

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
May 13, 2019

OFFICE OF ENERGY PROJECTS

Project No. 2570-032
Racine Hydroelectric Project
AEP Generation Resources, Inc.

Mr. Jonathan Magalski
Environmental Specialist Consultant
American Electric Power Services Corporation
1 Riverside Plaza
Columbus, OH 43215

Reference: Study Plan Determination for the Racine Hydroelectric Project

Dear Mr. Magalski:

Pursuant to 18 C.F.R. § 5.13(c) of the Commission's regulations, this letter contains the study plan determination for the Racine Hydroelectric Project (Racine Project) located at the U.S. Army Corps of Engineers' Racine Locks and Dam on the Ohio River near the Town of Racine in Meigs County, Ohio. 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 for the project.

Background

On December 14, 2018, AEP Generation Resources, Inc. (AEP Generation Resources) filed a Proposed Study Plan (PSP) with seven studies in support of its intent to relicense the project. The PSP addresses aquatic resources, water quality, wildlife resources, recreation, and cultural resources.

AEP Generation Resources held an Initial Study Plan Meeting to discuss the PSP on January 10, 2019. On February 27, 2019, AEP Generation Resources held a webinar for the resource agencies that were unable to attend the Initial Study Plan Meeting. The webinar was attended by the U.S. Fish and Wildlife Service (FWS) and West Virginia Division of Natural Resources (West Virginia DNR), and provided an opportunity for the

agencies to discuss the PSP. Comments on the PSP were filed by Commission staff, FWS, West Virginia DNR, and the Delaware Nation.¹

On April 12, 2019, AEP Generation Resources filed a Revised Study Plan (RSP) that includes revisions to five studies proposed in the PSP (*Water Quality Study, Mussel Survey, Fisheries Survey, Eastern Spadefoot Toad Habitat Suitability Assessment, and Recreation Study*). Comments on the RSP were filed by FWS and West Virginia DNR.

General Comments

A number of the comments on the RSP do not directly address the study plans. For example, some comments request that AEP Generation Resources provide additional information or recommend protection, mitigation, and enhancement measures. This determination does not address such comments, but rather addresses comments specific to the merits of the proposed studies submitted pursuant to section 5.13 of the Commission's regulations and comments received thereon.

Study Plan Determination

AEP Generation Resources' RSP is approved, with the staff-recommended modifications discussed in Appendix B. As indicated in Appendix A, of the seven studies proposed by AEP Generation Resources, five are approved as filed by AEP Generation Resources, and two are approved with staff-recommended modifications. This determination also addresses an additional study requested by West Virginia DNR (*see* Appendix A).

The specific modifications and basis for modifying AEP Generation Resources' RSP 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.

Studies for which no issues were raised in comments on the RSP are not discussed in this determination. Unless otherwise indicated, all components of the approved studies not modified in this determination must be completed as described in AEP Generation Resources' 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 May 12, 2020.

¹ In a notice issued on March 12, 2019, the Commission extended the comment period on the PSP to March 21, 2019, due to the funding lapse at certain federal agencies between December 22, 2018 and January 25, 2019.

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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. In addition, AEP Generation Resources may choose to conduct any study not specifically required herein that it feels would add pertinent information to the record.

If you have any questions, please contact Jay Summers at (202) 502-8764.

Sincerely,

Terry L. Turpin
Director
Office of Energy Projects

Enclosures: Appendix A -- Summary of Determinations on Proposed and Requested Studies

Appendix B – Staff's Recommendations on Proposed and Requested Studies

APPENDIX A

SUMMARY OF DETERMINATIONS ON PROPOSED AND REQUESTED STUDIES

Study	Recommending Entity	Approved	Approved with Modifications	Not Required
Water Quality Study	AEP Generation Resources, FWS, West Virginia DNR		X	
Fisheries Study	AEP Generation Resources, FWS, West Virginia DNR		X	
Fish Entrainment and Impingement Study	AEP Generation Resources, FWS, West Virginia DNR	X		
Fish Protection and Upstream and Downstream Fish Passage Study	West Virginia DNR			X
Mussel Survey	AEP Generation Resources, FWS, West Virginia DNR	X		
Eastern Spadefoot Habitat Suitability Study	AEP Generation Resources	X		
Recreation Study ²	AEP Generation Resources, West Virginia DNR	X		
Cultural Resources Study	AEP Generation Resources	X		

² In its comments on the Proposed Study Plan, FWS states that it defers to West Virginia DNR and the Ohio Department of Natural Resources, and supports their recommendations, with respect to the proposed *Recreation Study*.

APPENDIX B

STAFF'S RECOMMENDATIONS ON PROPOSED AND REQUESTED STUDIES

The following discusses staff's recommendations on studies proposed by AEP Generation Resources, Inc. (AEP Generation Resources), and requests for study modifications and additional studies. We base our recommendations on the study criteria outlined in the Commission's regulations [18 C.F.R. section 5.9(b)(1)-(7)].

I. Required Studies

Water Quality Study

Applicant's Proposed Study

AEP Generation Resources proposes to conduct a water quality study to characterize baseline water quality conditions and evaluate potential project effects on water quality in the project area. Specifically, AEP Generation Resources proposes to continuously monitor water temperature and dissolved oxygen at 15-minute intervals from May 1 through October 31, 2019. Continuous monitoring would occur using water quality data loggers at the following locations: (1) approximately 1,700 feet upstream of the project intake (at a point immediately upstream of the U.S. Army Corps of Engineers' (Corps) restricted area³ and 300 feet from the Ohio shoreline); (2) approximately 1,050 feet downstream of the project (at a point immediately downstream of the Corps' restricted area and 125 feet from the Ohio shoreline); and (3) 4,200 feet downstream of the project (at a point 275 feet from the Ohio shoreline). For the upstream water quality logger, AEP Generation Resources proposes to continuously monitor water temperature and dissolved oxygen at two different depths (one-third and two-thirds of the depth of the reservoir) to determine whether the reservoir thermally stratifies during the summer period. AEP Generation Resources proposes to deploy a second continuous water quality logger at each proposed monitoring location to provide backup data. AEP Generation

³ Upstream of the Racine Locks and Dam, the Corps' restricted area extends perpendicularly across the Ohio River. The restricted area begins at a point approximately 1,600 feet upstream of the dam on the Ohio shoreline and extends to the upstream end of the Corps' lock channel, approximately 400 feet from the West Virginia shoreline. Downstream of the Racine Locks and Dam, the Corps' restricted area begins at a point approximately 825 feet downstream of the dam on the Ohio shoreline. The restricted area extends from the shoreline at an approximate 45-degree angle to the downstream end of the Corps' lock channel, approximately 2,200 feet downstream of the dam and 300 feet from the West Virginia shoreline. See figure 6-1 of the Revised Study Plan for a detailed map of the Corps' restricted area.

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Resources also proposes to collect monthly (from May through October) in-situ water quality data for temperature, dissolved oxygen, pH, and specific conductance at each of the three continuous water quality monitoring locations.

AEP Generation Resources proposes to collect water temperature and dissolved oxygen profile data on a monthly basis from May 1 through October 31, 2019 at two locations approximately 0.4 mile upstream of the project (275 feet from the West Virginia shoreline and mid-river) and at a third location immediately upstream of the project intake (provided the intake site is accessible and river flows are conducive to sampling). Reservoir profile sampling would be conducted from the reservoir surface to the river bottom in 1-meter increments. However, if a thermocline is present, sampling would be reduced to 0.5-meter increments from one meter below the reservoir surface to one meter above the river bottom.

Although the Revised Study Plan (RSP) identifies the general locations of all proposed water quality sampling efforts, AEP Generation Resources proposes to consult with the stakeholders to refine the specific location of each water quality logger. Lastly, in the event of atypical weather or flow conditions during the implementation of the study in 2019, AEP Generation Resources states that it would consult with the resource agencies to determine the need for a second year of study in 2020.

Water Quality Logger Placement

Comments on the Study

The U.S. Fish and Wildlife Service (FWS) and West Virginia Division of Natural Resources (West Virginia DNR) express concern with the proposed locations of the continuous water quality loggers to be located in the Racine Reservoir and the project tailrace. FWS and West Virginia DNR state that the proposed locations of these two water quality loggers are too far from the project to provide an accurate assessment of water quality entering and being discharged from the project. FWS and West Virginia DNR recommend that water quality loggers be located as close as possible to the project intake and point of discharge, preferably within approximately 100 meters (328 feet) of both of these locations. FWS recommends that, ideally, the continuous water quality logger in the Racine Reservoir should be located at the project intake to coincide with the proposed profile monitoring location. Further, FWS states that it has contacted the Corps' Huntington District and received confirmation that it is possible to receive permission from the Corps to access the restricted area for scientific monitoring purposes.

To evaluate the effects of project operation on downstream water quality, West Virginia DNR specifically recommends that AEP Generation Resources deploy a continuous water quality logger adjacent to the project's fishing pier located just

downstream of the powerhouse, rather than downstream of the Corps' restricted area.⁴ West Virginia states that this recommended location experiences relatively low turbulence and anchoring the logger here would result in a minor increase in the cost of the study. Additionally, West Virginia DNR states that spill through the Corps' Tainter gates does not influence water quality at this recommended monitoring location, which would eliminate potential confounding effects to downstream water quality associated with the operation of the Corps' facilities.

Discussion and Staff Recommendation

In the RSP, AEP Generation Resources expresses logistical and technical concerns with monitoring water quality within the Corp's restricted area. AEP Generation Resources also states that water quality is unlikely to be different between the proposed monitoring locations and those recommended by the agencies. In response to the agencies' concerns regarding the location of the continuous water quality loggers to be located in the Racine Reservoir and the project tailrace, AEP Generation Resources moved the locations of both loggers closer to the project in the RSP. The Racine Reservoir and tailrace loggers were moved approximately 250 and 200 feet, respectively, closer to the project and would be located at the upstream and downstream boundaries of the Corps' restricted area. In regard to the continuous water quality logger to be located upstream of the project, FWS and West Virginia DNR have not provided any explanation as to why AEP Generation Resources' proposal to deploy this logger at a point approximately 1,700 feet upstream of the project would be insufficient to characterize baseline water quality conditions in the Racine Reservoir. It seems unlikely that water quality conditions in the Racine Reservoir would differ within an approximately 1,600 to 1,700-foot-long reach of the Ohio River between AEP Generation Resources' proposed and the agencies' recommended location for this continuous water quality logger. We note that AEP Generation Resources' proposal to conduct reservoir profile monitoring immediately upstream of the project intake and at two locations approximately 0.4 mile upstream of the project would, however, support an analysis of longitudinal changes to water quality within the Ohio River immediately upstream of the project. This data would provide the necessary information for making definitive conclusions regarding any longitudinal changes to water quality within the Ohio River immediately upstream of the project.

Regarding the placement of the continuous water quality logger in the project tailrace, deploying the logger any closer to the project would subject it to higher water velocities and turbulent conditions, which could potentially affect the quality of the data collected or result in the loss of the logger itself. Sampling within the Corps' restricted area would also entail certain procedural obstacles and safety considerations that

⁴ The project's fishing pier is approximately 300 feet long and begins at a point approximately 160 feet downstream of the dam.

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otherwise would not have to be considered if sampling were to occur outside this area. Additionally, AEP Generation Resources also states in the RSP that sampling within the restricted area would double the estimated cost of the study. Although a detailed breakdown of these additional costs were not provided, there would presumably be some added costs associated with consulting with the Corps, obtaining Corps' approval to access the restricted areas, acquiring the necessary equipment to safely sample in the adverse and dynamic conditions immediately downstream of the project, and replacing damaged or lost water quality loggers.

Continuously monitoring water quality immediately upstream and downstream of the Corps' restricted area from May 1 through October 31 would provide adequate information to describe baseline water quality conditions in the Racine Reservoir and the project tailrace and inform staff's environmental analysis [section 5.9(b)(4)]. AEP Generation Resources' proposal to compile and compare project operation data to the collected water quality data would provide useful information that more clearly illustrates the relationship between potential project effects and downstream water quality. We also recommend that the analysis for this study incorporate data from the operation of the Corps' Racine Locks and Dam facilities at the time of water quality sampling to determine whether any observed effects on downstream water quality are the result of project operation or the operation of the Corps' facilities. Further, FWS and West Virginia have not justified why the added level of effort and cost associated with monitoring within the Corps' restricted area is warranted [section 5.9(b)(7)]. Accordingly, we do not recommend the agencies' requests to move the location of these two continuous water quality loggers closer to the project.

Additional Water Quality Monitoring Locations

Comments on the Study

FWS recommends that an additional primary and secondary continuous water quality logger be located approximately 2,000 feet downstream from the powerhouse discharge. FWS states that this location corresponds to the area mussels were found in closest proximity to the project during a 2015 mussel survey conducted in support of the Corps' Navigation Dredge Program for the Corps' Huntington District (Lewis Environmental Consulting, 2015). FWS also recommends that an additional primary and secondary continuous water quality logger be located approximately 2,000 feet downstream from the dam on the opposite side of the river from the project (adjacent to the Corps' lock facilities). FWS states that water quality data collected from this location would be outside the project's area of potential project effects and serve as a reference point for the purposes of comparing other downstream water quality data collected as part of this study.

Discussion and Staff Recommendation

Staff's environmental analysis would need to assess the effects of continued project operation on aquatic resources, including water quality, in the Ohio River downstream of the project. Operation of the project, as well as, operation of the Corps' facilities, including the locks and spillway structures, affects the flow regime downstream of the dam. During the months of May through October, the Ohio River Valley Water Sanitation Commission (ORSANCO) monitors water temperature and dissolved oxygen at a site immediately upstream of the project at river mile 237.5 near the lock section of the dam. Data provided by ORSANCO indicates that during the summer months, dissolved oxygen levels occasionally drop below the water quality standards set by the Ohio Environmental Protection Agency (Ohio EPA). FWS' recommendation for an additional water quality monitoring station approximately 2,000 feet downstream from the Racine Dam would provide information that would further distinguish the water quality effects of project operation from the effects of the Corps' operation of the Racine Locks and Dam, and it would inform potential license requirements [sections 5.9(b)(4) and (5)]. As such, we recommend that AEP Generation Resources continuously monitor water temperature and dissolved oxygen at 15-minute intervals from May 1 through October 31, 2019 on the opposite side of the Ohio River from the project at location approximately 2,000 feet downstream from the Racine Dam. We recommend that AEP Generation Resources consult with FWS to determine the specific location of this continuous water quality logger.

As part of the proposed *Mussel Survey*, as discussed below, AEP Generation Resources proposes to take measurements of water temperature, dissolved oxygen, pH, and specific conductance from representative locations in the proposed mussel survey sampling areas at the beginning and end of each sampling day. This proposal would result in site-specific water quality data from areas downstream of the project that are known to support mussel populations. The water quality data collected as part of the *Mussel Survey*, in combination with the water quality data collected as part of this study, would be sufficiently robust to characterize baseline water quality conditions in the project vicinity and inform potential license requirements [sections 5.9(b)(4) and (5)]. This information would also provide sufficient information to analyze the longitudinal effects of continued project operation on water quality conditions and mussel communities downstream of the project [section 5.9(b)(4)]. Accordingly, we do not recommend the agencies' request to monitor water quality on a continuous basis at a location approximately 2,000 feet downstream from the powerhouse discharge.

Second Year of Study

West Virginia DNR states that AEP Generation Resources' proposal to conduct water quality monitoring for a single year may not be adequate to characterize baseline water quality conditions in the project vicinity. Accordingly, West Virginia DNR recommends that AEP Generation Resources conduct a second year of study to accommodate the natural variability in water quality that occurs on a yearly basis.⁵

Discussion and Staff Recommendation

There is no indication at this time that an additional year of study would be necessary to meet the goals and objectives of the study [section 5.9(b)(4)]. However, in the event study results do not adequately meet the study objectives or provide the information necessary for evaluating potential project effects, stakeholders would have an opportunity to file a request to modify the study to collect additional information.⁶ At that time, any requests to modify the approved study must be accompanied by a showing of good cause and must include a demonstration that: (1) the approved study was not conducted as provided for in the approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way. Therefore, we do not recommend a second study season at this time.

Fisheries Study

Applicant's Proposed Study

AEP Generation Resources proposes to summarize existing fisheries data collected from the Racine and RC Byrd Project (FERC Project No. 12796) Reservoirs to create a comprehensive fisheries database that describes the fish communities in both reservoirs.⁷ The comprehensive fisheries database would be used to analyze the seasonal and spatial trends of the fish community in the project area. AEP Generation Resources also proposes to supplement existing fisheries data with a targeted electrofishing survey

⁵ West Virginia DNR's recommendation for a second year of study applies to all aspects of AEP Generation Resources' proposed study, including continuous water quality monitoring, in-situ water quality sampling, and reservoir profile sampling.

⁶ See 18 C.F.R. § 5.15(d) (2018).

⁷ The RC Byrd Reservoir extends from the Corps' downstream RC Byrd Locks and Dam located at river mile 279.2 to the Corps' Racine Locks and Dam at river mile 237.5.

in the project tailwater and trawl surveys at three locations downstream of the project along the Ohio and West Virginia shorelines. The electrofishing and trawl surveys would document the composition, relative abundance, condition (of game fish species), distribution, and habitat use of the species collected.⁸ Specifically, AEP Generation Resources proposes to survey the project tailwater immediately downstream of the Corps' restricted area using boat electrofishing. Boat electrofishing surveys would be conducted along three, 500-meter-long transects in the fall (September or October) and focus on shoreline areas within the study reach. AEP Generation Resources proposes to conduct these surveys at night, beginning just after dusk, to take advantage of the increased foraging activity and nocturnal movements of fish during this period. Three daytime 500-meter-long trawl surveys would also be conducted at each of the following locations for a total of nine trawl surveys: (1) the project tailwater immediately downstream of the Corps' restricted area (i.e., the same location as the proposed electrofishing survey); (2) approximately 1,600 meters downstream of the Racine Dam along the Ohio shoreline; and (3) approximately 1,600 meters downstream of the Racine Locks along the West Virginia shoreline. To minimize the effects of the trawl surveys on freshwater mussels, AEP Generation Resources has adopted a trawl methodology recommended by FWS and West Virginia DNR in their respective comments provided on the RSP. Specifically, AEP Generation Resources proposes to conduct the trawl survey in June using an 8-foot mini-Missouri trawl net and limit the duration of each trawl to one minute.

Comments on the Study

FWS and West Virginia DNR express concern with AEP Generation Resources' reliance on several existing fisheries studies conducted in the project area to support conclusions made in the RSP. FWS and West Virginia specifically take issue with AEP Generation Resources' conclusion that comprehensive fisheries surveys of the Racine Reservoir are not warranted because ample existing fisheries data is available for the Ohio River both upstream and downstream of the project. FWS and West Virginia DNR caution that several of the fisheries studies cited by AEP Generation Resources focused mainly on gamefish (i.e., those conducted by resource agencies), or in the case of ORSANCO's fish surveys in the Racine Reservoir, were conducted using only one methodology (i.e., electrofishing) outside the migration periods of numerous species known to occur the project area (i.e., ORSANCO's surveys were conducted during the summer when water temperatures exceeded 65 °F). Conversely, FWS and West Virginia DNR suggest that existing fisheries data in the project is limited and, therefore, does not

⁸ AEP Generation Resources would characterize macrohabitat at sampling locations within the study reach using ORSANCO's method for classifying electrofishing habitats (ORSANCO, 2019) and Ohio EPA's Qualitative Habitat Evaluation Index for characterizing trawling habitats (Ohio EPA, 2006).

allow for a complete characterization of the fish community or the representative numbers of each species that are present in the project area during the all seasons. FWS and West Virginia DNR also caution that relying upon fisheries survey data collected solely during the summer months is problematic for a number of reasons, including: (1) fish catch rates are known to decrease with increasing water temperature; (2) electrofishing techniques are not as effective when water temperatures are warmer; (3) higher water temperature increases stresses induced by electrofishing, which may result in unnecessary and adverse effects to fish; and (4) some fish species seek refuge in cooler water (i.e., deeper water or tributaries) during the summer months and may not be susceptible to capture via electrofishing. Lastly, FWS states that its proposal for AEP Generation Resources to use multiple sampling methods over two additional seasons (spring and fall), as described below, is critical to fully assess the species and numbers of fish present in the project area at different times of year (including migratory species) in order to accurately inform the proposed *Fish Entrainment and Impingement Study*.

FWS and West Virginia DNR recommend that AEP Generation Resources expand the proposed *Fisheries Study* to include electrofishing surveys in the Racine Reservoir and additional trawl surveys at the locations described below to help inform the proposed *Fish Entrainment and Impingement Study*.⁹ FWS recommends that AEP Generation Resources conduct spring and fall electrofishing surveys in the Racine Reservoir. When scheduling the recommended spring and fall electrofishing surveys, FWS recommends that AEP Generation Resources consider the optimum temperature ranges for collecting target fish species such as flathead catfish and Percids.¹⁰ Specifically, FWS recommends that: (1) spring electrofishing surveys be conducted in April when water temperatures are between 40 and 50 °F; and (2) fall electrofishing surveys be conducted in October when water temperatures are between 60 and 65 °F and/or in November/December when water temperatures are between 40 and 50 °F. FWS also recommends that AEP Generation Resources conduct additional trawl surveys downstream of the dam in the thalweg and

⁹ We note that in West Virginia DNR's comments on the Proposed Study Plan (PSP), it recommended at least one electrofishing survey in the Racine Reservoir. In its comments on the RSP, West Virginia DNR did not specify the number or the seasonal timing of its recommended electrofishing surveys in the Racine Reservoir or the location of its recommended spring electrofishing survey. Given the similarities between FWS' and West Virginia DNR's requested study modifications for this study (and others) for the purposes of this determination, we assume West Virginia DNR's recommendation is for a spring electrofishing survey to be conducted in the Racine Reservoir, which is consistent with FWS' recommendation.

¹⁰ The percidae family is composed of 11 genera and an estimated 266 to 275 species, including yellow perch, walleye, sauger, and many species of darters.

six trawl surveys upstream of the dam to fully assess the fish community.¹¹ The upstream trawl surveys would include a total of six, one-minute trawls consisting of three, one-minute trawls in the thalweg and three, one-minute trawls on the right descending bank. Additionally, FWS states that it supports West Virginia DNR's recommendations regarding the total number of trawl transects AEP Generation Resources should conduct downstream of the Racine Dam, as discussed below.

Similar to FWS' recommendations above, West Virginia DNR recommends that AEP Generation Resources conduct its proposed fall electrofishing and trawl surveys downstream of the dam when water temperatures are between 60 and 65 °F to ensure they are most effective and consistent with previous West Virginia DNR fish surveys. West Virginia DNR also states that the proposed trawl survey methodology may not properly assess the fish community in the project area because AEP Generation Resources' proposal only includes trawl sampling along the Ohio and West Virginia shorelines and excludes sampling in the thalweg. As such, West Virginia DNR recommends that AEP Generation Resources conduct a total of 27, one-minute trawl surveys in the project area (both upstream and downstream of the dam) to comply with West Virginia DNR's trawl survey protocols. Specifically, West Virginia DNR recommends that the proposed study be modified to include the following:

- 1) For the proposed electrofishing/trawl sampling location furthest downstream on the left descending bank (along the West Virginia shoreline), three trawl surveys should be positioned at the left descending bank, right descending bank, and thalweg, respectively, with three, one-minute trawls per sampling location.
- 2) The proposed electrofishing/trawl sampling location located furthest downstream on the right descending bank (along the Ohio shoreline) should be relocated upstream to where the downstream terminus of this electrofishing/trawl sampling location is at least 10 meters upstream of the upstream terminus of the electrofishing/trawl sampling location on the left descending bank (*see* item 1). Due to the potential effects of the lock, two trawl surveys should be positioned at the right descending bank and thalweg, respectively, with three, one-minute trawls per sampling location.
- 3) For the proposed electrofishing/trawl sampling location located closest to the project on the right descending bank, due to the potential effects of the lock, two trawl surveys should be positioned on the right descending bank and thalweg, respectively, with three, one-minute trawls per sampling location.

¹¹ The thalweg is the longitudinal line of deepest water within a river.

- 4) AEP Generation Resources should conduct an upstream trawl survey in conjunction with the upstream electrofishing sampling location. Due to the potential effects of the lock structure, two trawl surveys should be conducted on the right descending bank and thalweg, respectively, with three, one-minute trawls per sampling location.

American Eel Surveys

FWS recommends that the *Fisheries Study* include American eel-targeted surveys that focus on detecting adult eels (i.e., silver eels) migrating downstream of Racine Locks and Dam in the fall and juvenile (i.e., yellow eels) migrating upstream of Racine Locks and Dam in the spring through fall. With regard to silver eels, FWS states that previous electrofishing surveys in the project reservoir (e.g., ORSANCO's fish surveys) likely underestimated eel abundance because the timing of these summer surveys did not coincide with the known downstream migration period for this species. FWS further states that electrofishing is not an ideal methodology for detecting American eel, and ORSANCO's electrofishing surveys did not target areas near the dam, which are areas expected to contain concentrations of silver eels as they attempt to migrate downstream. FWS states that eel surveys should begin in the spring when water temperatures reach 15 degrees Celsius (°C) (59 °F) and continue through the fall until water temperatures drop to 10 °C (50 °F). FWS recommends a combination of methodologies to survey for eels in the project area, including, daytime and nighttime electrofishing surveys in targeted areas near the dam (to the extent this can be done safely), eel traps, eel pots, and eel ramps. FWS also states that AEP Generation Resources should consider the use of nighttime red light surveys for American eels, if there are shallow water areas with low turbidity that would support the use of this methodology.

Discussion and Staff Recommendation

Racine Reservoir Fish Sampling

In the pre-application document (PAD) and RSP, AEP Generation Resources provided a summary of the available fisheries data for the Racine and RC Byrd Reservoirs that would be used to inform the development of a single, comprehensive fish population database for the project area. The major sources of available fisheries data include: (1) a 2010 fisheries study conducted by the City of Wadsworth, Ohio in support of the licensing process for the downstream RC Byrd Project;¹² (2) 2014 and 2015 fisheries studies conducted by the Electric Power Research Institute (EPRI) in

¹² The fisheries study was conducted between river miles 277.1 and 280.6 to characterize the fish community potentially affected by the construction and operation of the proposed RC Byrd Project.

conjunction with several power plants located along the Ohio River as part of the Ohio River Ecological Research Program, including the Kyger Power Plant, which is located in the RC Byrd Reservoir; and (3) 2012 fisheries studies conducted by the Ohio Department of Natural Resources (Ohio DNR) in the Racine Reservoir. Additionally, ORSANCO¹³ has monitored fish communities in the Ohio River via boat electrofishing (1991 through present), rotenone surveys at lock chambers (1957 through 2005), and benthic trawling (2006 through 2008), and maintains an extensive online database of these fish survey results (ORSANCO, 2019).

FWS and West Virginia DNR state that the majority of the fisheries data available for the project area has been collected during the summer and that there are either limited or no data available to characterize the fish community in the project area during the spring and fall. Upon review of the available fisheries data cited in the PAD and RSP, we have determined that the majority of the previous fish survey efforts in the immediate project area have focused on the summer months (i.e., primarily June through early September). For example, a review of ORSANCO's fish survey database reveals that all recent electrofishing efforts in the Racine Reservoir were conducted between July and early September. There also does not appear to be any available fisheries data for the Racine Reservoir prior to June, and fall fisheries survey data for the Racine Reservoir appears to be limited to a single day of trawl surveys conducted by the Ohio DNR in September 2012. While we acknowledge that some early fall (October) fisheries sampling has occurred in the RC Byrd Reservoir as part of the 2010 fisheries study¹⁴ and EPRI's Ohio River Ecological Research Program, we find that data from other reservoirs on the Ohio River may not accurately characterize the fish community in the Racine Reservoir [section 5.9(b)(4)].

We find that FWS and West Virginia DNR have provided reasonable justification as to why existing information concerning fishery resources in the project reservoir is not sufficient to fully characterize the fish community in the project area on a year-round basis. Further, given the site-specific spring and fall fisheries data gaps identified by the agencies, the seasonal and spatial trends of the fish community within the Racine Reservoir cannot be accurately characterized without further study. Accordingly, we recommend that AEP Generation Resources conduct spring and fall fish surveys in the Racine Reservoir. This recommended study plan modification would allow AEP

¹³ ORSANCO conducts fisheries surveys in several Ohio River reservoirs on an annual basis. Typically, four of the 19 reservoirs are sampled each year, achieving a complete river-wide survey every five years. The objective of these surveys is to provide background information on the status of fish populations, as needed, to provide insight into the overall health of the Ohio River.

¹⁴ The Fish Resources Report for the RC Byrd Hydroelectric Project is included as Appendix E4-2 to the final license application filed on March 28, 2011.

Generation Resources to characterize the occurrence, species composition, relative abundance, and size distribution of fish in proximity to the project intake during the spring and fall, and would provide valuable information needed to support a season-specific assessment of fish entrainment at the project (*see Fish Entrainment and Impingement Study*). As such, this information is necessary to evaluate potential project effects and inform potential license conditions [sections 5.9(b)(4) and (5)].

FWS and West Virginia recommend that a combination of electrofishing and trawl surveys be used to characterize the fish community in the Racine Reservoir during the spring and fall sampling events. These recommended methodologies are common and effective methodologies used to sample fish on the Ohio River [section 5.9(b)(6)]. Further, using more than one type of sampling gear has been shown to be more effective at sampling the greatest number of species (Neebling and Quist, 2011). In this instance, using both electrofishing and trawl surveys would allow AEP Generation Resources to sample different habitats in the Racine Reservoir, and therefore, different components of the fish assemblage for a more accurate depiction of the fish community that could potentially be subjected to turbine entrainment. As such, for each seasonal sampling event (spring and fall), we recommend that AEP Generation Resources adhere to the proposed electrofishing methodology for sampling downstream of the dam and conduct, at a minimum: (1) electrofishing surveys upstream of the project along the right descending bank and mid-river; and (2) two trawl surveys to coincide with the electrofishing sampling locations in item 1, with three, one-minute trawls per sampling location. We expect AEP Generation Resources to follow the agencies' recommended protocols for documenting, handling, and returning to the river all mussels collected during trawl sampling. To further minimize the effects of trawl surveys on mussel resources, we also expect AEP Generation Resources to follow the agencies' recommendations that trawl sampling be discontinued if the thresholds for the number of mussels collected, as discussed above, are met. Lastly, to ensure that the spring and fall surveys coincide with the optimal temperature ranges for the target fish species of concern, we recommend that AEP Generation Resources consult with FWS and West Virginia DNR to identify the specific timing of the surveys based on the guidance provided in their respective comments.

Trawl Surveys Downstream of the Racine Locks and Dam

During the scoping process, the project tailwater was identified as an important and unique habitat type in the project area for several small-bodied, benthic fish species, including several Ohio state-listed darters. As a result, an objective of this study is to conduct a tailrace fish survey downstream of the project. AEP Generation Resources proposes to limit sampling to two locations on the right descending bank downstream of the project tailwater and a single location on the opposite side of the river from the

project, along the West Virginia shoreline, for a total of nine trawl surveys.¹⁵ Alternatively, FWS and West Virginia DNR recommend a more rigorous trawl sampling effort and request that AEP Generation Resources conduct a total of 21 trawl surveys downstream of the Racine Locks and Dam, nine of which would be located in the thalweg.

The agencies did not provide an explanation as to why additional trawl surveys, including in the thalweg, are needed downstream of the project to meet the goals and objectives of this study [section 5.9(b)(4)]. Additionally, the need to move the proposed fish sampling location located furthest downstream of the project on the Ohio shoreline, as recommended by West Virginia DNR, is unclear [section 5.9(b)(4)]. The agencies also do not describe considerations of the level of effort or cost that would be associated with conducting an additional 12 trawl surveys downstream of the project [section 5.9(b)(7)]. AEP Generation Resources' proposed trawl methodology would provide adequate information to describe project effects on fishery resources in the project tailwater and inform potential license conditions [sections 5.9(b)(4) and (5)]. Further, the level of information that would be provided as result of conducting additional trawl surveys downstream of the dam exceeds the level needed for our environmental analysis, particularly given the additional level of effort and cost [section 5.9(b)(7)]. Therefore, we have no basis for recommending additional trawl surveys downstream of the dam.

American Eel Surveys Downstream of Racine Locks and Dam

In a letter filed on October 3, 2017, FWS provided recent evidence for the presence of American eels in the Ohio River, including recorded observations upstream of the project (e.g., Allegheny and Monongahela Rivers, and Robert C. Byrd Locks and Dam, etc.), but abundance estimates for this species in the Ohio River are not currently available (FWS, 2015). Although no dedicated upstream fish passage facilities are present at the Racine Locks and Dam or other Corps' dams on the Ohio River downstream of the project, in-migrating yellow eels are adept at passing dams through a variety of means and most likely access habitat along the Ohio River mainstem (including at the Racine Locks and Dams) and its tributaries via the Corps' lock facilities.¹⁶

¹⁵ Although no explanation was provided for the proposed sampling location downstream of the locks on the West Virginia shoreline, it presumably would serve as a reference reach whose resident fish community is unaffected by project operation.

¹⁶ During upstream migration, American eels are also able to climb vertical obstacles, such as low-head dams with wetted surfaces that can pose barriers to the upstream movement of other aquatic species.

Flow releases from the project also have the potential to effect upstream migrating eels by creating a source of false attraction flows [section 5.9(b)(5)]. More specifically, any eels diverted to the project tailwater on the east side of the dam would guide them away from the Corps' locks facilities on the west side of the dam, or other available means of upstream migration, thereby potentially impeding or delaying their upstream migration. However, no site-specific information is available at the project regarding the magnitude, timing, or method of upstream passage for American eels at the Racine Project [section 5.9(b)(4)].

Section 10(a)(2)(A) of the Federal Power Act requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. The Atlantic States Marine Fisheries Commission's Interstate Fishery Management Plan for American eel (*Anguilla rostrata*) (2000) is a Commission-approved comprehensive plan for the state of West Virginia and guides the management of eels in the territorial seas and inland waters along the Atlantic coast.¹⁷ Therefore, we will need to assess the effects of continued project operation on American eels and evaluate the need for any protection measures [section 5.9(b)(4)]. Given the known presence of this species in the project vicinity, its migratory life history, and its historic range in the Ohio River upstream of Racine Locks and Dam, continued project operation may affect this species [sections 5.9(b)(4) and (5)]. Therefore, we recommend that AEP Generation Resources conduct targeted surveys for upstream migrating American eels to evaluate potential project effects on this species. The study should provide baseline data on the presence of American eels in the project area. The objectives of the study should be to: (1) characterize the relative abundance and distribution of American eels downstream of the project to determine the timing, magnitude, and duration of upstream eel migration periods at the Racine Locks and Dam; (2) evaluate the potential effects of continued project operation on the upstream migration of American eels; and (3) evaluate the need for any American eel protection, mitigation, or enhancement measures.

We note that FWS did not specify the level of effort needed to conduct its recommended eel-targeted electrofishing surveys. However, at a minimum, the study should include a spring, summer, and fall American eel-targeted electrofishing survey downstream of the Racine Locks and Dam during the 2019 eel migratory season (as site safety conditions allow). The first survey should be conducted after water temperatures

¹⁷ The goals of this plan are to: (1) protect and enhance the abundance of American eels in inland and territorial waters of the Atlantic states and jurisdictions, and contribute to the viability of the American eel spawning population; and (2) provide for sustainable commercial, subsistence, and recreational fisheries by preventing overharvest of any eel life stage.

consistently reach 15 °C. Subsequent surveys should continue through the spring, summer, and fall, with a focus on the probable peak migration season of May through July (Richkus and Whalen, 1999) until water temperatures drop to 10 °C. Consistent with generally accepted practices, electrofishing surveys should be conducted during the evening/night-time hours, after periods of elevated river discharge, to coincide with periods of peak upstream eel migration [section 5.9(b)(6)]. The sampling must focus on those areas downstream of the dam where eels are most likely to concentrate, including shoreline areas within or approaching the tailrace channel. Data collected should include sampling location, observation of eels (presence, absence, numbers, and estimated sizes), time and date of observation, field notes on weather conditions, and moon phase [section 5.9(b)(6)]. AEP Generation Resources should also describe project operation and flows at the time of each sampling event.

The study should also include the use of eel traps, eel pots, and/or eel ramps, to be designed based on the physical habitat conditions and accessibility at the specific locations chosen for sampling. Consistent with generally accepted practices, eel traps, eel pots, and/or eel ramps should target shallow water stream edge habitats to capture eels migrating upstream [section 5.9(b)(6)]. The placement of eel traps, pots, and/or ramps must focus on those areas downstream of the dam where eels are likely to concentrate, including shoreline areas within or approaching the tailrace channel. Data collected should include the location of where eels congregate, observation of eels (presence, absence, numbers, and estimated sizes), time and date of observation, and field notes on weather conditions and the moon phase. AEP Generation Resources should also describe project operation and flows at the time of each sampling event. Eels collected from the eel traps, pots, and/or ramps should be marked in an effort to identify individuals that may have already been captured to avoid overestimating eel abundance. Any recaptures should be recorded.

American Eel Surveys Upstream of Racine Locks and Dam

Out-migrating silver eels likely move downstream of the Racine Locks and Dams via a combination of routes, including the project turbines and the Corp's Tainter gates and locks. Therefore, operation of the project has the potential to cause entrainment-related injury or mortality to eels migrating downstream of the project through the turbines [section 5.9(b)(5)].

With regard to FWS' recommendation for targeted American eel surveys upstream of the project, in its comments on the RSP, FWS states that electrofishing is an inadequate methodology for documenting and estimating the relative abundance of eels. We disagree, as electrofishing surveys are commonly used to sample for American eel and are consistent with generally accepted practice for documenting and estimating the relative abundance of American eel, although certain considerations should be taken into

account when electrofishing for eel to minimize injury and mortality [section 5.9(b)(6)].¹⁸ If timed correctly, staff's recommended fall electrofishing surveys in the Racine Reservoir should determine the presence/absence and relative abundance of American eel in the Racine Reservoir; therefore, there is no justification for FWS' additional targeted American eel surveys.

Although AEP Generation Resources proposes to include American eel in the entrainment evaluation that would be conducted as part of the proposed *Fish Entrainment and Impingement Study*, we recognize that existing data and data collected as part of the approved study plan may be insufficient to satisfactorily estimate American eel entrainment, impingement, and turbine mortality at the project. Therefore, AEP Generation Resources may need to supplement existing desktop entrainment databases with additional studies upstream of the project that focus on American eels. AEP Generation Resources should evaluate the need for additional data or studies on American eel after completing the *Fish Entrainment and Impingement* and *Fisheries Studies*, as modified herein, and should discuss in the Initial Study Report the need for any additional data or analysis. The issue can be addressed at the Initial Study Report Meeting required under section 5.15(b)(2). Following this meeting, stakeholders can request modifications to the approved study plan for additional data or analysis, or request new site-specific information gathering or studies. Accordingly, we do not recommend targeted eels surveys upstream of the project at this time.

Fish Entrainment and Impingement Study

Applicant's Proposed Study

AEP Generation Resources proposes to conduct a literature-based assessment of fish entrainment and turbine survival at the project. The study would involve: (1) characterizing the physical and operational characteristics of the project turbines and intake structure;¹⁹ (2) utilizing water quality profile data collected from the proposed *Water Quality Study* to characterize water quality conditions in the forebay and assessing

¹⁸ We note that on October 30, 2018, FWS filed its comments on the PAD and scoping document 1, and study requests, and recommended "both daytime and night-time electrofishing in targeted areas near the dam" to sample American eel.

¹⁹ As part of this objective, AEP Generation Resources proposes to measure intake velocities at the project using an Acoustic Doppler Current Profiler or similar technology. However, in the event in-field measurements are not possible (e.g., safety-related concerns), AEP Generation Resources proposes to calculate approach velocities using flow data and the cross sectional area of the project intake.

its potential influence on fish entrainment; (3) developing a target species list based on species of management concern, as well as, other non-game species (e.g. rare, threatened, and endangered species);²⁰ (4) using data from the proposed *Fisheries Survey* and other available information to describe the fish community assemblage present in the project area and determine the potential for entrainment based on the spatial and temporal characteristics, life history, swim speed, and avoidance behavior of the various lifestages of target fish species; (5) assessing the entrainment and impingement potential of target species larval, juvenile, and adult life stages based on information derived from the items above; and (6) reviewing existing entrainment studies conducted at other hydroelectric projects with similar physical and operational characteristics to the Racine Project to develop monthly estimates of entrainment and entrainment-related mortality.

Comments on the Study

FWS and West Virginia DNR express concern with the results of entrainment studies previously conducted on the Ohio River and state that no reliable in-field entrainment survival studies are available for hydroelectric projects on the Ohio River. FWS and West Virginia DNR further state that these studies are widely accepted in the scientific community as flawed.²¹ In its comments on the PSP, FWS and West Virginia DNR state that a comprehensive in-field entrainment study using tailrace netting is expensive and both agencies accept AEP Generation Resources' decision to forgo this type of study. Instead of a tailrace netting study, FWS and West Virginia DNR recommend that AEP Generation Resources utilize sonar technology to conduct an empirical evaluation of turbine entrainment at the project. FWS and West Virginia DNR state that the objectives of their request for the use of sonar technology are to obtain an accurate estimate of the numbers, sizes, timing, and families or species (if possible) of fish entering the project intake throughout the year, and to inform and validate the proposed *Fish Entrainment and Impingement Study*. Although FWS does not recommend a specific type of sonar technology, West Virginia DNR recommends that AEP Generation Resources utilize Dual-Frequency Identification Sonar (DIDSON).²² West Virginia states that two or three DIDSON units could be secured in strategic

²⁰ AEP Generation Resources proposes to form a study work group composed of representatives from FWS, West Virginia DNR, Ohio DNR, and other stakeholders to identify target fish species and refine the study methodology.

²¹ FWS and West Virginia DNR specifically reference in-field entrainment survival studies conducted at the Racine, New Martinsville (FERC Project No. 3206), and Greenup Projects (FERC Project No. 2614).

²² DIDSON uses sound to create underwater images with a sufficient resolution to distinguish fish by family and size classes.

locations at the project intake and AEP Generation Resources' concerns regarding technological challenges are unfounded based upon the successful use of this technology at other hydroelectric projects.

As discussed above (*see Fisheries Study*), FWS also expresses concern with AEP Generation Resources' proposal to refrain from conducting spring and fall fish surveys in the Racine Pool, and targeted American eel surveys in the project area. FWS states that without this information, relying solely upon existing fisheries data (collected predominantly during the summer months) and information to be gathered as part of AEP Generation Resources' proposed tailwater fish survey, would result in biased fish community information being used to inform the proposed *Fish Entrainment and Impingement Study*. FWS states that such a methodology would not produce meaningful results across all seasons because of the limited time of year and/or water temperatures associated with previous fish surveys, and the lack of eel-specific surveys, in the project area. FWS also states that without its recommended fish surveys, AEP Generation Resources' proposed methodology would underestimate the relative abundance of Percids, American eel, walleye, sauger, and skipjack herring, the latter three which are known fish hosts for federally and state-listed mussels species known to occur locally in the Ohio River.

Discussion and Staff Recommendation

AEP Generation Resource's proposal would consist of a desktop evaluation of the potential for fish impingement and entrainment, and turbine mortality at the project. The only proposed field component of AEP Generation Resources' proposed *Fish Entrainment and Impingement Study* would be limited to collecting intake velocities at the project, presumably under different operating scenarios, which would provide useful information that can be used to assess the ability of target species to avoid impingement and entrainment. Additionally, AEP Generation Resources proposes to use information from the proposed *Fisheries Study* and other relevant studies to develop body scaling factors (documented body length to width relationships) for the various lifestages of target fish species. This information would enable AEP Generation Resources to determine the potential for turbine entrainment at the project based upon target fish species' larval, juvenile, and adult lifestages.

With regard to the agencies' comments that additional, season-specific fisheries data from the Racine Reservoir is necessary to inform this desktop entrainment study, we have determined that additional information is needed. As discussed above (*see Fisheries Study*), we recommend that AEP Generation Resources conduct spring and fall fish surveys to ensure that a robust dataset on the fish community upstream of the project is available to support a season-specific analysis of fish entrainment and mortality at the project.

Using these types of information to conduct a desktop analysis is consistent with generally accepted practices for evaluating fish entrainment at hydroelectric projects and is a widely accepted methodology that has been implemented at other FERC projects, in lieu of, conducting site-specific entrainment studies [section 5.9(b)(6)]. Further, there is a substantial amount of existing information on the effects of fish entrainment, turbine mortality, and impingement at hydroelectric projects with similar physical, operational, and fishery characteristics to the Racine Project (EPRI, 1997) [section 5.9(b)(4)]. Extrapolating entrainment data from existing studies with similar characteristics to the Racine Project is a cost-effective approach. AEP Generation Resource's proposed desktop analysis would provide the necessary information for staff to conduct an analysis of fish entrainment and impingement at the project [section 5.9(b)(5)].

Although the agencies did not provide an estimated cost to conduct a sonar analysis at the project, conducting this recommended analysis using DIDSON would significantly increase the cost of the proposed study. DIDSON units cost approximately \$80,000 or the units can be rented at a rate of approximately \$650 a day (Kane-Sutton and Gelwick, 2013). Deploying DIDSON technology upstream of the Racine Dam would likely require at least three units given the size of the intake. Further, deploying and maintaining DIDSON technology at Racine Dam, and processing the data collected from the units, would be labor-intensive and costly. Based upon challenges encountered during DIDSON studies at other hydroelectric projects, similar technological and environmental challenges could result from the deployment of this technology at the Racine Dam. For example, Schmidt et al. (2018) found that personnel were required to be onsite to ensure floating debris did not damage DIDSON units deployed upstream of an intake at a hydroelectric project in Austria. Further, due to equipment and operational costs, Schmidt et al. (2018) concluded that long-term deployment of DIDSON technology is limited. Based on the above, it is difficult to estimate the cost of a DIDSON analysis at the project because several unknown variables would be involved (e.g., number of DIDSON units, length of sampling period, etc.). However, we estimate that if such a study were to occur for a week during two seasons (spring and fall), it would exceed \$75,000. Accordingly, there is no justification for the added level of cost and effort that would be associated with conducting a DIDSON analysis at the project [section 5.9(b)(7)]. Therefore, we do not recommend that AEP Generation Resources conduct the agencies' recommended sonar analysis.

Mussel Survey

Applicant's Proposed Study

AEP Generation Resources proposes to conduct a mussel survey from the downstream extent of the Corps restricted area²³ downstream of the Racine Dam to a point approximately 1,340 meters further downstream. The purpose of this study is to document the status of the existing mussel community downstream of the project. Specifically, AEP Generation Resources proposes to conduct a qualitative mussel survey between May 1 through October 1 (water temperature and river flow dependent) in representative habitat types located within the proposed study reach. AEP Generation Resources proposes to conduct the survey in accordance with the West Virginia Mussel Survey Protocol (West Virginia DNR, 2018). SCUBA equipment would be used to conduct visual timed searches of transects within the study area. Starting from the downstream end of each transect or survey site, the survey would consist of searching for mussels or shell material in a meandering or “zigzag” pattern, with a focus on representative mussel habitats within the study reach. AEP Generation Resources proposes to identify all collected mussels to the species level and record basic information on each mussel (i.e., shell length and condition) and its surrounding habitat (i.e., substrate and habitat types, water depth, cover type, stream width, and water velocity). AEP Generation Resources also proposes to survey shoreline areas within the survey area for evidence of shell material or middens.²⁴

AEP Generation Resources proposes to divide the study area into two separate sampling zones. AEP Generation Resources states Zone 1 would encompass the immediate (near field) area of potential project effects and extend from immediately downstream of the Corps' restricted area at 250 meters downstream of the dam to a point approximately 1,000 meters downstream of the dam. Within Zone 1, AEP Generation Resources would sample a total of fourteen 180-meter-long transects perpendicular to river flow beginning at the right descending bank and proceeding every 50 meters downstream until the end of the reach.²⁵ Zone 2 would encompass a 600-meter-long

²³ The Corps' restricted area extends approximately 250 meters downstream of the dam.

²⁴ Middens are collections or piles of mussel shell material, often accumulating because of river flow patterns or animal predation.

²⁵ Because the Corps' restricted zone extends from the Ohio shoreline at a 45-degree angle, AEP Generation Resources proposes that the first transect downstream of the project would have a length of 100 meters so as not to encroach upon the Corps' restricted area.

reach from the downstream end of Zone 1, beginning 1,000 meters downstream of the dam, to a point approximately 1,600 meters downstream of the dam. Within Zone 2, AEP Generation Resources would sample a total of six 180-meter-long transects perpendicular to river flow beginning at the right descending bank and proceeding every 100 meters downstream until the end of the reach.

Lastly, upon completion of the initial mussel surveys in Zones 1 and 2, AEP Generation Resources proposes to conduct additional spot dives (ten minutes in length) in the areas of highest mussel densities in an effort to detect any additional species and develop a species richness curve. Timed searches would be conducted within the areas of highest mussel densities until no new species are found in six consecutive samples.

Comments on the Study

FWS and West Virginia DNR state that AEP Generation Resources' proposed study methodology does not conform to the West Virginia Mussel Survey Protocol for transect spacing. FWS expresses particular concern with the proposed transect spacing in Zone 2, which was found to contain the highest mussel concentrations and species diversity during a previous mussel survey conducted in the project area in 2015 (Lewis Environmental Consulting, 2015). FWS states that project effects can extend well downstream of a project, which is why the West Virginia Mussel Survey Protocol typically requires that all aspects of the protocol, including semi-quantitative surveys along the transects, be adhered to for a distance of 1,600 meters downstream of a project.

FWS and West Virginia DNR recommend that AEP Generation Resources modify the proposed transect spacing for the *Mussel Survey* to adhere to the protocols outlined in West Virginia's Mussel Survey Protocols for a Phase 2 survey on a large river where federally endangered species are expected to occur (i.e., otherwise known as a Group 4 river). The agencies state that based on the results of Lewis Environmental Consulting, LLC's survey (2015), the trigger for a Phase 2 survey has already been met. Therefore, the agencies state that conducting a less rigorous survey, similar to the survey proposed by AEP Generation Resources (otherwise known as a Phase 1 survey), is not appropriate.²⁶ A Phase 2 survey requires a maximum transect spacing of 25 meters; however, the agencies state they are willing to compromise on transect spacing and recommend the following three-phased approach:

²⁶ The purpose of a Phase 1 survey is to determine mussel distribution and delineate mussel concentrations and/or areas that have potential to harbor federally endangered mussel species to avoid and minimize effects to mussels (West Virginia's Mussel Survey Protocols, 2018).

- 1) The total survey area should begin at the downstream end of the Corps' restricted area and extend to a point 1,600 meters downstream from the dam.
- 2) Transects should be 180 meters in length.
- 3) Begin the survey with 50-meter transect spacing. If the trigger criteria²⁷ described in West Virginia's Mussel Survey Protocol (2018) are met for requiring a Phase 2 survey along a transect, then additional transects are to be added between the transects where the trigger is met, resulting in 25-meter transect spacing within areas where the Phase 2 trigger is met.
- 4) If the trigger is again met along added transects (i.e., 25-meter spaced transects), then additional transects are to be added between these transects. Additional transects are required between triggered transects, and upstream and downstream of last triggered transects. As an example, if transects 4, 5 and 6 are triggered (i.e., mussel concentrations or species indicate need for Phase 2 survey), then additional transects would be required at 3.5, 4.5, 5.5, and 6.5. If these are all triggered once more, then additional transects would be required at 3.25, 3.75, 4.25, 4.75, etc.
- 5) Surveys should begin with a transect survey followed by a qualitative timed search between transects with suitable habitat (if no mussels are found along the transect). Qualitative timed searched should also be conducted in mussel concentrations to increase the probability of finding an endangered species and to develop a species richness curve.

Discussion and Staff Recommendation

Previous mussel surveys conducted downstream of the project have identified a mussel bed beginning approximately 1,100 meters downstream of the project (Lewis Environmental Consulting, 2015). Given the known presence of this mussel bed and the mussel densities previously reported to occur in this bed (0.5 mussels per square meter), increased sampling efforts in certain areas of the study reach would likely be needed by AEP Generation Resources to be consistent with the phased transect spacing approach recommended by the agencies. While this increased effort associated with additional sampling may increase the likelihood of documenting additional mussel species, including rare, threatened, or endangered species, it would also increase the cost of the study. Depending upon how often the triggers described in the West Virginia's Mussel

²⁷ The trigger criteria are based upon observed mussel densities and/or the number and presence of certain species collected during the survey, as further described in West Virginia's Mussel Survey Protocols, 2018.

Survey Protocols are met, this could potentially result in AEP Generation Resources conducting a substantial number of additional transects that could result in significant additional costs to the study.

AEP Generation Resources' proposed study would provide staff with the information necessary to describe the existing environment and to evaluate potential project effects on the mussel community downstream of the project [sections 5.9(b)(4) and (5)]. Further, because AEP Generation Resources proposes to supplement its transect sampling with additional spot searches in the areas of highest mussel densities and search until no new species are collected, it is reasonable to conclude that the proposed study would document all mussel species present within the 1,350-meter-long study reach. Therefore, that additional effort recommended by the agencies is not necessary for staff's analysis and would not be worth the additional cost [section 5.9(b)(7)]. For these reasons, we do not recommend modifying the study to include the transect spacing recommended by FWS and West Virginia DNR.

II. Studies Requested but not Adopted by AEP Generation Resources

Fish Protection and Upstream and Downstream Fish Passage Study

Study Request

West Virginia DNR recommends that AEP Generation Resources conduct a *Fish Protection and Upstream and Downstream Fish Passage Study*.²⁸ West Virginia DNR expresses concern that project operation reduces the attraction of upstream migrating fish to the Corps' lock facilities.²⁹ West Virginia DNR also expresses concern that project operation: (1) may serve as a more attractive option to fish moving downstream of the dam, rather than other available routes (e.g., Corps' Tainter gates and locks), when river

²⁸ On October 30, 2018, FWS filed its study requests, which included a request for a *Fish Protection and Upstream and Downstream Passage Study*, similar to the study requested by West Virginia DNR. However, in its comments on the PSP, FWS states that its previously requested *Fish Protection and Upstream and Downstream Passage Study* is expensive and that it accepts AEP Generation Resource's decision to forgo conducting this study. In lieu of conducting this study, FWS requests that AEP Generation Resources provide additional information pertaining to project facilities, and operation of the project and the Corps' Racine Locks and Dam (*see* FWS' March 15, 2019 filing for a detailed description of the requested information).

²⁹ West Virginia DNR notes that although it is known that the Corps' operation of the lock facilities at the Racine Locks and Dam allows a limited number of fish to pass upstream of the Racine Dam, no studies exist that demonstrate that the locks are currently providing "safe, effective, and timely" passage for upstream migrants.

flows exceed the project's hydraulic capacity; and (2) reduces survival rates for downstream migrants by subjecting fish to entrainment-related mortality. West Virginia DNR states that this study is necessary to gather information on current fish passage dynamics and to assess the potential for fish passage opportunities at the project. West Virginia DNR also states that this information would inform the need for measures to meet its goals of avoiding and minimizing fish mortality at the project. Specifically, West Virginia DNR requests that AEP Generation Resources: (1) assess the movement of fish through the project area; (2) identify likely fish passage routes under a variety of conditions; and (3) assess the feasibility of incorporating alternative fish passage routes or additional fish protection measures at the project.

Discussion and Staff Recommendation

AEP Generation Resources does not propose to conduct a *Fish Protection and Upstream and Downstream Fish Passage Study* at this time. AEP Generation Resources considers this study premature because it states that the need for information pertaining to fish passage and protection alternatives has not been demonstrated. Specifically, AEP Generation Resources states that each of the Corps' navigational dams on the Ohio River create, at a minimum, a partial obstruction to fish migration because there are no existing (or planned) fish passage facilities at any of these facilities. AEP Generation Resources also states that it is not appropriate to conduct this study at this time because there is no evidence that indicates project operation is having an adverse effect on resident fish populations. AEP Generation Resources further states that the proposed *Fisheries and Fish Entrainment and Impingement Studies*, as discussed above, would provide additional information on the resident fish community and the effects of project operation on fisheries resources, which would help to inform the need for fish protection and passage measures at the project. Lastly, AEP Generation Resources states that the longitudinal fragmentation of the Ohio River and the lack of "safe, timely, and effective" fish passage at the Racine Locks and Dam are not caused by the project, but rather, the Corps' facilities, which are not part of the project.

AEP Generation Resources' proposed *Fisheries and Fish Entrainment and Impingement Studies*, as modified herein, would provide information that would determine the need for species-specific fish passage and/or protection measures at the project [sections 5.9(b)(4) and (5)]. Therefore, we do not recommend the *Fish Protection and Upstream and Downstream Fish Passage Study*.

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