Brookfield

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August 10, 2017

Re: <u>Bear Swamp Project (FERC Project No. 2669-085)</u> July 28, 2017 Flow Regime Working Group Meeting Summary

Bear Swamp Power Company, LLC (BSPC) is the Licensee for the 610-megawatt Bear Swamp Project (Project) (FERC No. 2669). BSPC is pursuing a new license for the Project from the Federal Energy Regulatory Commission (FERC or Commission) using the Commission's Integrated Licensing Process (ILP) as defined in 18 Code of Federal Regulations Part 5. In accordance with the ILP, the Commission issued a Study Plan Determination (SPD) for the Project on October 30, 2015. The SPD directed BSPC to conduct 19 studies in support of relicensing the Project, including an Operations Model. Pursuant to the approved study plan for the Operations Model, BSPC held a Flow Regime Working Group (FRWG) Meeting on July 28, 2017. This memorandum provides a summary of the July 28, 2017 FRWG Meeting. Meeting presentation documents are available at the Project's public relicensing website at www.bearswampproject.com.

BSPC notes that Section 3.0 of this memorandum summarizes additional model series requested by FRWG participants during the July 28, 2017 meeting and additional scenarios requested by parties subsequent to the meeting. BSPC respectfully requests that participants advise BSPC of any additional scenarios to be modeled for this study on or before August 18, 2017 (extended from the August 11, 2017 date discussed during the meeting).

1.0 Purpose and Participants

1.1 Purpose

In accordance with the approved Operations Model study plan, BSPC established the FRWG to serve as a forum to discuss model scenario development, findings, on-going efforts by BSPC, and to examine the feasibility of potential operational modifications that can benefit or support interests of relicensing participants and BSPC.

BSPC held an initial FRWG Meeting on February 24, 2016. At that time, FRWG participants agreed to postpone quarterly FRWG Meetings until the Operations Model was fully developed and information from other studies was available. In the October 31, 2016 Initial Study Report and the February 28, 2017 Study Progress Report, BSPC indicated that coordination with the FRWG to resume FRWG Meetings would take place in Quarter 1 of 2017. Accordingly, and by letter dated March 31, 2017, BSPC invited FRWG participants to attend the second FRWG Meeting. The second FRWG Meeting was held at the Berkshire East Mountain Resort in Charlemont, MA from 12:00 PM until 4:00 PM on April 12, 2017. By letter dated June 20, 2017, BSPC invited FRWG participants to attend a third FRWG meeting in July 2017. BSPC consulted with FRWG participants to determine an appropriate meeting date. Based on this consultation, the third FRWG Meeting was held on July 28, 2017 at the Hampton Inn & Suites in Greenfield, MA from 9:00 AM until 3:00 PM.

1.2 Participants

Participants that attended the July 28, 2017 FRWG Meeting are presented in Table 1.

Participant	Organization / Affiliation
John Baummer	FERC
Patrick Crile	FERC
Chris Jackson	Trout Unlimited (TU)
Horace Taft	TU
Bob May	Deerfield River Watershed Association (DRWA)
Don Pugh	Individual
Dominic Capozzi	Berkshire East Mountain Resort (Berkshire)
Frank Mooney	Crab Apple Whitewater, Inc. (Crab Apple)
Bruce Lessels	Zoar Outdoor (Zoar)
Andrea Donlon	Connecticut River Conservancy (CRC)
Tom Christopher	New England FLOW (NE FLOW)
Norm Simms	Appalachian Mountain Club (AMC)
Bob Nasdor	American Whitewater (AW)
John Ragonese	Great River Hydro, LLC (GRH)
Jason Canaday	GRH
Tom Mapletoft	Brookfield
Steve Murphy	Brookfield
Rob Quiggle	HDR
Angie Scangas	HDR
Brian Krolak	HDR
David Culligan	HDR

TABLE 1 BEAR SWAMP PROJECT FRWG MEETING PARTICIPANTS

2.0 Summary of Flow Regime Working Group Meeting

BSPC provided an overview of the Operations Model goals and objectives, discussed the 31 scenarios modeled to-date, reviewed the CHEOPSTM model (Computer Hydro Electric Operations and Planning Software), and presented the results of the modeling. The model runs completed to-date are summarized in Figure 1, below.

- AW asked how the historical dataset was used to setup the model.
 - HDR explained that a dataset from a nine-year period of record (2005 2015, excluding 2010) was used for the model, and 2015 was used to calibrate operations.
 HDR explained that the entire nine-year period of record was modeled for each of the scenarios.
- AW asked if the reservoir storage associated with the Bear Swamp Pumped Storage Development (PSD) was used in the model to augment downstream flows.
 - HDR explained that Bear Swamp PSD operations and associated reservoir storage were modeled in a manner consistent with historical operations.

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FIGURE 1. MODEL SCENARIOS COMPLETED TO-DATE, SHOWING SUMMARY DATA.

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- Zoar stated that the model did not take into account any additional inflow that BSPC could require GRH to provide from upstream storage.
 - BSPC noted that BSPC could not require GRH to provide any additional inflow from upstream storage. GRH operates pursuant to their existing license, 401 Water Quality Certification, and the Settlement Agreement; BSPC cannot dictate GRH's operations or demand additional water.
- FERC asked if, based on the data presented by BSPC, the volumetric shortfall represented by the FERC_MinInst225 scenario meant that the system would have a shortfall of approximately 11 Bear Swamp PSD-equivalents over the nine year period of record. HDR confirmed that this was the case.
- TU asked if FERC was aware of any facilities that had a "stop-safe" provision that was based on wet or dry years.
 - FERC stated that such provisions are not included in licenses; if a licensee cannot provide the required minimum flow, the licensee submits a notification to FERC and it could be considered a violation of the license requirements.
- AW asked if the existing base case wasn't a deficit since there is a discrepancy between inflow from the Deerfield River Project's (FERC No. 2323) Station No. 5 (Station 5) and outflow from the Fife Brook Development.
 - HDR explained that there is no deficit since BSPC manages the discrepancy to meet the minimum flow requirements and 106 annual recreational releases. All flow requirements can be met under normal conditions and existing management.
- Don Pugh and CRC requested that BSPC provide the model output data, including data on how volumetric shortfalls occur on an hourly basis.
 - BSPC stated that the presentation with results would be available on the Project's public relicensing website (www.bearswampproject.com) and the Operations Modeling Study Report would contain additional, relevant data.
 - GRH noted that looking at the data in terms of days is helpful because the Deerfield River is a peaking system.
- NE FLOW stated that the modeling results are not relevant because it only shows that BSPC starts with a deficit and any increase in recreational or minimum flows from Fife Brook Dam will result in a larger deficit.
 - BSPC responded that the data is extremely relevant, as the information is necessary to understand in order to have any discussions about whether these volumetric shortfalls can be addressed.
- AW noted that it should not be considered a deficit if BSPC is unable to provide a flow in the morning due to a volumetric deficit, but the volume is available in the afternoon.

- HDR explained that it is a deficit because at the specific time the flow was required, water to provide that flow was unavailable.
- FERC asked if the model prioritized minimum flow or recreational flow for each scenario.
 - HDR responded that the model did not prioritize either flow requirement.
 - AMC noted that it was their understanding that the existing license requires minimum flows to be prioritized.
 - BSPC stated that the license generally requires BSPC to meet all flow requirements and does not prioritize minimum flows over recreational flows.¹
- Zoar asked if the existing water-sharing agreement between GRH and BSPC ends with the term of the Project's existing license.
 - BSPC and GRH confirmed that the current agreement ends with BSPC's license.
- AMC stated that the RaftRec_NoGen scenarios did not take into account the potential for The Bear Swamp PSD to generate after the Monroe Bridge releases were complete; AMC believes that generation losses would be substantially less than modeled under the current scenario.
 - BSPC noted that the criteria for those scenarios were consistent with the original request, and BSPC assumed no generation for Monroe Bridge release days to be sure that the model held the elevation of the Lower Reservoir at or below 835 feet for the entire release.
- CRC requested that the model output charts be modified to indicate that "Count of Days with No Generation" is in reference to the Bear Swamp PSD.
- BSPC noted that, as part of the Operations Model, BSPC is reviewing how many days the Lower Reservoir was at or below 835 feet during the Monroe Bridge releases to determine how often the Showtime whitewater feature was available to paddlers during the period of record.
- Zoar asked what the water budget is for the entire Deerfield River and further stated it believed the Bear Swamp PSD is constrained by water coming into the system, but that operations should not be constrained if the upstream licensee provides additional water.
 - FERC stated that this study was conducted in support of Bear Swamp Project relicensing and does not extend to upstream operations; therefore, the study is appropriately scoped to determine what BSPC can do with the water that is provided as inflow into the Project.

¹ While the existing license does not explicitly prioritize minimum flows over recreation flows, it states that the 125 cfs minimum flow is "guaranteed from storage."

- BSPC stated that it is looking at what options are feasible with respect to what BSPC has direct control over. BSPC does not control the upstream licensee's operations or its' license, nor does it have sole control over water-sharing agreements, the existing Settlement Agreement, or any hypothetical contract to purchase water from the upstream licensee.
- AMC asked if BSPC could assign costs to the generation losses, etc.
 - BSPC noted that the costs are being evaluated and will be presented in the Draft and Final License Applications, as appropriate.
 - FERC noted that, as part of its analysis, FERC would need to know the costs for any proposed protection, mitigation, or enhancement measures, including generation losses.
- AW noted that a potential modeling scenario would be to match the flow from Station 5 at the Fife Brook Development on the 32 Monroe Bridge recreation release days.
- TU and CRC noted that they would like to see model scenarios that incorporated seasonally appropriate minimum flows and gradual ramping rates; however, they do not believe that there is sufficient data available to determine what those flows and ramping rates should be.
- AW asked if the Fife Brook Development typically follows Station 5's authorized peaking operations.
 - BSPC confirmed that the Fife Brook Development generally follows the peaking operations authorized at Station No. 5, and does so in the context of managing the minimum flow disconnect and required recreational releases. Once the next day's schedule is received from GRH (late in the afternoon) and the Waterline FlowCast[©] is subsequently updated, BSPC strives to follow that schedule unless circumstances change upstream. Therefore, if water arrives at the Lower Reservoir unexpectedly, BSPC will hold the water in the Lower Reservoir (if possible) to avoid discharging high flows downstream that are inconsistent with the flows presented on the Waterline FlowCast.
- Zoar asked if BSPC could manage the volume disconnect more aggressively to eliminate the days where minimum flow requirements or recreational releases cannot be met under the modeled scenarios. Zoar believes that this disconnect was managed more aggressively in the past.
 - BSPC stated that more aggressive management of timing and magnitude of the volume disconnect could be explored but that there are limits to how effective this management can be.
 - BSPC also noted that, while the volume disconnect may have been managed more aggressively in the past, those operations were under the direction of a different, single owner, in a different market, and under a different regulatory environment.

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- GRH asked if BSPC could model alternative Lower Reservoir operations to see what the impact would be on generation and if there would be decreases in the number of days that minimum flow and/or recreation flow requirements could not be met under the modeled scenarios.
 - BSPC noted that the scenarios could be modeled to reflect alternative Lower Reservoir operations to explore options to better align the timing of inflows from Station 5 and Fife Brook releases.

3.0 Additional Model Scenarios

Based on the discussions during the FRWG Meeting and specific requests by FRWG participants, BSPC intends to model the following additional series:

- BSPC will explore alternative Lower Reservoir operations to better align the timing of inflows from Station 5 and Fife Brook releases to reduce the number of days that minimum flow and/or recreation flow requirements could not be met under the modeled scenarios.
- AMC requested that BSPC model whitewater release series that include the following:
 - Assume an additional 14 recreation release days from Fife Brook during the whitewater boating season (bringing the total to 120), with the additional 14 days occurring approximately six days/week in July and August, annually;
 - Recreation releases beginning at 10:00 AM;
 - Recreation release lasting a minimum of 3 hours
 - Maintain Lower Reservoir elevation at or below 835 feet to expose the Showtime whitewater feature during Monroe Bridge releases, but assume that Bear Swamp PSD generation can begin one hour after completion of the Monroe Bridge recreational release; and
 - Model the following recreational flow releases from Fife Brook Dam:
 - 800 cfs;
 - 900 cfs; and
 - 1100 cfs.
- AW, Zoar, Crab Apple, and Berkshire requested that BSPC model whitewater release series that include the following criteria:
 - Assume an additional 14 recreation release days from Fife Brook during the whitewater boating season (bringing the total to 120), with the additional 14 days occurring approximately six days/week in July and August, annually;

- Recreation releases beginning at 10:00 AM;
- Minimum recreational flow release of 900 cfs for 3 hours;
- Maintain Lower Reservoir elevation at or below 835 feet to expose the Showtime whitewater feature during Monroe Bridge releases, but prioritize flows over reservoir elevation;
- Prioritize 125 cfs minimum flow release; and
- On days after June 15, when the "stable or rising" requirement at the upstream Harriman Reservoir ends, model two different scenarios:
 - On non-Monroe Bridge weekend release days, release flows of 1000 or 1100; and
 - Alternative series would include a scenario that would not exclude weekend Monroe Bridge release days.
- AW requested that BSPC model a whitewater release series that includes the following criteria:
 - Match the flow from Station 5 at the Fife Brook Development on the 32 Monroe Bridge recreation release days.
- By email dated August 3, 2017, TU requested that BSPC model additional series that include the following criteria:
 - Assume 106 whitewater flow releases annually;
 - Prioritize minimum flow releases;
 - Assume a recreation flow releases of 700 cfs and model two different scenarios:
 - A 175 cfs minimum flow release from Fife Brook Dam; and
 - A 225 cfs minimum flow release from Fife Brook Dam.

Cc: Public Bear Swamp Public Relicensing website