FEDERAL ENERGY REGULATORY COMMISSION
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August 24, 2022

OFFICE OF ENERGY PROJECTS

Project No. 14873-001 – Alaska
Nuyakuk River Hydroelectric Project
Nushagak Electric and Telephone Cooperative

VIA FERC SERVICE

Will Chaney
Electric Operations Manager
Nushagak Electric and Telephone Cooperative
P.O. Box 350
Dillingham, AK 99576

Reference: Study Plan Determination for the Nuyakuk River Hydroelectric Project

Dear Mr. Chaney:

Pursuant to 18 C.F.R. § 5.13(c) of the Commission's regulations, this letter contains the study plan determination for the Nuyakuk River Hydroelectric Project No. 14873 (project), located on the Nuyakuk River in the Dillingham Census Area, Alaska. The determination is based on the study criteria set forth in section 5.9(b) of the Commission's regulations, applicable law, Commission policy and practice, and the record of information.

Background

On March 20, 2020, Nushagak Electric and Telephone Cooperative (Cooperative) filed its proposed study plan (PSP) in support of its intent to construct and operate the proposed project. The Cooperative held study plan meetings on April 20 and 22, 2020 to discuss the PSP. On June 8, 2020, the Cooperative filed a request to hold the project's Integrated Licensing Process in abeyance until further notice, which was granted on June 9, 2020. The Cooperative held two additional meetings in September 2021 while the ILP was in abeyance to discuss the study plan with stakeholders. On March 2, 2022, the Cooperative filed an updated PSP and a request to restart the ILP. The updated PSP covers 16 studies related to water, fisheries, terrestrial, recreation, and cultural resources.

Comments on the updated PSP were filed by the Alaska Department of Fish and Game, Alaska Department of Natural Resources Division of Parks and Outdoor Recreation, U.S. Fish and Wildlife Service, National Marine Fisheries Service, Bristol Bay Regional Seafood Development Association, Alaska State Historical Preservation Office, Royal Coachman Lodge, Molly Welker, United Tribes of Bristol Bay, and Commission staff.

The Cooperative filed a revised study plan (RSP) on August 1, 2022, that includes the 16 studies from the updated PSP, and 2 additional studies—one on environmental justice communities and one for the development of a decision support tool. Comments on the RSP were filed by the Bristol Bay Science and Research Institute.

Study Plan Determination

Of the 18 studies proposed by the Cooperative, 14 are approved as proposed by the Cooperative, 2 are approved with staff recommended modifications, and 2 are not required (Appendix A). One additional study not proposed in the RSP is required. The specific modifications to the study plan and the bases for modifying the Cooperative's study plan are discussed in Appendix B. Commission staff reviewed all comments and considered all study plan criteria in section 5.9 of the Commission's regulations. However, only the specific study criteria particularly relevant to the determination are referenced in Appendix B.

Unless otherwise indicated, all components of the approved studies not modified in this determination must be completed as described in the Cooperative's RSP. Pursuant to section 5.15(c)(1) of the Commission's regulations, the initial study report for all studies in the approved study plan must be filed by August 9, 2023.

Nothing in this study plan determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies. The Cooperative may choose to conduct any study not specifically required herein that it feels would add pertinent information to the record of this proceeding.

If you have any questions, please contact Matt Cutlip at (503) 552-2762 or email at matt.cutlip@ferc.gov.

Sincerely,

JOHN WOOD Digitally signed by JOHN WOOD Date: 2022.08.24 10:58:37 -04'00'

for
Terry L. Turpin
Director
Office of Energy Projects

Enclosures: Appendix A – Summary of Determinations on Proposed and Requested Studies
Appendix B – Staff Recommendations on Proposed and Requested Studies

APPENDIX A

SUMMARY OF DETERMINATIONS ON PROPOSED AND REQUESTED STUDIES

Study	Proposed or Requested By	Approved	Approved with Modifications	Not Required
1. Characterization of Fish Community and Behavior near the Project Intake	Cooperative	X		
2. Nuyakuk Falls Fish Passage Study	Cooperative	X		
3. Fish Entrainment and Impingement Study	Cooperative	X		
4. Assessment of False Attraction to the Tailrace Barrier	Cooperative	X		
5. Chinook and Sockeye Salmon Lifecycle Modeling	Cooperative		X	
6. Integrated Risk Assessment of Fish Populations	Cooperative	X		
7. Future Flows Study	Cooperative, NMFS			X
8. Water Quality Assessment	Cooperative	X		
9. Flow Duration Curve Change Analysis Study	Cooperative, NMFS			X
10. Ice Processes Assessment	Cooperative	X		
11. Botanical and Wetlands Survey	Cooperative	X		
12. Caribou Population Evaluation	Cooperative	X		
13. Subsistence Study	Cooperative	X		
14. Section 106 Evaluation	Cooperative	X		

Study	Proposed or Requested By	Approved	Approved with Modifications	Not Required
15. Noise Study	Cooperative		X	
16. Recreation Inventory by Season	Cooperative	X		
17. Environmental Justice Communities	Cooperative	X		
18. Decision Support Tool	Cooperative	X		
19. Aesthetic Study	FERC	X		

APPENDIX B

STAFF RECOMMENDATIONS ON PROPOSED AND REQUESTED STUDIES

The following discussion includes staff's recommendations on studies proposed by the Cooperative and requests for study modifications. We base our recommendations on the study criteria located in the Commission's regulations at 18 C.F.R. § 5.9(b)(1)-(7). Except as explained below, the revised study plan (RSP) filed on August 1, 2022, adequately addresses all study needs at this time.

I. Required Studies

Chinook and Sockeye Salmon Lifecycle Modeling Study

Applicant's Proposed Study

The Cooperative proposes to develop life cycle models (LCM) for sockeye and Chinook salmon, two species that support regionally important subsistence and commercial salmon fisheries. The Cooperative states that the LCMs are intended to quantify project effects at the population level for these two species by integrating population responses to a range of environmental and project conditions or scenarios. Specifically, the study will construct stage-structured population dynamics models that will relate project and environmental information to stage transitions (e.g., movement, survival, and reproduction) that drive population dynamics (Hendrix et al., 2014; Cunningham et al., 2015).

The fundamental questions that the LCMs will aid in answering are: (1) what effect would the project have on the number of successful spawners and the number of juvenile outmigrants and (2) what magnitude of such effects would jeopardize the sustainability of the populations?

The Cooperative states that much of the LCMs will be constructed with information from the Nushagak River, other Bristol Bay watersheds, and other available literature. The Cooperative states that fish survival information and escapement estimates exist for areas upstream and downstream of the project that can be used to develop the models, but existing data will be supplemented with information collected from the other fisheries studies in the RSP. The study plan does not explicitly describe what information is available now versus what needs to be collected to develop the LCMs, but Study Task 2 states that the Cooperative would "Identify abundance data, brood tables, run reconstruction, etc. (e.g., ADFG data series, Cunningham et al. 2015) that can provide indices of abundance that will be useful in the model."

According to the schedule in the RSP, Study Task 2 would be completed during the first study season. The results of Study Task 2 would be presented in a report that includes "a table describing the abundance data, period of record, type of data collection, life history stage surveyed, location, source, and caveats."

Comments on the Study

Bristol Bay Science and Research Institute (Institute) asserts that to accomplish the goals of the study, it will be necessary to develop brood tables for historical and recent salmon returns. The Institute asserts that a brood table provides age specific estimates of total return (catch + escapement) by spawning year. Further, brood tables provide the data necessary to generate a stock production curve that characterizes the relationship between year-specific spawning abundance and the subsequent age-specific returns. The Institute states that brood tables would represent the natural population dynamics of Nuyakuk sockeye and Chinook and would be the basis for applying the effects of project operation scenarios.

The Institute contends that a brood table requires recent catch and escapement data to provide a meaningful productivity relationship. The Institute states that Alaska Department of Fish and Game (Alaska DFG) and others historically counted sockeye escapement in the Nuyakuk River via a counting tower from the 1950s until the early 1980s, and again briefly in the mid-1990s and mid-2000s. The Institute states that these historical sockeye counts "provide a healthy start to a Nuyakuk brood table but need to be augmented with recent productivity data." The Institute asserts that annual spawning abundance during the study plan period will be essential to developing the Nuyakuk brood table and the life cycle models, but the need for this data is not explicitly stated in the RSP. The Institute states that some of the information required to develop a brood table can be obtained through existing data sources (e.g., annual Alaska DFG reports of catch and escapement for Bristol Bay). However, Nuyakuk escapement data is lacking from the last 2-3 decades, and therefore, the Cooperative should collect additional abundance data via a sockeye salmon counting tower and netting below the falls to obtain age composition.

Discussion and Staff Recommendation

The Cooperative acknowledges that there is a need for adult salmon abundance data, which could include brood tables, to develop its proposed LCMs. However, the Cooperative does not explicitly state what data are available and would be used to develop the LCMs. Instead, it points to a variety of potential sources, including historical fish count data for the Nuyakuk and Nushagak Rivers, the literature, and additional site-specific information collected through the other fisheries studies in the RSP. Although counting towers and netting could be used to determine the abundance and age composition of salmon at the project, they would require substantial effort and cost (section 5.9(b)(7)) relative to the other potential methods proposed by the Cooperative, especially if it is able to develop abundance estimates using existing information. However, because the Cooperative has yet to compile the data, it is premature to determine whether existing information is adequate or more site-specific data are needed to develop the LCMs. The Cooperative proposes to compile the existing information on salmon abundance during the first study season and include it in a "report" but does not specifically state when the report would be available. To provide Commission staff and stakeholders an opportunity to review the abundance data used in the models and evaluate their adequacy prior to completion of the study, we recommend that the Cooperative include its

proposed report on Study Task 2 in the Initial Study Report. No other modifications to the study plan are needed.

Noise Study

Study Request

In the Commission's January 23, 2020 study request, staff requested a study to measure and characterize ambient noise levels and estimate with-project noise generation to determine how project-related construction and operation would affect sensitive noise receptors (e.g., wildlife habitat, recreation, cultural areas, residences).

Under the requested study, the Cooperative would: (1) review the construction equipment, schedules, and methods to identify the types of excavation or blasting expected to occur and where noise is likely to be heard by the public; (2) identify the type and expected frequency of maintenance activities that would generate noise in the project vicinity; (3) identify sensitive noise receptors (e.g., wildlife habitat, recreation, cultural areas); (4) collect ambient sound level measurements at the identified noise receptor sites and identify sounds contributing to ambient sound levels at these sites; (5) use an acoustic model to predict sound levels during project construction, operation, and maintenance at the noise receptor site, estimated in A-weighted decibels (dBA), and indicate the duration of these sound levels; (6) superimpose "sound contours" on aerial photographs or maps of the project area to include specific sound level predictions at the selected measurement locations; and (7) develop measures to avoid or lessen project-generated noise.

Applicant's Proposed Study

In the RSP, the Cooperative agrees to conduct the study consistent with staff's request. The geographic scope for the proposed study includes an approximately 18-square-mile area centered around the proposed intake and powerhouse facilities, construction camp, and air strip.

Discussion and Staff Recommendations

The geographic scope for the noise study does not include any of the proposed 135-mile-long transmission line. The proposed transmission line would connect with existing electrical distribution systems in six communities in the Bristol Bay region, and, depending on the types of construction used, could affect ambient noise levels in these communities as well as other sensitive noise receptors along the proposed transmission line route (e.g., wildlife habitats, recreation areas, cultural areas). Therefore, we recommend that the Cooperative expand the geographic scope of the study to identify and assess the noise effects of the proposed transmission line construction/installation on representative sensitive noise receptors.

Aesthetics Study

Study Request

In the PAD, the Cooperative proposed to conduct a detailed assessment of the visual effects of the project on recreation and subsistence users, including those that float the river and navigate upriver to access Tikchik Lake and the lower Tikchik River. The Cooperative also proposed to evaluate the visual effects of the project transmission line from various viewpoints in the surrounding area, such as some of the public use sites identified in the *Nushagak & Mulchatna Rivers Recreation Management Plan.* However, the Cooperative did not include a study plan in its updated PSP. Commission staff noted the lack of the aesthetic study in its June 28, 2022 comments on the updated PSP. Commission staff requested that the RSP include a viewshed/landscape analysis that identifies key areas where visitors would see the project and its facilities and assess how those views would change following project construction. Commission staff requested that the analysis include photo simulations of representative sites before and after the project is constructed and identify measures that could reduce those effects (e.g., lighting, painting, landscaping, etc.).

Applicant's Proposed Study

In the RSP, the Cooperative states that it "added text related to the visual resource assessment" request described above.

Discussion and Staff Recommendations

Commission staff could not find any revisions to the RSP or proposed methods to assess the effects of project construction on aesthetic resources in the RSP. As noted by the Cooperative in the PAD, constructing the project will add structures to a largely undeveloped landscape that could affect recreation and subsistence activities by altering or obstructing views (section 5.9(b)(5)).

To ensure that staff has sufficient information to describe the existing aesthetic resources of the project area and evaluate how constructing the project would affect those resources, we recommend that the Cooperative conduct an aesthetic assessment following the Bureau of Land Management's (BLM) Visual Resource Management (VRM) methodology,[1] or an equivalent visual resource assessment tool (section 5.9(b)(6)). This methodology identifies key observation points (KOP), visual values, and develops classifications to describe the level of change from the existing conditions. VRM also recommends using an interdisciplinary team for visual resource evaluations to identify the KOPs. At a minimum, KOPs should be established near Nuyakuk Falls and from representative public use sites along the transmission line and within the six communities served by the proposed project transmission line. We recommend that the

[1] This methodology is publicly available through the BLM and can be found at https://www.blm.gov/programs/recreation/recreation-programs/visual-resource-management and https://www.blm.gov/sites/blm.gov/files/uploads/Media_Library_BLM_Policy_H8431.pdf.

Cooperative invite representatives from the Alaska Department of Natural Resources Division of Parks and Outdoor Recreation, local outfitters such as the Royal Coachman Lodge, and Native Alaskan tribes that use the project area for subsistence, residence, or other traditional cultural practices to be on the evaluation team. For each KOP, the Cooperative should take representative photos and create photo simulations of the constructed project features at selected representative sites. The effects analysis should discuss how the project changes the character of the landscape and how it would affect land management objectives described in the *Nushagak & Mulchatna Rivers Recreation Management Plan*. The cost of conducting this study is estimated to be $30,000. The information to be obtained is necessary for staff's environmental analysis.

II. Studies Not Required

Flow Duration Curve Change Analysis Study

Study Request

In its February 4, 2020 study request, the National Marine Fisheries Service (NMFS) requested a streamflow change analysis study to identify trends in Nuyakuk River flow conditions that provide a forward-looking evaluation of the flow duration curve. The information would be used to determine which flow data are useful to develop "climate-resilient license articles." Specifically, the study would determine if the flow data from the USGS gage near the project exhibit "stationarity"[2] (Milly, 2008). NMFS's proposed study methods would require the Cooperative to use current literature, existing data from the USGS gage (USGS No. 15302000), and standard practices accepted by the scientific community to determine if the hydrologic trends are changing and if those changes are statistically significant.

Applicant's Proposed Study

In the RSP, the Cooperative agrees to conduct the study consistent with NMFS's request. The study methods are identical to those described in NMFS's study request. The Cooperative states that the study would cost $100,000 - $125,000.

Discussion and Staff Recommendation

NMFS and the Cooperative do not specifically define the term "stationarity" but based on our review of Milly (2008) and other available literature (Friedman et al., 2016), stationarity appears to refer to the assumption that the statistical characteristics of stream flow data at a given location in a given waterbody are constant through time.

However, it is unclear how this study would be conducted because neither NMFS nor the Cooperative specify the methods that would be used to determine if the Nuyakuk River flow record exhibits "stationarity" or a statistically significant trend in some aspect of the data.

[2] NMFS does not define the term "stationarity".

Additionally, while NMFS propose methods from Milly (2008), we have reviewed Milly (2008) and we don't see where it defines a specific methodology for completing this analysis.

Regardless, the USGS gage near the project has 69 years of flow records that can be used to assess any changes in streamflow that might have occurred over time. NMFS cites to these records in its study request and uses the data to compare the annual flow duration curve for 6 different 10-year periods, and points out that the two most recent 10-year periods show that spring runoff began about 20 days earlier than prior years. This supports the notion that the long-term gage data are sufficient to evaluate potential changes in streamflow over time. While we do expect the Cooperative to use the available hydrologic record to look at trends in flow and use the portion of the flow record that is reflective of current trends when developing its proposed action, we do not need to know if there is any statistically significant trend in some aspect of the data or if the gage exhibits "stationarity" to conduct our analysis of Nuyakuk River hydrology or to develop license conditions for the project (section 5.9(b)(4)). For these reasons, we do not recommend requiring the Cooperative to conduct a flow duration curve change analysis study. However, the Cooperative is free to do so on its own.

Climate Change Study

Study Request

In its February 4, 2020 study request, NMFS requested that the Cooperative conduct a future flows and water temperatures study to "inform the design of project infrastructure, including fish passage protection measures, and project operations."

NMFS states that global climate models strongly agree on 21st century projections of significant increases in winter precipitation and temperature in Alaska and across high latitudes (Maloney et. al., 2014). NMFS states that air temperatures in Alaska are projected to rise dramatically in the next decades, within the period of the potential license term (Stewart et. al., 2022). NMFS states that most of the warming has occurred in the winter and spring and the least amount in the summer and fall. Spring temperatures have been above average since the late 1980s, and winter temperatures have been mostly above average since 2001. NMFS states that Wobus et. al., (2015) predicted changes in air temperature and precipitation from five downscaled global climate models to project flow changes in the Koktuli River, a tributary on the east side of the Nushagak River basin, predicting large changes in monthly temperature and precipitation through the year 2100. However, NMFS states that the results of Wobus et al. are not applicable to the project site because the Nuyakuk River is on the west side of the Nushagak basin and the study did not assess flows or temperature in the Nuyakuk River.

Specifically, NMFS recommends that the Cooperative: (1) develop monthly values (or a more-frequent time step such as daily values, if available) of projected future air temperature and precipitation for the Nuyakuk River using existing peer-reviewed and publicly available downscaled climate model outputs; and (2) develop a hydrologic model (such as MIKE/SHE modeling system (Graham and Butts, 2005)) using the future air temperature and precipitation

values from the downscaled climate models as input to predict how changes in these two variables affect other hydroclimate variables (e.g., evaporation, soil percolation, surface runoff), and ultimately, water temperatures and the timing and quantity of streamflow in the Nuyakuk River at the project on a monthly or more frequent time step.

NMFS states that it anticipates a 50-year license term would be issued for the project; therefore, changes in air temperature and precipitation and corresponding changes in water temperature and streamflow would need to be assessed for three distinct periods: "the first third (e.g. 2030 – 2047); the middle third (e.g. 2047-2064); and the late or final third (e.g. 2064 to 2080) for the Nuyakuk watershed." NMFS states that this approach would allow consideration of flow trends that may evolve over the anticipated license term, and potentially different project operations as conditions change over time.

NMFS states that the study results would inform the other fisheries studies, the ice processes assessment, project design, and the decision support tool.[3] For example, NMFS states that the study results would be used to: (1) "project timing of out-migrating smolt in the future;" (2) "inform turbine sizing and winter, spring and fall energy production;" (3) "inform project design and operation including tunnel design, groin design, and any attempt to mesh winter hydropower with other electric generation facilities to meet domestic winter power demands of the six communities;" and (4) "determine the future timing of returning adult salmon and when water will be needed in the river to support fish passage both up and down the falls."

Applicant's Proposed Study

In the RSP, the Cooperative agrees to conduct the study consistent with NMFS's request. The study methods are identical to those described in NMFS's study request.[4] The Cooperative states that the study would cost $50,000 - $75,000.

Discussion and Staff Recommendation

As NMFS points out, Wobus et al. (2015) developed a hydrologic model under a range of future climate scenarios to characterize changes in the hydrology of the upper Nushagak[5] and Kvichak Rivers. Specifically, the goal of Wobus et al. (2015) was to evaluate how streamflow

[3] The RSP includes a study to develop a spreadsheet-based analytical tool to aid in assessing tradeoffs between the power generation and economic benefits of the project and potential effects on other resources such as salmon abundance and commercial salmon fisheries. The tool would consider numerous factors such as the cost of project power, the cost of existing diesel generation, and the amount of energy produced at the project over the license term and considering different flow conditions due to climate change (based primarily on Wobus et al. (2015)).

[4] NMFS updated its study request in its comments on the updated PSP, which the Cooperative adopted in the RSP.

[5] Nuyakuk River is a tributary to the Nushagak River.

and water temperatures in Bristol Bay river systems might change under a range of future climate scenarios through the year 2100. The methods implemented by Wobus et al. (2015) were similar to NMFS's requested future flows study for the Nuyakuk River at the project, including using five downscaled global climate models (GCM) under two different emissions scenarios (i.e., a stabilized global emissions scenario and an increasing emissions scenario through 2100) as input to a hydrologic model developed with the MIKE/SHE modeling platform. The study results show that peak annual streamflows in the study rivers could decrease between 10% - 40% depending on emissions scenario and GCM, and the timing of peak flows could change from current conditions (i.e., late May and early June during peak snowmelt runoff) to "virtually any month of the year, depending on the timing of individual rainstorms." Other study findings include: (1) average winter base flow would double compared to existing conditions; (2) winter precipitation is more likely to fall as rain instead of snow in the future, thus leading to flashier conditions with less stable winter flows; and (3) changes in summer flows would be less significant with summer flows typically within 10-15% of current conditions.

Sufficient information exists to determine the appropriate size and capacity of project facilities such as power tunnels and turbines (section 5.9(b)(4)). The USGS gage near the project has 69 years of flow records that can be used to describe current flow conditions and assess whether there have been changes in flows that have occurred over time. Additionally, the results of Wobus et al. (2015) could be used to generally evaluate whether proposed project facilities could accommodate future flows estimated under current climate change projections (e.g., higher winter base flow, lower peak flows).

Further, NMFS states that salmon migrations are keyed to water temperatures and flow, and therefore, the future flows study is needed to "project" changes in water temperature and flow and corresponding changes in the timing of upstream and downstream salmon migration at the project site. However, NMFS does not state how specifically this should occur. Any future potential changes in the timing of upstream and downstream migration of five different species of salmon through the project site would be dependent on numerous factors that would be difficult or impossible to predict. For example, as discussed in Stillwater Sciences (2013), variations in the timing of juvenile Chinook transitioning from rearing parr to out-migrating smolt has been shown to be influenced by genetics, fish size, flow, water temperature, and other environmental and demographic factors (e.g., lunar cycle, photoperiod, turbidity).

Additionally, the Cooperative is already proposing several studies to specifically assess fish passage through the project site (e.g., fish passage study through the falls using a 2-dimensional hydraulic model and radio tagging, fish entrainment study). The data from these studies should be sufficient to assess fish passage under a range of flow conditions at the project and to inform license conditions to protect upstream and downstream fish migrations through the project (section 5.9(b)(4)). Should a license be issued for the project and the timing of salmon migrations shift over the long term, the license would include a standard reopener article which could be used to make changes to license conditions (e.g., higher or lower minimum flows at different times of the year to facilitate fish passage), if needed.

For these reasons, we do not recommend requiring the Cooperative to conduct a future flows study for the Nuyakuk River at the project site. Nonetheless, the Cooperative is free to do so on its own.

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