UNITED STATES OF AMERICA 72 FERC ¶ 62, 150
FEDERAL ENERGY REGULATORY COMMISSION

Central Vermont Public Service Corporation Project No. 2489-006 and 009 Vermont

ORDER MODIFYING AND APPROVING FLOW MANAGEMENT PLAN
AUGUST 17, 1995

Central Vermont Public Service Corporation (licensee) filed for Commission approval, on May 1, 1995, a flow management plan. This plan addressed those items required by articles 403 and 404 of the license for the Cavendish Project.[1]

Article 403 requires the licensee to consult with the U.S. Fish and Wildlife Service (FWS), the U.S. Geological Survey (USGS), and the Vermont Agency of Natural Resources (VANR) and develop a plan to monitor inflow to the project and outflow from the project both below the tailrace and in the bypassed reach. The plan should include measures to document compliance with the run-of-river operation and provision of downstream flows during impoundment refilling, required by article 401, and the 10 cubic feet per second (cfs) minimum instantaneous flow in the bypassed reach, required by article 402.

The plan shall include, at a minimum, the following items: (1) the specific methods to provide the specified minimum flows; (2) a schedule for installing all flow measuring devices; (3) the planned locations of the flow measuring devices; (4) the design of the devices, including any pertinent hydraulic calculations; (5) operating measures that will minimize the effects of lag time and deviations from true run-of-river conditions below the project; (6) the method of flow data collection, and provisions for providing data to the regulatory agencies in a timely manner; and (7) a provision to provide the project's turbine rating curve to the VANR within 90 days of the Commission's approval of the plan.

Article 404 requires the licensee to consult with the VANR and develop a plan that describes the measures that will be used to manage the impoundment level at the project.[2]

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[1] 69 FERC ¶ 62,110.

[2] Article 404 requires the licensee to maintain the level of the impoundment no lower than 6 inches below the crest of the flashboards, except during periods when the project's control system is not functioning or the flashboards have failed. When the control system is not functioning, the impoundment shall be maintained no lower than 12 inches below the crest of the

Licensee's Proposed Plan

The licensee proposes to measure impoundment level at the project using the existing pressure sensor located in a stilling well mounted between the gatehouse and the intake and monitor impoundment level using the Supervisory Control and Data Acquisition (SCADA) system. The licensee plans to install a second headpond level transducer adjacent to the existing system for use in the rubber dam control system.[3] The licensee proposes to use this second transducer as a backup for the existing system.

The licensee proposes to pass the minimum flow of 10 cfs required by article 402 through the permanent downstream fish passage facility. The licensee proposes to maintain the headpond level constant at 102.9 feet, approximately 1-inch below crest, and set the fish passage gate at 101.9 feet, in order to maintain 1-foot of spill through the downstream fish passage facility. The licensee proposes to monitor headpond level using the SCADA system, reading turbine output and headpond level every 15 minutes. The licensee plans to automatically raise or lower turbine load as necessary to maintain the headpond constant at 102.9 feet. The licensee proposes to check the fish passage each time the operator visits the dam (in general, at least once per day, six days per week) to verify the release of the required minimum flow.

To ensure run-of-river operation, the licensee proposes to maintain the impoundment level constant at 102.9 feet, as described above, except during high water conditions when the reservoir may be slightly higher. The licensee stated that river flows upstream and downstream of the dam will be approximated using the headpond level reading and the output of the hydroelectric generating station.

The licensee stated the main causes for past impoundment fluctuation were failure of flashboard supports during ice breakup and high water, and annual maintenance on the flashboards. To minimize impoundment fluctuations, the licensee plans to replace the flashboards with an inflatable rubber dam by September 15, 1995. As a secondary control system, the licensee proposes to use a programmable controller to inflate or deflate

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flashboards. Further, article 404 requires the licensee to manage the impoundment level such that changes in excess of minus 2 feet from the normal operating level are eliminated.

[3] The installation of a 6-foot high inflatable dam was approved in the Commission's Order Amending License and Approving Plan and Schedule for Installation of Downstream Fish Passage Facility, issued April 4, 1995.

the dam as necessary to maintain a constant headpond level at 102.9 feet. During high water events, the licensee proposes to maintain the pond level between elevation 103 and 104.5 feet with a maximum drawdown of the rubber dam to 102.5 feet.

The licensee plans to dispatch personnel to the site if the rubber dam does not begin to deflate when the reservoir elevation reaches 104 feet. The licensee plans to equip the rubber dam with an emergency deflation float that activates if the control system fails and pond elevation reaches elevation 105 feet.

In order to minimize the effects of lag time on run-of-river conditions prior to a planned shutdown of the project's three units, the licensee proposes to increase flow through the fish passage to 20 cfs, reduce generation, and allow flows to begin spilling at the dam. The licensee proposes to shut the units down when the increased flow from the dam reaches the station tailrace (approximately 45 minutes). Prior to any planned shutting down of a single unit, the licensee proposes to follow the same procedure, but would only increase the flow through the fish passage to 15 cfs. The licensee stated that planned shutdowns are expected to occur less than two times per year. Further, the licensee stated due to the minimum flow through the fishway and the normal operating level 1-inch from the top of the rubber dam, unplanned shutdowns are not expected to create a lag of any significant duration.

Annually, the licensee plans to lower the impoundment elevation to 101 feet to allow inspection of the portion of the rubber dam below the normal impoundment level. During this drawdown, the licensee proposes to adjust the fishway gate to 100 feet to provide the flow required in article 402. The licensee proposes to refill the impoundment in accordance with article 401.[4]

The licensee proposes to record station output and headpond level every 15 minutes. The licensee proposes to submit an annual report based on this information to the VANR by January 31 of the year following collection of the data. The licensee stated the VANR may waive the requirement for the annual report. The licensee proposes to provide flow data to the VANR or the FWS within 30 days of an agency's request. The licensee proposes to

[4] During refill, article 401 requires the following instantaneous minimum flows released downstream of the project: 42 cfs from June 1 to September 30; 83 cfs from October 1 to March 31; and 332 cfs from April 1 to May 31. When natural inflow to the project is insufficient to meet these flow requirements the impoundment shall be refilled while releasing 90 percent of the instantaneous inflow at all times through the turbines.

submit to VANR, within 90 days of approval of this plan, a turbine rating curve for the project.

The licensee proposes to implement the plan in August 1995, pending approval by the Commission. The licensee stated that currently the minimum flow is being maintained as spill through the interim fish passage facility, as described in the Order Approving Interim Downstream Fish Passage Facility, issued March 27, 1995.

Agency Comments

The FWS and VANR commented on the proposed plans in letters dated April 4 and 24, 1995, respectively. The USGS did not provide comments on the proposed plan.

The FWS, in its April 4 letter, stated that although the installation of the rubber dam will limit headpond fluctuations, it will not eliminate them entirely. Therefore, FWS recommended the fish passage gate be designed to pass 1 foot of water at the minimum operating level (i.e. 1 foot lower than the rubber dam will be lowered to during extreme high water events). Further, FWS stated that the 10 cfs bypass flow should be released at all times outside of the spring salmon migration period, when 20 cfs should be discharged through the fish passage facility.

The FWS stated the reporting procedures and installation schedule outlined in the proposed plan are acceptable. The FWS's comments regarding maintenance of flows during impoundment refill and a schedule for checking the bypass opening for blockage were addressed in the licensee's proposed plan.

In its letter dated April 24, 1995, the VANR recommended that the elevations given in the proposed plan be changed to National Geodetic Vertical Datum (NGVD) for clarity. The VANR also recommended the licensee inspect the rubber dam with a smaller drawdown to reduce the impact of a lower water level on wetlands associated with the impoundment.

The VANR stated the plan should address operating procedures when emergency deflation of the rubber dam occurs, both with respect to the change in the amount of spill and the effects on impoundment water levels. The VANR also recommended that the plan indicate how spillage flow over the rubber dam will be estimated since the crest of the rubber dam may be uneven and the hydraulic coefficient may not be defined. Further, VANR recommended that the flow through the fishway be confirmed by actual stream measurements, including an estimate of net leakage, and the results submitted to VANR.

The VANR recommended the plan outline potential emergency conditions that may force the suspension of run-of-river operations or bypass flows, along with a contingency plan for flow management and record keeping under those circumstances in order to minimize the deviation from the flow requirements of the license. Other comments from VANR concerning maintenance of minimum flows during drawdown, estimation of spill passed through the fish passage facility, and maintaining required flows through the interim fish passage facility, were addressed in the licensee's proposed plan.

Licensee's Response to Agency Comments

In a letter dated April 26, 1995, the licensee responded to the agencies' comments. With regards to FWS's comment on setting the gate on the fish passage to pass 1 foot of water at the minimum operating level, the licensee stated the only time the rubber dam will be deflated to elevation 102.5 would be during extreme flood events. Further, the licensee stated that the fish passage is indistinguishable during these rare events due to increased spill over the dam.

The licensee stated that converting the reservoir levels to NGVD, as recommended by VANR, may be confusing to project personnel since the levels described in the plan are those used by the operators. With regards to VANR's recommendation to reduce the level of reservoir drawdown during inspection of the rubber dam, the licensee stated that the manufacturer's recommended drawdown to the anchor plate has already been reduced in order to comply with article 404. The licensee stated that a two foot drawdown is necessary for thorough inspection of the portion of the dam most likely to be damaged by ice and debris.

With regards to emergency deflation and incorporating contingency plans for emergency conditions, the licensee stated that after such a deflation, the system will require manual resetting to allow for re-inflation. The licensee stated that developing detailed contingency plans for hypothetical emergency events is unproductive. The licensee stated that the dam and control system have been designed for most likely events. If the flows at the project are modified, the licensee stated the Commission and the agencies will be notified as soon as possible, but no later than 10 days after each incident, as required in the license.

With regards to estimating spillage flow over the rubber dam, as recommended by VANR, the licensee stated that the proposed plan includes calculations for fishway gate spillage and similar calculations can be performed for spillage over the rubber dam. The licensee stated the hydraulic coefficient is defined for the rubber dam (c=2.26) and the information available indicates the inflated crest height of the rubber dam will be as

consistent as the actual dam. The licensee stated that if the units are shut down due to low water, one will not be put back on line unless the 10 cfs minimum flow can be provided.

With regards to actual streamflow measurements to verify the amount of flow through the fish passage, the licensee stated that due to the irregularity of the gorge, actual streamflow measurements may not be as accurate as flow calculations based on weir dimensions.

Additional Agency Comments

By letter dated May 10, 1995, the VANR stated the licensee's response and proposed plan are not clear with respect to two issues. First, VANR stated the plan does not define what extent downstream flows will vary from run-of-river conditions during transitions (i.e. planned shutdown, unplanned shutdown, and shutdown due to low flows). Without the information, the VANR contends it is difficult to assess the licensee's adequacy in protecting instream flow releases. The VANR suggested other methods of minimizing deviations in run-of-river including idling the flow through the units or partially deflating the rubber dam to release full project inflow at the dam, then shutting down the units when the increased spillage from the dam reaches the tailrace.

In addition, VANR reiterated the licensee should explain the type of emergency conditions that have occurred which may affect the maintenance of impoundment levels or minimum flows. The VANR recommended the licensee design a contingency plan identifying what circumstances legitimately qualify for special waives; how frequently those circumstances occur; and how operation can be modified to react to the emergency and at the same time minimize the deviation for the licensing requirements to protect the instream resources. The VANR stated this information would allow the resource agencies to assess the adequacy of the plan and the potential for damage to the river ecology.

Discussion and Conclusion

The licensee's proposed flow management plan includes those requirements stipulated in articles 403 and 404 of the license. Implementation of the licensee's proposed plan will provide for adequate monitoring of the flow releases required in article 402 and maintenance and documentation of a constant headpond level as required by article 404.

The FWS recommended the licensee set the fish passage gate at 101.5 feet when the rubber dam is set at 102.5 feet during extreme high water events, in order to maintain 1-foot of spill through the fish passage facility to ensure release of the required minimum flow. During such events, however, when the

rubber dam is set at elevation 102.5 feet, additional spill will enter the bypassed reach over the dam, thereby ensuring release of the required minimum flow. Therefore, setting the fish passage gate to 101.5 feet during highwater events is not necessary. The licensee will continue to record headwater elevation during these events to document the amount of spill entering the bypassed reach through the downstream fishway.

The FWS's comment regarding operation of the fish passage facility during the spring salmon migration period will be addressed in the plan required by article 407 of the license. Article 407 requires the licensee to consult with the FWS and VANR and develop a plan for operating, maintaining, and monitoring the effectiveness of the permanent downstream fish passage facilities, for Commission approval. Concerns regarding operation of the fish passage facility should be addressed during the development of this plan and during the Commission's review of the licensee's proposed plan.

Article 403 requires that the plan include operating measures that will minimize the effects of lag time and deviations from true run-of-river conditions below the project. In the event of planned and unplanned shutdowns, the licensee proposes to reduce generation, increase flows through the bypass reach by either 5 cfs (in the planned event of 1 unit shutdown) or 10 cfs (in the planned event of project shutdown), allow the additional spill to reach the tailrace (approximately 45 minutes), then bring the unit(s) off-line.

The licensee's proposed operating measures during planned shutdown of the project may result in significant fluctuations in flow downstream of the project. Any such fluctuations may adversely affect downstream aquatic resources. For example, given the project is operating at maximum hydraulic capacity, approximately 226 cfs, a reduction in flow to 20 cfs (for shutdown of the project's three units) may last for approximately 1 hour or longer. This reduction in flow may cause the stranding of fish or other aquatic organisms. The magnitude of any fluctuation resulting from project shutdown will be dependent upon flow conditions at the time of shutdown and the rate at which generation is reduced.

To minimize the effects of lag time on true run-of-river operations at the project the VANR suggested the following: (1) idling flow through the units; and (2) partially deflating the rubber dam to release full project inflow at the dam while continuing to operate the project until the additional spill from the dam enters the tailrace. In addition, installation of a bypass flow pipe at the powerhouse or limiting ramping rates during reductions in power generation prior to planned shutdown of 1 or more units may also significantly reduce the magnitude of fluctuations in flows downstream of the tailrace.

Given that project shutdown of 1 or more units may adversely affect the aquatic resources downstream of the project, the licensee should be required to develop additional measures to ensure that fluctuations are minimized during planned shutdowns. Therefore, within 90 days of the date of issuance of this order, the licensee should file, for Commission approval, a plan to minimize project-induced flow fluctuations downstream of the project which may occur as a result of project shutdown. Possible measures may include installation of a bypass flow pipe at the powerhouse or limiting ramping rates during reductions in power generation prior to shutdown. The plan should include, but not be limited to, an outline of operating procedures implemented prior to and immediately following shutdown of individual unit(s) and full project shutdown. The licensee should include documentation of consultation with FWS and the VANR; each agency should be given 30 days to comment. The Commission should reserve the right to require changes to the plan.

The VANR recommended the licensee explain the type of emergency conditions that have occurred at the project which may affect the maintenance of impoundment levels or minimum flows. The VANR stated the licensee should be able to design a contingency plan identifying what circumstances legitimately qualify for special waives; how frequently those circumstances occur; and how operations can be modified to react to the emergency and at the same time minimize the deviation from the licensing requirements in order to protect the instream resources.

As required in articles 403 and 404, the licensee's proposed plan included those measures that will be used to provide the minimum flow and manage impoundment level at the project. The licensee's proposed plan describes operating procedures during normal and high flows and outlines the frequency of drawdowns for inspection of the rubber dam and the expected frequency of planned shutdowns. The proposed plan also includes the reservoir level at which the rubber dam will automatically deflate and a description of operating measures implemented in situations where the rubber dam does not deflate. Further, articles 402 and 404 of the license stipulate operating requirements during low flows and failure of the control system, respectively.[5]

[5] Article 402, in part, requires the licensee to release all inflow at the dam if instantaneous inflow falls below the hydraulic capacity of the turbine unit plus the spillage requirement. Article 404, in part, requires the licensee to maintain the impoundment no lower than 12 inches below the crest of the flashboards (replaced by rubber dam) when the control system is not functioning.

The licensee's proposed plan and the project license address a number of situations expected to occur at the project which may affect the release of the required flows. Any further description by the licensee of conceivable deviations from the requirements of the license, as suggested by VANR, is not necessary for the purposes of the requirements of articles 403 and 404. The licensee's compliance with the requirements of the license, including future waivers of the flow requirements of the license, will be determined by the Commission's review of flow deviation incidents that occur on a case-by-case basis.

With regards to VANR's recommendation that elevations be converted to NGVD, the reservoir elevations given in the plan are those used by the licensee to monitor impoundment levels and project operations. These reservoir elevations should be adequate to determine compliance, therefore conversion to NGVD is not necessary.

The VANR also recommended the licensee reduce the magnitude of the drawdown associated with inspection of the rubber dam. The proposed magnitude of the drawdown associated with inspection of the rubber dam does not exceed the limits required in article 404 and therefore is allowed under the requirements of the license.

The VANR suggested estimations of spill over the rubber dam may be difficult since the crest is uneven and the hydraulic coefficient is not defined. We agree that when the dam is less than fully inflated, accurate estimates of flow may be difficult since spill will vary in length across the rubber dam. However, deflation of the rubber dam should only occur during periods of high flows. During such events, spill over the dam will combine with the spill through the fishway thereby exceeding the minimum flow required in article 402. During normal operations, i.e., a fully inflated dam, the licensee stated the hydraulic coefficient is 2.26 for the rubber dam, therefore the amount of spill can be determined using calculations similar to those used for assessing spill through the fish passage.

The VANR recommended that flows released into the bypassed reach be verified by actual streamflow measurements. Verification of bypass flows, however, may be inaccurate given the 1,570-foot bypass reach contains a series of cascades or chutes linking a number of pools differing in size. Since streamflow measurements may not accurately depict actual flow releases, verification of releases using flow measurements is not necessary.

If the flows through the project, as measured by the approved gaging system, deviate from the run-of-river requirements under article 401, the minimum flow requirement under article 402, and/or the reservoir elevation level limits

under article 404, the licensee should file a report with the Commission within 30 days of the incident. The report should, to the extent possible, identify the cause, severity, and duration of the incident, and any observed or reported adverse environmental impacts resulting from the incident. The report should also include: (1) operational data necessary to determine compliance with articles 401, 402, and/or 404; (2) a description of any corrective measures implemented at the time of occurrence and the measures implemented or proposed to ensure that similar incidents do not recur; and (3) comments or correspondence, if any, received from the resource agencies regarding the incident. Based on the report and the Commission's evaluation of the incident, the Commission should reserve the right to require modifications to project facilities and operations to ensure future compliance.

The Director Orders:

(A) The licensee's flow management plan, filed with the Commission on May 1, 1995, as modified in paragraph (B) through (D), are approved.

(B) Within 90 days of the date of issuance of this order, the licensee shall file, for Commission approval, a plan to minimize project-induced flow fluctuations downstream of the project which may occur as a result of project shutdown. The plan shall include, but not be limited to, an outline of operating procedures implemented prior to and immediately following shutdown of individual unit(s) and full project shutdown. The licensee shall include documentation of consultation with U.S. Fish and Wildlife Service and Vermont Agency of Natural Resources; each agency shall be given 30 days to comment. The Commission shall reserve the right to require changes to the plan.

(C) If the flows through the project, as measured by the approved gaging system, deviate from the run-of-river requirements under article 401, the minimum flow requirement under article 402, and/or the reservoir elevation level limits required by article 404, the licensee shall file a report with the Commission within 30 days of the incident. The report shall, to the extent possible, identify the cause, severity, and duration of the incident, and any observed or reported adverse environmental impacts resulting from the incident. The report shall also include: (1) operational data necessary to determine compliance with articles 401, 402, and/or 404; (2) a description of any corrective measures implemented at the time of occurrence and the measures implemented or proposed to ensure that similar incidents do not recur; and (3) comments or correspondence, if any, received from the resource agencies regarding the incident. Based on the report and the Commission's evaluation of the incident, the Commission reserves the right to require

modifications to project facilities and operations to ensure future compliance.

(D) Unless otherwise directed in this order, the licensee shall file an original and eight copies of any filing required by this order with:

The Secretary
Federal Energy Regulatory Commission
Mail Code: DPCA, HL-21.1
825 North Capitol Street, N.E.
Washington, D.C. 20426

In addition, the licensee shall serve copies of these filings on any entity specified in this order to be consulted on matters related to these filings. Proof of service on these entities shall accompany the filings with the Commission.

(E) The order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days from the date of issuance of this order, pursuant to 18 C.F.R. § 385.713.

J. Mark Robinson
Director, Division of Project
Compliance and Administration