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99 FERC ¶ 62, 042
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Central Vermont Public Service Corporation) Project No. 2731-026

ORDER MODIFYING AND APPROVING DIVERSION STRUCTURE CONSTRUCTION PLAN UNDER ARTICLE 402 AND AMENDING FEBRUARY 13, 2002 ORDER[1]

(Issued April 12, 2002)

The Central Vermont Public Service Corporation (licensee) filed with the Commission on February 13, 2002, its plan to construct the diversion structure at the Weybridge Project under article 402 of the project license.[2] The licensee supplemented its plan on April 4, 5 and 9, 2002. The Weybridge Project is located on Otter Creek in the towns of Weybridge and New Haven, in Addison County, Vermont.

Article 402 requires the licensee to prepare, after consultation with the U.S. Fish and Wildlife Service (FWS) and the Vermont Agency of Natural Resources (VANR), a plan for construction of the diversion structure at the downstream end of Rock Island.[3] The structure is to meet the following criteria: (1) distribute flows with 125 cubic feet per second (cfs) to the east and west channels around Wyman Island[4] during non-generation periods, and 125 to the west channel during generation; (2) high performance and limited maintenance; (3) allow upstream fish movement through the structure; (4) the ability to adjust flow distributions; (5) not create a safety hazard; (6) not cause unplanned bank or channel erosion; (7) blend in with the surrounding environment as much as possible. The licensee is to include in the filing comments and recommendations from the resource agencies on the proposed plan, and specific descriptions of how the agencies' comments are accommodated by the plan. If the licensee does not adopt a recommendation, the

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1 Order Modifying and Approving Project Operations Plan Under Article 404, 98 FERC ¶ 62,105.

2 Order Issuing New License (Major Project), August 1, 2001, 96 FERC ¶ 62, 097.

3 Rock Island bisects the dam and extends downstream from the dam, separating the west, bypass channel from the main, tailrace channel on the east side of the island.

4 Wyman Island is a larger island downstream from Rock Island and the project dam.

filing shall include the licensee's reasons, based on site-specific information. The Commission reserved the right to require changes to the plan. No construction shall begin until the licensee is notified the plan is approved.

LICENSEE'S PROPOSED OPERATIONS PLAN

The licensee's filed plan included drawings of the diversion structure. The licensee's plan included a plan view of the channel in the area of the diversion structure, with a benchmark indicated, bottom contour lines, elevations on the bank of the west channel and Rock Island, and the intended location of the diversion structure and the control weir indicated. Detail drawings specified profile and plan views of the diversion structure with the fish movement slot, and construction details of diversion structure sections showing expected water levels.

The diversion structure is a gravity structure, its mass providing its stability. The substrate in the construction area is mainly cobble with some areas of bedrock. The licensee expects no or very little removal of bedrock to be necessary for the construction. Precast concrete blocks with steel reinforcing bars protruding would be placed in a trench and would become a portion of, and partial form for, the reinforced concrete foundation. One-foot deep sockets, placed five feet apart in the concrete foundation would accommodate vertical pins. Horizontal wooden members (heavy timbers), expected to extend up 1.8 feet from the foundation, would be stacked against the face of the pins and spiked together. The horizontal members would be attached on the west (bypass) channel side of the pins.[5]

The foundation of the diversion structure and the control weir would be protected with 12-inch minimum-size riprap on the downstream side (east channel side of the diversion structure). The riprap would extend out a distance of 4 feet from the foundation and to a level even with the top of the foundation. The riprap face is expected to have a slope of 2:1 from top to foundation to toe. Exposed concrete used for construction would be pigmented to match the surrounding substrate in Otter Creek and/or the riprap to be placed against the east channel face of the foundation.

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5 The west channel is calculated to have consistently higher water elevations. At times of maximum generation, with 1600 cfs in the tailrace (east) channel and 125 cfs of bypass flow in the west channel from the taintor gate, the water level is expected to be 0.9 foot higher in the west channel. Water pressure would be the primary force holding the horizontal wooden members in place.

The licensee's proposed diversion structure includes a control weir across the west channel at the diversion structure's downstream end. The control weir provides head control for the diversion structure, stabilizing the water level at the diversion structure. A 15-feet-wide by 3.5-feet-high notch in the control weir would pass water from the pool formed by the control weir and the diversion structure downstream into the west channel. The control weir notch would also be constructed with stop log slots for an additional degree of flow control, should it be needed.

The licensee proposed to calibrate the diversion structure by opening the taintor gate to discharge 125 cfs into the west channel, and then adjust the top of the horizontal wooden members of the diversion structure to match the steady state water elevation in the west channel without spillage over the diversion structure, except through the fish movement slot. This adjustability will allow the licensee to adapt the diversion structure to any future morphological changes in the west channel.

The licensee's proposed diversion structure provides for fish movement through the diversion structure at both 125 and 250 cfs. A vertical concrete slot running from 2 feet below the bottom of the wooden horizontals to roughly half a foot above the anticipated top of the wooden horizontals, would allow for fish movement through the structure. When the bypass flow is 125 cfs, the licensee calculated a maximum of 10 cfs would flow through the slot. When generation ceases and the bypass flow is 250 cfs, a maximum of 15 cfs would flow through the fish movement slot. Under conditions of no generation, low water levels on the tailrace side (east channel) of the structure may make the function of the fish movement slot less than optimal; however, it should remain functional under all flow conditions. The fish movement slot was sized to accommodate the expected flows. However, like the control weir notch, the fish movement slot is equipped with stop log slots to allow control of the flow, if needed.

The licensee stated its monitoring plan for the diversion structure was presented in its article 404 filing;[6] however, the licensee repeated portions of the previously filed and approved monitoring plan in the current filing. The February 13, 2002 filing under article 402 provided additional information on the staff gauge location, stating the gauge would likely be installed in the west channel near the diversion structure and would be easily visible from Rock Island.

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6 Modified and approved by the February 13, 2002 Commission Order Modifying and Approving Project Operations Plan, 98 FERC ¶ 62,105.

RESOURCE AGENCIES' COMMENTS AND LICENSEE'S RESPONSES

The licensee consulted with the FWS and VANR in preparation of the plan and incorporated their comments into the filed plan except as follows. In response to comments and questions from the VANR, the licensee provided additional information in the April 5 and 9, 2002 filings. In the April 5 filing the licensee responded to the VANR's concerns that less than 125 cfs would flow downstream from the control weir into the west channel, because a portion of the 125 cfs released at the taintor gate would be siphoned off through the fish movement slot. However, flow from the control weir into the west channel around Wyman Island is augmented by a flow from the main channel. Data from field flow measurements showed that at least 125 cfs would flow in the west channel around Wyman Island under all flow conditions, and significantly more than 125 cfs under some frequently occurring conditions. The VANR suggested that part of verifying the minimum flow release might require measuring augmentation of flow into the west channel around Wyman Island. The licensee stated the volume of this crossover flow from the main channel to the west channel around Wyman Island would be verified during the adjustment of the diversion structure height.

The VANR recommended that the licensee angle the diversion structure pins supporting the horizontal members, downstream from the vertical (towards the east channel) and support them with struts, to make the structure more resistant to flood damage and to allow ice and debris to be more easily carried over the structure. The licensee stated it rejected the slanted design due to the difficulty of diversion structure height adjustment this extra complexity would bring. It stated the vertical design would allow overtopping (which would help pass debris), minimize the cost and frequency of replacing materials following damage, minimize leakage by the weight of the stacked horizontal members on top of each other, reduce man-made debris, like plywood, in Otter Creek, and be more aesthetically pleasing than plywood.

In the licensee's April 9, 2002 filing, the licensee responded to the VANR comments and questions filed with the Commission on April 4, 2002. The VANR suggested an alternative alignment of the diversion structure and asked if the alternative was considered and, if so, why it was not adopted. The licensee responded that the VANR's suggested location would create shallower depths downstream from the fish movement slot, hampering fish movement when main channel flows are low. It also observed that the over 200-foot length of the diversion structure provided by the planned alignment was needed to split the 250 cfs bypass flow. The proposed alignment also facilitated the positioning of the control weir, where it could be tied into bed rock, and its notch aligned with the deep side of the channel. Additional consideration was given

to maximizing the angle between the diversion structure and the control weir, to minimize eddying and debris build up in the corner between the two.

The VANR requested information on the basis of the design, including supporting hydraulic calculations. The licensee stated that it provided the VANR with background information and calculations, such as water levels under different generation flows used for the design, in a separately bound compilation of design considerations. The licensee explained its design criteria and processes for the diversion structure and for the fish movement slot and adjustability of the fish movement slot. The licensee stated that the notch in the control weir may also function to allow upstream fish movement, as the velocities are expected to be 4 feet per second or less through the weir notch.

The VANR revisited the subject of pigmented concrete for exposed portions of the construction, and requested that color choices be coordinated with its representatives. The licensee repeated its intention to use pigmented concrete for visible concrete portions of the structure, and discussed its criteria for color selection, with the provision to send its color selection to VANR for review.

The VANR requested information on how much the bypass channel would be subject to backwater effects. The licensee stated that limited information is available, due to the limited amount of survey data. The licensee stated that without the diversion structure, the bypass channel has an approximate water surface elevation of 143.9 feet with a generation flow of 1600 cfs in the main channel, mainly due to backwater effects. With the diversion structure in place, water in the bypass channel would be from the taintor gate release, and independent of the main channel. Bypass channel water surface elevation with the diversion structure in place is expected to be about 144.8 feet, which is 0.9 foot higher than prior to the structure. The licensee stated that the diversion structure is expected to elevate water levels in the bypass channel at the diversion structure sufficiently to send 125 cfs down the west channel and sufficiently for the diversion structure to split the flow when 250 cfs is released.

The VANR questioned how the diversion structure would react to flood conditions, whether overtopping of the structure's abutments would cause bank scour, and whether information exists about what flow conditions would be likely to cause the failure of the structure. The licensee stated that riprap on the downstream side of the structure would prevent scour in the event of overtopping during a flood. It stated that flow conditions for a likely failure are in excess of a 100-year flood event. The licensee explained that installation of a rubber dam on the east channel spillway will allow the east channel to pass most of the flow during floods. The licensee discussed design flood

flows and associated stresses for the diversion structure, and stated that it provided the VANR with design criteria and calculations for various flood stress conditions in the separately bound compilation of design considerations.

The VANR asked if it would be possible to reduce the footprint of the diversion structure, and questioned several design parameters controlling the footprint size. The licensee stated that the breadth of the foundation is dictated by the required mass of the gravity structure, and explained the reasons necessitating the questioned design elements.

The VANR requested the licensee provide information on the expected tailwater conditions at the fish movement slot, in order that the functionality can be better assessed. The licensee stated that it provided the VANR with design calculations for the fish movement slot and tailwater conditions near the slot in the separately bound compilation of design considerations. The licensee explained that submergence of the slot would be greater with full generation (1600 cfs in the main channel) than with minimum generation (450 cfs in the main channel); therefore, flow through the slot will differ slightly based on main channel flows. The licensee stated the fish movement slot[7] was designed to function at as wide of a range of flows as possible; this was facilitated by locating the slot at a low point in the riffle. The slot will continuously flow, regardless of the release flow volume.

The VANR noted the licensee's filing did not include information on the backwater analysis of the control weir's tailwater condition. The licensee stated it included the results of its backwater analysis and design calculations for the control weir in the separately bound compilation of design considerations provided to the VANR.

DISCUSSION AND CONCLUSIONS

The licensee fully considered the resource agencies comments and responded completely, as documented by the licensee's filings. The licensee's current filings provided a complete picture of the licensee's planned diversion structure and its construction. However, the licensee's plan filed under article 404 did not provide sufficient information to demonstrate that the diversion structure would consistently provide the minimum flows required under article 401. Therefore, paragraphs (B) and

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7 Specific design considerations for the fish movement slot and control weir notch were cited as having been developed in consultation with the FWS.

(C) were included in the February 13, 2002 order approving the plan under article 404 to assure the needed information would be provided. The current filing under article 402 provided a detailed plan view of the relevant area with stream bottom contours, elevations and a benchmark indicated, and included specific measures to calibrate the diversion structure through adjustment of the top of the horizontal wooden members of the diversion structure. This adjustability will allow the licensee to adapt the diversion structure to any future morphological changes in the stream channel, and should assure that the minimum flow is always conveyed down the west channel and partitioned as required. With the new information provided in the February 13, 2002, article 402 filing, paragraphs (B) and (C), are no longer necessary, and can be deleted from the February 13, 2002 order.

The licensee proposed to calibrate the diversion structure but did not include a schedule for conducting the calibration and providing the results of the calibration to the agencies and the Commission. The calibration should be conducted to assure that the diversion structure will provide the minimum flows. In addition, in conjunction with the calibration of the diversion structure, the licensee should verify that the flow from the control weir into the west channel around Wyman Island is augmented by a cross-over flow from the tailrace channel at least equal to the amount leaving the west channel flow through the fish movement slot. This would assure that at least 125 cfs flows in the west channel around Wyman Island is maintained at all times. The licensee should therefore develop a plan in consultation with the VANR and FWS to include a schedule for conducting the calibration and flow verification. The plan shall also include a schedule for providing the results of the calibration and flow verification to the agencies and the Commission.

Pursuant to paragraphs 12.4, 12.11, and 12.40 of the Commission's regulations, the licensee should submit a plans and specifications package to the Commission's Regional Director, at least 60 days prior to starting construction activities for the diversion structure. Authorization to start construction activities will be given by the Regional Director after all preconstruction requirements are satisfied. Within 90 days of completion of the diversion structure construction, the licensee should file, for Commission approval, revised as-built drawings reflecting the change in project facilities.

With the modifications discussed above, the licensee's filed plan should meet the requirements of article 402, and assure that the structure would perform according to the requirements of article 402. The plan, with the discussed modifications should, therefore, be approved.

<u>The Director Orders:</u>

(A) The licensee's plan to construct the diversion structure, filed under article 402 on February 13, and supplemented on April 4, 5, and 9, 2002, as modified in paragraphs (B) and (C), is approved.

(B) The licensee shall perform the calibration of the diversion structure to assure that the diversion structure will provide the required minimum flows. In conjunction with the calibration of the diversion structure, the licensee shall also verify that the flow in the west channel around Wyman Island is at least 125 cfs. The licensee shall within 180 days from the date of issuance of this order file with the Commission for approval, a plan to include a schedule for conducting the calibration and flow verification. The plan shall also include a schedule for providing the results of the calibration and flow verification to the Vermont Agency of Natural Resources, the U.S. Fish and Wildlife Services and the Commission. The licensee will allow the agencies 30 days to comment on the plan before filing it with the Commission. The licensee shall include in the filing with the Commission documentation of its consultation, copies of comments and recommendations made in connection with the plan, and a description of how the plan accommodates the comments and recommendations. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information . The Commission reserves the right to make changes to any plan submitted. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

(C) Pursuant to paragraphs 12.4, 12.11, and 12.40 of the Commission's regulations, the licensee shall submit the plans and specifications package and a quality control and inspection program to the Commission's Regional Director, at least 60 days prior to starting construction activities for the diversion structure. Authorization to start construction activities will be given by the Regional Director after all preconstruction requirements are satisfied. Within 90 days of completion of the diversion structure construction, the licensee shall file, for Commission approval, revised as-built drawings reflecting the change in project facilities.

(D) Paragraphs (B) and (C) of the February 13, 2002 Order Modifying and Approving Project Operations Plan (98 FERC ¶ 62, 105) are deleted.

(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, pursuant to 18 CFR § 385.713.

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and Compliance