIS for the new license determined, based on three published studies, that temperatures at or above 80.6 degrees Fahrenheit are generally lethal for brown and rainbow trout. *See* EIS at 3-48.

[13] *See* March 15, 2004 letter at 8.

[14] *See* 92 FERC at 61,837 and EIS at 4-62. *See also* license Article 426 (requiring monitoring and minimization of adverse impacts to boat ramps and docks at Hebgen reservoir caused by changes in reservoir water levels); Article 404 (requiring monitoring and collection of data on toxic algae bloom conditions at reservoir).

[15] For example, the licensee states that on July 21, 2003, inflow into Hebgen reservoir was only 700 cubic feet per second (cfs) while the required minimum flow at the downstream Madison development was 1,100 cfs. On the same day a pulse flow

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final protocol, required non-pulse flow releases from July through October of the past four years accounted for an average of 81 percent of Hebgen reservoir drawdowns. Pulse flows during the same period accounted for an average of only 19 percent (an average of 25 pulsing days) of the licensee's drawdowns of the reservoir.[16] Pulse flows have in fact been required at the project in only six (1988, 1994, and 2000-2003) of the last 15 years.[17]

15. Through the final protocol, the licensee must timely notify state and federal agencies and the public whenever summer conditions in the Madison River drainage make pulse flows imminent. To ensure that this occurs, we are clarifying the final protocol by requiring that real time monitoring data from all of the licensee's monitoring stations are to be made available on the internet.[18] In the final protocol, the licensee also proposes to discontinue collecting meteorological data at its Sloan monitoring station if 2004 data validate the TDSS' accuracy. We are requiring that the licensee's collection of data at the station may not be discontinued until the Commission staff determines that collected data reconfirm that the TDSS successfully predicts river water temperatures within an acceptable margin of error. Finally, the licensee's final protocol proposes that the licensee report to the Commission every five years on the performance of the protocol. We are modifying this protocol provision by requiring prior Commission approval of any changes to the protocol proposed in the reports.

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release of 3,000 cfs was required to maintain water temperatures in the lower Madison River near 80 degrees Fahrenheit. Air temperatures that day at a downstream monitoring station exceeded 100 degrees Fahrenheit. *See* March 15, 2004 letter at 8.

[16] One commenter (M. Manship, June 14, 2004) incorrectly suggests that pulse flow releases are being using to generate additional power for profit. The maximum hydraulic capacity of the Madison development is 1,650 cubic feet per second (cfs). Pulse flows under the protocol are generally higher. A substantial amount of pulse flow water is therefore usually spilled over the Madison development dam. Using a hypothetical power value of $50 per megawatt-hour, the licensee estimates that a 2,100 cfs second pulse flow event to reduce downstream water temperatures results in spilled flows unavailable for power production valued at $1,550. *See* March 15, 2004 letter at 4.

[17] *See* March 15, 2004 letter at 4. Prior to issuance of the new license in 2001, the licensee voluntarily released pulse flows at the project in 1988, 1994, and 2000.

[18] The Commission staff found that, contrary to indications in the final protocol, the licensee's public information internet web site on protocol operations does not fully provide near real-time data from all of the licensee's monitoring stations.

16. Based on foregoing, we will approve the final pulse flow protocol. The extended drought conditions in the project area over the last four years, which show no signs of abating, underscore the need for a mechanism to prevent such conditions from causing high water temperatures harmful to the valuable cold water fishery below the Madison development. The two-system (TDSS and manual) redundancy and the conservative nature of the flow calculation methods used by the final pulse flow protocol provide a reasonable method for keeping water temperatures downstream from the Madison development at or below 80 degrees Fahrenheit. The proposed protocol, as modified, will help protect the fishery resources of the lower Madison River and fulfills the requirements of license Article 413.

The Commission orders:

(A) The final pulse flow protocol for the Missouri-Madison Project No. 2188, filed by PPL Montana, LLC on March 19, 2004, is approved, as modified herein.

(B) The licensee shall publish on its Madison Decision Support System internet website near real-time data from all of the licensee's lower Madison River monitoring stations.

(C) The licensee may discontinue collecting meteorological data at its Sloan monitoring station on the lower Madison River only upon Commission approval of a report documenting that the Thermal Decision Support System for the pulse flow protocol successfully predicts river water temperatures within an acceptable margin of error. The report shall be based on data collected by the licensee through at least the year 2004 validating the accuracy of the licensee's 2003 calibration of the Thermal Decision Support System, and shall include comments from the U.S. Fish and Wildlife Service; the Montana Department of Fish, Wildlife, and Parks; and the Montana Department of Environmental Quality.

(D) The licensee shall, five years from the date of this order, and every five years thereafter, file with the Commission a report on the performance of the licensee's pulse flow protocol, including comments from the U.S. Fish and Wildlife Service; the Montana Department of Fish, Wildlife, and Parks; and the Montana Department of Environmental Quality. Any proposed changes to the pulse flow protocol in the reports will be subject to Commission approval.

(E) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order.

By the Commission.

( S E A L )

Magalie R. Salas,
Secretary.