United States Department of the Interior

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In Reply Refer To:
FWS/Region 5/ES-TE

JAN 29 2014

Memorandum

To: Assistant Regional Director, Ecological Services, Region 5

From: Chief, Division of Endangered Species, Ecological Services, Region 5

Subject: Findings and Recommendation Regarding the Incidental Take Permit to Criterion Power Partners, LLC to Allow Incidental Take of the Indiana bat at the Criterion Wind Project in Garrett County, Maryland

Pursuant to section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (l6 U.S.C. Section l531 *et seq.*) (ESA), the U.S. Fish and Wildlife Service (Service) proposes to issue an incidental take permit (ITP) to Criterion Power Partners, LLC (CPP) for incidental take[1] of the federally listed endangered Indiana bat (*Myotis sodalis*) resulting from operations of the Criterion Wind Project in Garrett County, Maryland. The CPP is a wholly owned subsidiary of Constellation Holdings, LLC, which is a subsidiary of Exelon Generation Company, LLC. In support of its ITP application, CPP developed a habitat conservation plan (HCP). The Service finds that CPP's application for an ITP meets permit issuance criteria outlined in section 10(a)(2)(B) of the ESA and in 50 CFR 17.22(b)(2) as explained by the following analysis and rationale. The resulting permit will authorize the take of up to 12 Indiana bats over a 20-year permit term.

Documents used in the preparation of these findings and recommendation include (1) CPP's final HCP (CPP 2014), (2) an implementing agreement (IA) between the Service and CPP, (3) the Service's biological opinion (BO) under section 7 of the ESA, and (4) the Service's final environmental assessment (EA; USFWS, 2013a). Additional information regarding the project, conservation measures, and anticipated impacts is included in the HCP and EA and is incorporated by reference.

[1] Take is defined in section 3 of the ESA as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Here, the turbine operations would cause take of listed bats through collision or barotrauma.

I. Project Description

The CPP submitted an ITP permit application to the Service to request authorization for incidental take of Indiana bats associated with operation of its 70-mega-watt (MW) wind energy facility consisting of 28 wind turbine generators (WTGs) for a period of 20 years. The purposes of the HCP are to avoid, minimize, and mitigate for potential adverse effects from the covered activities on the covered species and to provide the basis for take authorization via a Service-issued ITP, pursuant to the ESA. The project is summarized below though a complete project description is included in the HCP.

Project Location; Covered Lands; Covered Activities; Permit Term

Covered lands are described in sections 1.3 and 2.1 of the final HCP and encompass 117 leased acres (ac) located along the ridgeline of Backbone Mountain, which is east of the town of Oakland in Garrett County, Maryland. The project is distributed linearly over 9 miles of ridgeline. The topography of the area is steeply sloping on the western side of the ridge and relatively gently sloping on the eastern side. The elevation of the ridgeline is approximately 3,200 feet (ft) (975 meters (m)) above mean sea level. The project is situated on largely undeveloped, previously logged forestland interspersed with some open farmland. The covered lands include the following project components:

- Twenty-eight Clipper 2.5 MW Liberty WTGs that are approximately 262 ft (80 m) in height and have a rotor blade path of 305 ft (93 m). Each turbine site consists of a pad-mounted transformer, power distribution panel, turbine tower, gravel access drive, and buffer area on a total of 1.62 ac;
- One permanent, unguyed, 240-foot (73-m) meteorological tower situated within a 46 ft by 46 ft chain-linked fenced and graveled yard;
- One substation that feeds electricity into an existing Allegheny Power 138-kilovolt (kV) electrical transmission line. The substation includes the Criterion control yard and the Kelso Gap control yard (16 ft by 31 ft one-story structure), which are both fenced and graveled with their respective control houses; and
- A one-story operations and maintenance building (4,162 square feet (387 square meters) provides administrative office space and a maintenance/storage area for the operations and maintenance personnel.

Covered activities are described in section 2.2 of the final HCP and include operations, maintenance, and decommissioning of 28 WTGs over a 21-year period. Of these activities, the Service determined in our BO (USFWS, 2013b) that after implementation of avoidance and minimization measures, only turbine operations are reasonable likely to cause incidental take over the duration of the ITP, and thus, the permit we issue will authorize only take associated with turbine operations. The permit will authorize cumulative take of up to 12 Indiana bats over the 20 year duration of the permit.

We note that the project has already been constructed and that construction is not a covered activity. The minimum functional life of the turbines is 20 years, but the useful life of a particular turbine may vary. After 20 years of operation, CPP will evaluate whether to continue

turbine operations, retrofit the project with new turbines, or decommission the project. The first two options would require permit amendment or renewal.

Minimization and Mitigation Measures

Section 5.2 of the final HCP and section II of the BO identify the full suite of minimization measures. But the key minimization measure to address incidental take is a turbine curtailment strategy under which turbines will be curtailed under a 5.0 meters per second (mps) wind speed at night during the fall migration season. We anticipate this will achieve at least a 50 percent reduction in bat fatalities. This will be evaluated and confirmed throughout the permit duration through the monitoring strategy.

To mitigate for the incidental take of Indiana bats, CPP will implement a hibernaculum gating project within the Appalachian Mountain Recovery Unit (AMRU) (HCP section 5.3.1). The overall intent of the mitigation project is to eliminate or minimize existing threats to a population of wintering Indiana bats. The CPP will conduct a formal threats analysis for the cave to determine if there is the potential for human disturbance and also the surrounding property to determine if there are potential land uses such as mineral extraction or forestry that could result in disturbances to hibernating or swarming bats. The CPP will develop a 20-year management plan for the cave and the surrounding area to ensure continued viability of the hibernaculum. The CPP will monitor the mitigation site annually to ensure that the gates are intact and the site is being maintained and managed according to the management plan developed for the site. Sections 5.2 and 5.3 of the final HCP provides further details about these minimization and mitigation measures. Later in this document, the Service explains how these measures satisfy the "maximum extent practicable" issuance criterion.

Monitoring and Reporting

HCP compliance and effectiveness monitoring is discussed in section 5.5 of the final HCP.[2] The objective of the first year of monitoring, which consisted of daily monitoring from April 1 to November 15 at all turbines was to assess take of Indiana bats and to determine total bat mortality and seasonality of bat mortality, while years 2 and 3 (weekly searches at 14 turbines from April 1 to November 15) assessed take of Indiana bats (via the surrogate model) and total bat mortality with curtailment. During the first 3 years of postconstruction monitoring, estimates of the total Indiana bat take were made based on (1) the actual number of recovered Indiana bats adjusted for bias correction factors (e.g., searcher efficiency, carcass removal) as described in the monitoring plan (appendix D of the final HCP), and (2) the number of little brown bat fatalities (the surrogate species) adjusted for bias correction factors (e.g., searcher efficiency, carcass removal, area searched). No Indiana bats were found during the 3 years of postconstruction monitoring, so the initial take estimates are based on the surrogate species approach. Annual take estimates are compared with the authorized take averaged over the permit period (i.e., 12 bats over 20 years equates to a rate of take of 0.60 bats per year) to determine the need for an

[2] Note that the final HCP relies on 3 years of post-construction monitoring to assess the estimated level of take and to evaluate the effectiveness of turbine curtailment. The CPP implemented that monitoring from 2011 to 2013 at the same time the HCP was being developed. As explained below, the Service considers these initial 3 years of intensive monitoring adequate for the purposes of the HCP.

adaptive management response (i.e., whether additional onsite minimization measures are necessary). Preliminary analysis of the existing postconstruction monitoring data suggests estimated take is below the 0.60 bat per year rate and thus demonstrates that the HCP turbine curtailment strategy is effective. Follow-up compliance and effectiveness monitoring will occur in permit years 5, 10, and 15 (weekly searches at 14 turbines from April 1 to November 15) to ensure that total bat mortality does not increase and incidental take remains below the authorized levels.

Designing a monitoring strategy sufficient to detect the fatality of such rare species as Indiana bats is difficult from both an implementation and statistical sampling perspective. In addition, the level of effort and intensity required can be costly. Therefore, through coordination with the Service, CPP has developed a tiered monitoring strategy that relies on the use of surrogates as an index to assess potential Indiana bat fatalities.

The 2011 postconstruction monitoring at the site used daily searches, as the goal of the first year was to gather comprehensive baseline data on total bat fatality estimates. In addition, CPP was interested in developing a predictive model of weather effects on bat mortality. At the most recent 2012 National Wind Coordinating Committee Wind Wildlife Research meeting, Dr. Huso explained that there is no need for daily searches unless there is an interest in developing a weather model. Since the weather model was completed in 2011, there is no ongoing need to continue with daily monitoring. Further, the primary reason for daily searches is to ensure that carcass scavenging does not affect total mortality estimates. Postconstruction monitoring protocols included carcass removal trials, which allowed for calculation of a project-specific carcass removal rate, which was then incorporated as a correction factor when calculating the total bat fatality rate.

Compliance and effectiveness monitoring during permit years 5, 10, and 15 will rely on weekly carcass surveys conducted at half the turbines. The Service anticipates that this protocol will be sufficient to determine the level of all bat mortality occurring at the project site (Huso 2010, Warren-Hicks et al. in prep). An analysis of the variation in bat mortality among the turbines at the site showed that less than 3 percent of the time a random sample of 14 turbines (50 percent) would provide a biased estimate of mortality. That is, it would be extremely difficult to select 50 percent of the turbines for sampling that would provide a significantly greater or significantly lower estimate of mortality than what was developed by surveys at all the turbines (Nations and Young, 2013). An additional simulation analysis that sampled the pool of data from the 2011 postconstruction monitoring according to the 2012 protocol of weekly surveys at 14 turbines (50 percent) generated similar results for total estimated bat mortality. Variation in the results from the 2011 data are not directly comparable to variation in the simulation because the source of variation is different; however, the overall estimates from the two different sampling protocols were similar (see Young and Sonnenburg 2013), and the simulated bat mortality estimate was nearly identical to the mean of results from all the regional monitoring study results available (see table 4.3 in the final HCP).

An evaluation will be made each monitoring year utilizing previous monitoring study results to ensure that the study design for that monitoring year is sufficient to meet the objectives. If new information becomes available to suggest otherwise, improved ways of assessing Indiana bat

mortality directly or better ways of assessing bat mortality as a surrogate measure for Indiana bat mortality, CPP will implement those methods in consultation with the Service.

A couple of issues regarding CPP's postconstruction monitoring obligations in the HCP are worth noting. First, the initial 3 years of intensive postconstruction monitoring have already been completed. The CPP initiated the monitoring in 2011 and also conducted monitoring in 2012 and 2013, during finalization and permit processing for the ITP. The Service accepts these 3 years as the initial 3 years of intensive monitoring per the HCP conditions because CPP's monitoring strategy was developed in consultation with the Service and CPP followed the monitoring procedures and methodology described in the final HCP. The CPP provided annual monitoring reports to the Service in 2011 and 2012, which the Service reviewed and discussed with CPP. In addition, these initial years of monitoring provide the Service confidence that the minimization strategy will be effective in meeting the biological goals of the project, since CPP also implemented the HCP turbine curtailment strategy during this time.

Second, the followup compliance and effectiveness monitoring over the permit term will be conducted at 5 year increments (permit years 5, 10, and 15), rather than annually. The Service finds this to be adequate because the initial 3 years of monitoring was intensive, generated reliable bat fatality estimates with and without turbine curtailment measures, allowed for an assessment of inter-annual variation in bat mortality, and was sufficient to ensure that the annual rate of take is unlikely to exceed the cumulative take threshold for the permit. The 3 years of data were also compared to other nearby projects (within approximately a 40-mile radius of CPP's project), where monitoring studies were available, to ensure that bat fatalities at CPP's site were within the same range as the other facilities (table 12, Young et al. 2013). Therefore, the initial 3 years of monitoring establish fatality rates that will be assumed for each year of the permit and validated by the followup monitoring that will occur every 5 years (permit years 5, 10, and 15). If the followup monitoring were to demonstrate an annual fatality rate exceeding the threshold established by the initial 3 years of monitoring, additional minimization measures and intensive monitoring would be triggered. The take estimated during the compliance monitoring will be applied to each of the nonmonitored years to calculate a cumulative take estimate for the project, which cannot exceed 12 Indiana bats over the 20-year permit period. In addition, CPP has established an in-house Operating Procedure for Incidental Bird and Bat Casualties (appendix E of the final HCP). This operating procedure identifies a process for handling bird and bat casualties discovered at the project outside of formal monitoring studies. The Service considers this monitoring strategy to be sufficient to assess and demonstrate compliance with the permitted level of take and to be appropriate and reasonable for the relatively small amount of take anticipated at this project.

Reporting is discussed in section 5.5 of the final HCP. The CPP will prepare and submit annual reports to the Service no later than January 31 of each year. The annual report will include

a. A cumulative assessment of take;
b. An assessment of the effectiveness of the conservation plan;
c. The status of the mitigation project;
d. A list of any changed circumstances that apply and strategies to address them;
e. A written confirmation that funding is available or committed for the full implementation of the HCP for the ensuing year; and

f. Recommendations for future research, monitoring, and mitigation, if applicable.

During years in which intensive monitoring is conducted, the following will also be included in the monitoring report:

a. A summary of the results of monitoring conducted the previous year;
b. An evaluation of the efficacy of monitoring methods;
c. A comparison of the results of the monitoring to the authorized take;
d. An evaluation of the success of any onsite minimization strategies relative to the Indiana bat;

Changed Circumstances and Adaptive Management

Chapter 8 of the HCP describes changed circumstances and other aspects of the adaptive management plan. Five specific circumstances are identified that, if triggered, will result in changes to the conservation plan, summarized as follows:

- Impacts of white-nose syndrome (WNS) on covered species: The HCP and other Service documents (e.g., BO) assume that WNS is affecting Indiana bats and that their population in the AMRU will experience a 70 percent reduction over time, as has been seen in the Northeast Recovery Unit. The purpose of this changed circumstance is to allow a reanalysis of the impact of take and to change the conservation measures, as necessary, if this assumption becomes invalidated by more severe population estimates during the permit term. The trigger will be a 70 percent or greater reduction in the Indiana bat AMRU population from the 2011 estimates (pre-WNS), based on biennial Service estimates. The response will be for CPP to conduct an analysis, in coordination with the Service, to determine whether the level of Indiana bat take at the project is having an additive effect on the remaining Indiana bat populations. If the analysis demonstrates that existing minimization and mitigation measures are no longer sufficient to prevent additive effects with the declining population, CPP will implement additional minimization measures (e.g., turbine operational restrictions) by the next bat spring emergence season (i.e., April) or additional mitigation measures within 24 months. These additional measures will be determined through consultation with the Service, which will determine what level of take reduction or additional mitigation prevents additive effects. A written plan will be provided by CPP to the Service for discussion by December, with formal concurrence reached by February 1st. If the Service does not provide formal concurrence within 60 days, CPP will implement the measures provided in the written plan. Any unresolved issues will be dealt with through the dispute resolution process described in the IA. In addition, the effectiveness of these additional measures will be evaluated by additional monitoring, which will be detailed in the written plan.
- Listing of new species: The purpose of this changed circumstance is to identify a process for adding new covered species to the HCP in the event of future listing actions for species potentially affected by the project. The trigger will be any future listing of bats or other species as threatened, endangered, or candidates. The response will be that CPP will confer with the Service about the need for an HCP amendment to include these as covered species and incorporate appropriate conservation measures.

- Changed technology/techniques: The purpose of this changed circumstance is to identify a process for incorporating wind turbine technology advances and techniques that will better avoid or minimize the mortality of bats during the permit term. The trigger will be if CPP determines that new techniques or technology are available that are cost effective, feasible to implement, and meet the HCP biological objectives. The response will be implementation of such measures if they have been demonstrated to be effective in a scientifically based study, are approved by the Service as the best available science, are compliant with HCP biological goals and objectives, and will not increase the authorized level of incidental take.
- Changes in Indiana bat distribution due to climate changes that may influence the species' survival and recruitment in previously unsuitable areas: The purpose of this changed circumstance is to identify a process for addressing changes in species abundance and distribution. In the event that Indiana bat distribution changes, by spatially affected changes such as increased seasonal temperatures that may result in greater localized abundance or the evidence of a maternity colony in close vicinity to the project, the risk of take of Indiana bats could change over current conditions. The CPP will evaluate results from the monitoring in 2018, 2023, and 2028 and the best available data and information at the time to determine, in coordination with the Service, whether there has been a confirmed, significant increase in Indiana bat abundance in the permit area. The trigger for a confirmed significant increase in Indiana bat abundance in the permit area as measured by the best available scientific information, including results from monitoring in the permit area in 2018, 2023, and 2028 is the discovery of two or more Indiana bat fatalities in one monitoring year; the discovery of one Indiana bat fatality outside of the formal monitoring (nonmonitoring years); or the discovery of a fatality of a reproductive female Indiana bat during the spring maternity season (or otherwise evidence of the presence of a maternity colony). The response will be that CPP will evaluate the information related to the impacts and determine if additional studies are need to determine if the level of take associated with the project would change. The CPP will coordinate with the Service to evaluate the need for a permit amendment to increase the permitted take level and make any required adjustments in the habitat conservation plan minimization, mitigation, monitoring and funding measures to address the increased permitted take level.
- Viability of the mitigation site: The purpose of this changed circumstance is to address the unlikely potential for the mitigation project to not meet the purpose of offsetting the take of Indiana bats because bats are no longer using the site long term or the population is extirpated due to other factors (e.g., WNS). In coordination with the Service, CPP will evaluate results from the mitigation project monitoring and population monitoring efforts of the Service and state agencies to determine whether there has been a confirmed, significant decline in Indiana bat abundance in the mitigation project hibernaculum. The trigger for this changed circumstance is if monitoring results over a 5-year period indicate that bats are no longer using the cave or there is no evidence of bats persisting in the hibernaculum. The response is that CPP, in coordination with the Service, will evaluate if the mitigation project site could still be future habitat for Indiana bats (e.g., there is evidence that bats persist in the hibernaculum). In the event that the site remains viable winter habitat for bats, and some bats persist in the hibernaculum, CPP will continue to implement the hibernacula management plan. In the event that the site no longer is used

by bats for winter habitat, then remaining funds for project implementation at that time will be redirected to an appropriate conservation program with the mission of Indiana bat conservation or to another mitigation project that is sufficient to compensate for the remaining estimated take in the permit term. Measures to be implemented will be determined in coordination with the Service.

II. Incidental Take Permit Issuance Criteria – Analysis and Findings

A. Permit Issuance Criteria

Section 10(a)(2) of the ESA specifies the requirements for permit issuance. This provision is broken into two component parts, one directed to applicants and the other to the Service. Section 10(a)(2)(A) sets forth the required components of an application from which the Service can judge whether an applicant's submission is complete. Section 10(a)(2)(B) provides the criteria by which the Service must evaluate and approve an application package once it has determined the submission is complete. As described below, the requirements, although necessarily similar, are not identical, and are not interchangeable standards.

Section 10(a)(2)(A) of the ESA mandates that "no permit may be issued by the Secretary authorizing any taking referred to in paragraph (1)(B) unless the applicant submits to the Secretary a conservation plan that specifies-(i) the impact which will likely result from such taking; (ii) what steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps; (iii) what alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and (iv) such other measures as the Secretary may require as being necessary or appropriate for the purposes of the plan." The Service evaluated CPP's HCP and considered it to be complete prior to initiating the public comment process.

Section 10(a)(2)(B) of the ESA mandates that the Secretary shall issue a permit, "if the Secretary finds, after opportunity for public comment, with respect to a permit application and the related conservation plan that-(i) the taking will be incidental; (ii) the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking; (iii) the applicant will assure that adequate funding for the plan will be provided; (iv) the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and (v) the measures, if any, required under subparagraph (A)(iv) will be met; and he has received such other assurances as he may require that the plan will be implemented."

B. Anticipated Take of Indiana bats

The issuance criteria of ESA section 10(a)(2)(B) focus largely on the take that is anticipated to occur as a result of the proposed project and the obligations of CPP, as the permittee, to reduce or compensate for the impact of the taking. To provide context for that discussion, we summarize what is known about the bat species in the project area, and the take we project to occur when accounting for CPP's minimization strategy.[3]

Indiana bats

There is potential for male Indiana bats to occur within the action area between April and November, and there are summer records of either males or nonreproductive females in Garrett County. Acoustic (i.e., Anabat) surveys were conducted for two-night survey periods at four locations within the action area in early September 2003 and in mid-May and late-June 2004 (Gates et al. 2006). Of the calls identified to species, none were identified as Indiana bats. Additional acoustic (i.e., Anabat) surveys were conducted in 2010 from April 1 through November 15 (Gruver 2011). A total of 912 detector-nights were accumulated over the study period, and 57,112 bat calls were recorded. Of the bat calls, 43,953 (77 percent) were high-frequency (HF) calls (those greater than 35 kilohertz (kHz)), which generally include the *Myotis* species of bats. A total of 12,000 HF calls were of sufficient quality to be screened with a discriminant function analysis (DFA) to statistically classify the call sequences based on 11 parameters of the call. Of all the HF calls, 46 calls (approximately 0.10 percent) were treated as Indiana bat calls based on the analyses (see Gruver 2011 for details of the analyses). Results of this study suggest Indiana bats may have been present within the action area in early June and mid-August. However, the overall activity level for suspected Indiana bats was low, and no individuals were recorded or trapped during mist-netting surveys at the end of June and early July (Gruver 2011). These acoustic data may reflect the potential for an occasional Indiana bat to occur within the action area between April and November, and there are summer records of either males or nonreproductive females in Garrett County.

These results suggest that Indiana bats occur infrequently in the action area and are unlikely to maintain maternity colonies on or near the action area, likely due to the thermal effects of elevation. Individuals may pass through the site during migration seasons, or transient males or nonreproductive females may use the site during the summer, but the relative use is low. A more complete description of Indiana bat use of the action area, as well as status at the species, regional and local level, is provided in the Service's BO (2013b).

Anticipated Take from Collision and Barotrauma

Impacts associated with operating wind turbines are the only component of the project likely to result in take. It is well documented that wind turbines kill bats of several different species through collision with turbine blades and barotrauma (Arnett et al 2008, Taucher et al. 2012). Barotrauma is internal hemorrhaging due to an overexpansion of hollow respiratory structures

[3] In the BO, we determined that several other components of the wind project are not likely to adversely affect the Indiana bats in the action area. These components are (1) vehicle collisions, (2) vegetation control, (3) lighting, and (4) noise disturbance.

and is caused by a sudden drop in air pressure near wind turbine blades.

Long-distance migratory tree bats (such as the red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver haired bat (*Lasionycteris noctivagans*) are the most common fatalities at wind turbines constituting 50 to 75 percent of all bat mortality (Arnett et al. 2008, Taucher et al. 2012). Other species are also killed though there appears to be species-specific vulnerabilities. For example, the bat community in West Virginia can be described from the 330 summer mist-net surveys conducted across the State from 2005 to 2009, which captured a total of 17,440 bats (compiled by C. Stihler, WVDNR, 2011). In this sample, the northern long-eared bat (*Myotis septentrionalis*) is the most common species in mist-net surveys in West Virginia, but this species is rarely found in wind turbine mortality in this area (figure 6 in BO, USFWS 2013b). Conversely, the tri-colored bat (*Pipistrellus subflavus*) is frequently found in wind turbine fatalities but less commonly found in mist-net surveys. These differences may reflect the height at which these species typically fly and whether they fly high enough to be within the rotor swept area. For example, the northern long-eared bat commonly flies low and within the heights of mist nets, but not within the much higher rotor swept areas. The species-specific vulnerability of Indiana bats is not known. The species is described as typically foraging at the canopy level or lower, which would place it below the rotor swept area; however, the height at which they migrate might be different than when foraging.

Five Indiana bat fatalities have been documented at wind turbines across the country (table 2 in the BO, USFWS 2013b). Most of these are females that have been killed in late September or early October; however, one male was killed in West Virginia on July 8th. And since two are from the AMRU, Indiana bats clearly have some vulnerability to wind turbines in the AMRU. It is likely that additional Indiana bat mortality has occurred at wind farms across the country, but has not been documented due to lack of postconstruction monitoring, inaccurate identifications, or simply the fact that rare species are not always detected by the imperfect surveys that result from searcher inefficiency, decomposition, and removal by scavengers. These later three variables are measured and addressed in postconstruction surveys and incorporated into the estimates of total bats killed, but these adjustments do not change the difficulty in detecting rare species.

Bat activity is highest at wind turbines on warm nights with low winds as these conditions are best for foraging bats. The effect of wind speed may be even greater on smaller bats like the Indiana bat. Several studies have investigated turbine curtailment strategies that feather turbine blades so they are not rotating at lethal speeds when wind speeds are low (table 3 in BO, USFWS 2013b). These strategies include curtailment of the turbine blades until winds reach a particular threshold such as 5.0 mps or 6.5 mps. Though there are slight differences in how these studies were conducted, generally we conclude that feathering turbine blades so that they do not rotate at greater than 2 revolutions per minute (rpm) when wind speeds are 5.0 mps or less will reduce total bat fatalities by 50 percent or more. Feathering below 6.5 mps will reduce total bat mortality by about 75 percent. If feathering were conducted up to higher wind speeds, for example to 6.9 mps, we would expect even greater reductions in total bat mortality. These studies varied in length but were generally conducted during August or September when bat mortality is highest.

Based on review of existing studies and postconstruction mortality reports from a variety of

projects, feathering wind turbines at wind speeds below 5.0 mps is generally effective at reducing overall bat mortality, including the likelihood of Indiana bat mortality, by 60 percent during the time when curtailment is applied (table 3 in BO, USFWS 2013b). A similar pattern was evident at CPP. Comparison of the project's 2011 data when no feathering occurred and the 2012 data when feathering occurred up to 5.0 mps from July 15 to October 15 found a 51 percent reduction in total bat mortality for the entire season (April 1 to November 15) and a 62 percent reduction during the July 15 to October 15 period when operational changes were made (Young et al. 2012). However, we recognize that this curtailment regime does not entirely eliminate risk to Indiana bats from operating turbines. For example, the second Indiana bat fatality at Fowler Ridge occurred at a turbine that was programmed to cut in at wind speeds below 5.0 mps. The night that the bat was killed, wind speeds were often higher than 5.0 mps (figure 17, Good et al. 2011), and it is likely that the bat was killed when the turbine was operating at higher wind speeds.

With implementation of the turbine curtailment strategy in the HCP, we assume that fatality of Indiana bats will be minimized, but not fully avoided. Therefore, adverse effects are anticipated from turbine operations. Incidental take from this component of the project would be authorized through the ITP.

Quantifying Take of Individual Bats by Collision or Barotrauma

Fatality-related impacts to individual Indiana bats will occur in the action area due to collision and barotrauma during turbine operations. As previously explained, there are potentially other effects from the project (vehicle collisions, noise disturbance, lighting, and vegetation control), but with implementation of the HCP conservation measures they are not anticipated to result in take of Indiana bats in the action area.

It has been demonstrated that wind turbines kill bats of several different species through collision with turbines and/or barotrauma, and five Indiana bat fatalities have been documented at wind turbines in the United States. However, these fatalities are too few to fully understand the risk to Indiana bats from operating wind turbines. This is further exacerbated because it is difficult to quantify the take of a rare species such as the Indiana bat. Monitoring of bat mortality is always challenging, and it is not possible to find every bat that is killed by turbines; thus, rare species can be missed. Therefore, the Service and CPP worked together to develop a model (CPP 2014; section 4.1.2) to estimate take of Indiana bats based on surrogate variables that include the mortality of a more common species, the little brown bat. These variables are easily and more reliably measured and are considered likely to be positively related to Indiana bat mortality. Because it was developed before there were any monitoring data available at Criterion, the model used information from surrounding projects to produce the best assessment of likely take of Indiana bats. The model is described in section 4.1.2 of the HCP. Following the public comment period on the draft HCP and draft EA, the Service worked with CPP to develop a revised take estimate that still uses the surrogate model but incorporates the 2 years of site-specific postconstruction monitoring data and the best available regional post-WNS data. The revised take estimate can be found in the Service's BO (USFWS 2013b) and appendix F of the HCP (CPP 2014).

We felt it was important to revise the take estimate using the 2 years of site-specific

postconstruction monitoring data and post-WNS data as the composition of bats on the landscape is changing due to WNS. As bat populations decline due to WNS, we expect reduced total numbers of bats killed because fewer bats are flying in the airspace and potentially interacting with turbine blades.

As explained in the final HCP (CPP 2014), the surrogate model used to estimate take of Indiana bats is based on the following formula:

(Estimate of total annual bat fatality per turbine) x (28 turbines) x (Proportion of fatalities that are little brown bats) x (Proportion of Indiana bats to little brown bats in the population) x (Number of years)

The take model is sensitive to total annual bat mortality rates and to the ratio of Indiana bats to the surrogate species. Therefore, we carefully considered which data sets would give the most unbiased estimates. We were able to use the 2011 CPP postconstruction monitoring data to determine a site-specific estimate of total bat fatalities per turbine per year (39.03) and the proportion of total fatalities that were little brown bats (0.045 or 4.5 percent). We consider these to be site-specific values that reflect some of the declines from WNS. For the proportion of Indiana bats to little brown bats in the population, we used a large and long-term data set from West Virginia (summer mist-net surveys statewide) and used only data where Indiana bats had not been known to occur prior to the survey. This is less biased than including data where Indiana bats are known to occur and best reflects Indiana bat presence on the landscape. The ratio of Indiana bats to little brown bats averaged 2.38 percent for the post-WNS period from 2009 to 2012, versus an average of 0.81 percent for the pre-WNS period from 2003 to 2008. We used the more recent data as it best reflects current conditions. This change may reflect a faster decline in the little brown bat population than the Indiana bat population.

Applying all of these variables to the surrogate formula resulted in a cumulative project take estimate of 12 Indiana bats (0.6 bats/year from the project or 0.02 bats/turbine/year) for the 20-year duration of the ITP with operational conservation measures in place. This is a 50 percent reduction from the 23 bats that would be killed by project operations without implementation of the HCP minimization measures. This reduction is further supported by comparison to the 2012 monitoring data collected while curtailment was conducted from July 15 to October 15. In 2012, total bat mortality for the entire season was reduced by 50 percent from the 2011 data, and the reduction in mortality from July 15 to October 15, when conservation measures were in place, was 60 percent (Young et al. 2013).

Finally, in addition to the surrogate model approach, the Service independently estimated take of Indiana bats for the Criterion project using an alternate method that relies on actual Indiana bat fatality data at those projects where carcasses have been found using a regional sample of studies (Maryland and West Virginia). This is a simpler formula with fewer variables than the surrogate method:

(Total bat fatality per turbine per year) x (28 turbines) x (Proportion of all bat carcasses found that are Indiana bats in a regional sample)

We again used the site-specific value for total bat fatalities per turbine (39.04) and multiplied by

28 turbines to obtain the estimate of total annual bat fatalities at the project (1,093 bats). To determine the appropriate ratio of Indiana bat fatalities to total bat fatalities, we used two data sets that cover a large portion of the AMRU. The large sample of Pennsylvania studies have been summarized by Taucher et al. (2012) and report one Indiana bat recovered from 24 project studies that collected 2,820 bat fatalities (thus a ratio of 1/2,820 or 0.00035). We also examined the available West Virginia and Maryland studies, which had full season surveys and no curtailment of turbines (Table 4 in BO, USFWS 2013b). Seven studies provided data that includes one Indiana bat casualty among 2,133 bat casualties (thus a ratio of 1/2,133 or .000469). We used the latter ratio from the West Virginia and Maryland studies as we were certain all studies were within the Indiana bat range, and while most of the Pennsylvania studies are likely within this we could not separate out those that might not be. Note that it is important to include the studies that did not collect an Indiana bat fatality as well as the studies that did collect an Indiana bat fatality when calculating this ratio as the majority of turbine studies do not detect an Indiana bat fatality because it is a rare event. If we use only the studies in which an Indiana bat fatality was discovered, the ratio will be an overestimate and will reflect an incident of mortality that suggests an Indiana bat is killed every year at a project. This is not the case, and the growing set of data from postconstruction monitoring confirms that. There is no reason to believe that an Indiana bat carcass is more difficult to detect among fatalities than a little brown bat as they are similar in size, shape, and color. Thus, the rarity of detections of Indiana bat fatalities is most likely a result of its rarity in the population of bats and bat fatalities.

Using this ratio method, we estimate that about 10 Indiana bats would be killed at the project in 20 years without curtailment and 5 bats with curtailment (39.04 bats/turbine/year x 28 turbines x .0004688 Indiana bats/total bats x 20 years = 10 Indiana bats in 20 years with no curtailment; 5 Indiana bats in 20 years with curtailment). This method provides a lower estimate of take (5 Indiana bats in 20 years) than the surrogate species model (12 Indiana bats in 20 years); however, because both approaches have uncertainty associated with them, we went with the higher and more conservative estimate of take.

Both the surrogate species approach and the ratio method have strengths and weaknesses. The surrogate species model is especially reasonable when there is little data. As data from postconstruction monitoring accumulates, the ratio method becomes possible and this has the advantage of being empirically based rather than based on several assumptions that have not been tested (e.g., Indiana bats are more likely to be killed where there are lots of little brown bat fatalities). Our estimates of take were first constructed using the surrogate species approach, and we consider this to still be reasonable, though the ratio method suggests a slightly lower take estimate. For the purposes of this analysis and our issuance of a 20-year incidental take permit, we assume between 5 and 12 Indiana bats will be incidentally killed after implementation of the turbine curtailment strategy and will use the higher number to be conservative. We know that take of Indiana bats is somewhat rare and not anticipated to occur every year. However, we anticipate that some level of incidental take over the permit period is likely.

In summary, the Service independently evaluated alternative methods, datasets, and assumptions for estimating Indiana bat take. The estimates ranged from 10 to 23 Indiana bats (before curtailment is applied); however, we chose to use the more conservative surrogate approach due to uncertainty associated with both approaches. This estimation method suggests there will be

take of 12 Indiana bats after curtailment is applied. Therefore, we believe 12 is a reasonable estimated take for the project.

Although take of individual Indiana bats from turbine operations will occur within the action area, it is the impact from the loss of those individuals to their associated maternity colonies or hibernacula that will determine the impact of the take to the broader populations. This is assessed in the jeopardy analysis, section VII, of the BO (USFWS 2013b).

It is against these calculations that we evaluate the impacts of the taking, in the context of the permit issuance criteria.

C. Findings

1. The taking will be incidental.

Incidental take is defined in 50 CFR 17.3 as "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." The first part of the definition addresses whether take of Indiana bats is the purpose of activities in the HCP. As discussed above, the purpose of the covered activities in the HCP are to operate, maintain, and decommission (at the end of the project) a 28-turbine wind energy facility over a 20-year period. In the course of implementing these activities, CPP anticipates the unavoidable take of Indiana bats. For this reason, CPP developed the HCP, which describes the avoidance, minimization, and mitigation measures it will implement to address potential impacts from the project. Thus, take of listed species is not the purpose of the wind energy project and will occur incidental to CPP's efforts to conduct the covered activities.

The second part of the definition addresses whether CPP is conducting otherwise lawful activities. Section 1.4 of the final EA includes a discussion of the various review processes CPP undertook for construction and operation of the project (USFWS 2013a). On August 26, 2002, the previous owner, Clipper, submitted an application for the State-required Certificate of Public Convenience and Necessity (CPCN) from the Maryland Public Service Commission (PSC) to allow for construction and operation of the project. The application analyzed the environmental and socioeconomic impacts of the project. In addition to requiring the application, the PSC process requires the opportunity for public notice and comment and a formal, adjudicatory hearing with expert witness testimony. Following completion of the hearing and discussions and negotiations with Clipper, interveners, and applicable regulatory agencies, an Agreement of Stipulation and Settlement was reached, and on March 26, 2003, the PSC adopted the proposed order and accepted the settlement agreement. The settlement agreement included 23 conditions for mitigation of any potential adverse impacts that might result from construction or operation of the project, including conducting a postconstruction study of bird and bat mortality associated with turbine operations. A more detailed history of the CPCN process is included in appendix B of the final EA.

Following completion of the original CPCN process in 2007, Maryland legislation allowed for a streamlined PSC review of wind facilities 70 MW or less. An application for the project was filed with the PSC for a CPCN exemption for a project of 70 MW versus the original 101 MW and a 15-to 20-foot increase in height. The PSC process for a CPCN exemption included public

notice and comment. On October 29, 2008, after considering the written comments and oral comments from the public hearing and the administrative hearing, the PSC granted a CPCN exemption for the project. The Criterion project was permitted in Case No. 8938; testimony, final recommended conditions, and other information associated with that case can be found at *http://webapp.psc.state.md.us/Intranet/home.cfm*.

All other required construction and operations permits and approvals for the project have been obtained. Any permits required for decommissioning will be acquired before that phase of the project occurs. A summary of these permits is provided in table 1-1 of the EA (USFWS 2103a).

While it is not necessary for the Service to demonstrate that CPP has complied with all other laws prior to ITP issuance, we do as a standard practice include a permit term and condition on every ITP issued that says: "The validity of this permit is conditioned upon strict observance of all applicable foreign, State, local, tribal, or other Federal law."

The CPP has developed and is implementing an avian protection plan (APP)[4] (see the final EA, USFWS 2013a) as recommended by the Service's Land-Based Wind Energy Guidelines (USFWS 2012). These guidelines serve as the primary tool to facilitate compliance with the Migratory Bird Treaty Act (MBTA) for terrestrial wind energy facilities. The objectives of the project's APP are to assess the risks to migratory birds posed by the project; assess the likelihood of take of eagles under the Bald and Golden Eagle Protection Act (BGEPA) and the need for further action; and describe the project measures aimed at avoiding, minimizing, and providing compensatory mitigation, if needed, for impacts to migratory birds and eagles and thereby demonstrate compliance with the intent of the MBTA and BGEPA.

The document assesses the environmental baseline conditions of the project area with respect to birds through onsite wildlife monitoring studies, Federal and state agency personnel, published literature, and internet-based resources. Using baseline information and postconstruction monitoring data from nearby projects (e.g., Mount Storm Wind Project, Tucker County, West Virginia; Mountaineer Wind Project, Preston and Tucker Counties, West Virginia; and the Casselman Wind Project, Somerset County, Pennsylvania (see table 3.1 in the APP), a risk assessment was conducted for species protected under the MBTA, and avoidance and minimization measures were identified (table 4.1 of APP). The CPP's postconstruction monitoring data will be assessed and the impact levels analyzed relative to regional findings from other windenergy facilities. If impacts reach trigger levels as identified in table 4.2 of the APP, then additional mitigation measures will be implemented as part of an adaptive management plan (section 4.1 of the APP).

The Eagle Conservation Plan Guidance (USFWS 2013c) was used to assess risk to bald and golden eagles to determine whether a programmatic take permit was needed. The Service concluded that the risk of take of bald and golden eagles is low because no known nesting pairs within 10 miles of the project area and because the use of the site will be limited to eagles migrating through the area on occasion. Nearby wind projects have not detected any eagle

[4] In the final version of the Wind Energy Guidelines, published in March 2012, these plans are now called Bird and Bat Conservation Strategies (BBCS). We note that we provided technical assistance to CPP on its APP based on these guidelines, not the Service's 2003 Wind Guidelines referenced in the application materials.

mortality and the first 3 years of fatality monitoring conducted at the project site did not find eagle mortality. Eagles are diurnal migrants with good vision and may be able to avoid collision with wind turbines as long as there is not food underneath the turbines. We consider it likely that as long as food (e.g., carrion) does not become abundant underneath the turbines, which is incorporated as an avoidance measure in the APP, migrating eagles will avoid collisions with operating turbines. Due to the currently low risk of eagle fatalities at the site, and the inclusion of avoidance and minimization measures in the APP, the Service does not believe that take of bald or golden eagles is likely at the site and that therefore CPP does not need a take permit for these species. However, if there is a take of an eagle in the future, the Service will investigate the situation surrounding that fatality and may recommend that CPP apply for a permit.

Because the ITP pertains only to project operations and no construction related impacts are authorized by the ITP, there are no activities that will require compliance with the National Historic Preservation Act, and no cultural resources will be impacted by the Service's permit issuance decision.

In conclusion, the Service finds that the activities proposed in the HCP will not be conducted for the purpose of causing take of Indiana bats and are anticipated to be otherwise lawful; therefore, the Service concludes that the anticipated take associated with the project will be incidental to otherwise lawful activities.

2. The HCP will, to the maximum extent practicable, minimize and mitigate the impacts of such taking.

To issue an incidental take permit, the Service must find that "the applicant will, to the maximum extent practicable, minimize, and mitigate the impacts of the taking." 16 U.S.C. 1539(a)(1)(B)(ii); 50 C.F.R. 17.22(b)(2)(B) & 17.32(b)(2)(B).

The Service's HCP Guidance (USFWS 2000) states that

> [t]he applicant decides during the HCP development phase what measures to include in the HCP (though, obviously, the applicant does so in light of discussions with and recommendations from FWS or NMFS). However, the Services ultimately decide, at the conclusion of the permit application processing phase, whether the mitigation program proposed by the applicant has satisfied this statutory issuance criterion.

To do so, the Service must examine and predict the adequacy and efficiency of the applicant's proposed minimization and mitigation measures. It is important to understand that, in doing so, the Service is focused solely on measures to be undertaken to reduce the likelihood and extent of the take resulting from the project as proposed, as well as appropriate compensatory measures. It is the Service's position that the impacts of the proposed project that were not *eliminated* through the HCP process, must be minimized to the maximum extent practicable, and then those remaining impacts that cannot be further minimized must be mitigated commensurate with the level of take. These standards are based in a *biological determination* of the impacts of the project as proposed, what would further minimize those impacts, and then what would biologically mitigate or compensate for those remaining impacts.

If an applicant commits to implement minimization and mitigation measures that are fully commensurate with the level of impacts, or are consistent with what current science demonstrates to be effective, it has minimized and mitigated to the maximum extent practicable. See, e.g., National Wildlife Federation v. Norton, 306 F. Supp. 2d 920 (E.D. Cal. 2004) (finding that the level of mitigation provided must be "rationally related to the level of take under the plan" and that where mitigation "more than compensates" for the impacts of take, it did not need to demonstrate that more mitigation would be infeasible").[5] National Wildlife Fed'n v. Babbit, 306 F. Supp. 2d 920, (E.D. Cal. 2005). Thus, it is only where certain constraints may preclude implementing proven measures or reaching these thresholds that the "practicability" issue needs to be addressed more thoroughly.

In those circumstances where the applicant cannot fully achieve the minimization and mitigation standards, the Service must evaluate whether the applicant has still minimized and mitigated "to the maximum extent practicable." The court in National Wildlife Fed'n v. Babbit (2005) noted that the word "practicable" as used in the ESA does not simply mean "possible" but means "reasonably capable of being accomplished." It also corroborated that "there are two components to the mitigation finding: (1) the adequacy of the mitigation program in proportion to the level of take that will result, and (2) whether the mitigation is the maximum that can be practically implemented by the applicant." Id. Factors to be considered in the practicability analysis may include constraints based on the site itself, availability of mitigation habitat, timing and nature of the project, the financial means of the applicant, cost and time associated with redesign, and going through local and state permitting and zoning processes. In these instances, the Service must evaluate whether the applicant has provided reasonable explanations concerning its constraints or infeasibility. The Service must also independently review the record evidence supporting the applicant's assertions. The practicability evaluation is necessarily project specific, and may properly yield different determinations in different situations. The analysis is a limited, although substantial, examination. But the Service need not examine practicability where the applicant has already committed to implement minimization and mitigation measures commensurate with the impacts of the taking. In those circumstances, no more is required of the applicant.

The CPP incorporated a number of measures during initial project siting and planning that either purposefully or incidentally avoided or reduced some of the potential impacts to Indiana bats (final HCP section 1.5). These measures are as follows.

- During project design and planning the total number of turbines was reduced, which resulted in less habitat clearing.

- The majority of the tree clearing for the 28 WTGs occurred between November 15 and April 1.

[5] In deferring to the Service's interpretation of the term, the Court also explained that "[t]he words 'maximum extent practicable' signify that the applicant may do something less than fully minimize and mitigate the impacts of the take where to do more would not be practicable. Moreover, the statutory language does not suggest that an applicant must ever do more than mitigate the effect of its take of species."

- No new transmission lines were constructed for the project, thereby reducing habitat clearing.

- The facility was constructed at high elevation where the potential for Indiana bat maternity habitat to be present is low.

- Preconstruction studies were conducted to evaluate potential species presence, and at that time mist-nest and bioacoustic surveys concluded that Indiana bats were unlikely to occur within the project area (Gates et al. 2006).

- The tree clearing that occurred during the time-of-year restrictions (after April 15) occurred only after acoustic monitoring and screening (Gruver et al. 2010), which was used to determine the potential presence of Indiana bats. If this screening method suggested persistent use by the species in the area where clearing was to occur, then a comprehensive mist-netting survey was conducted to determine presence or absence (Gruver 2011). Trees were not cleared until absence was confirmed.

- The electrical collection system was rerouted to avoid additional Indiana bat habitat removal and placed entirely underground.

- The turbine pad clearing size was minimized by including only the area required for construction and erection of towers, and only the blade lanes were cleared for the assembly and erection of the turbine blades.

Minimization Measures (final HCP section 5.2)

The final HCP describes the impacts of take associated with CPP's covered activities and includes measures to avoid, minimize, and mitigate the impacts of incidental take of Indiana bats (final HCP section 5.2). While there are a number of HCP commitments, the primary impact of the project to covered species is from wind turbine-related fatalities. Therefore, the key minimization measure is a turbine curtailment strategy that will be implemented as follows: turbine blade feathering below a wind cut-in speed of 5.0 mps from sunset to sunrise between July 15 and October 15 annually. The Service anticipates that this level of curtailment will achieve at least a 50 percent reduction in bat fatalities, and thus also a 50 percent reduction in Indiana bat fatalities.

The Service has independently evaluated the fatality reduction goals and determined they are biologically sufficient to reduce incidental take to a level at which it will not have additive effects to the existing Indiana bat population at local and regional levels. The Service used a demographic model developed by Thogmartin et al. (2013) to compare the Indiana bat population trajectories with and without various levels of incidental take from the project. The model demonstrated that the level of incidental take associated with a 50 percent reduction in Indiana bat fatalities will result in a population trajectory (at both local and regional levels) that is nearly indistinguishable from the trajectory that will occur without the project impacts (USFWS 2013b).

Based on the best available science, the most effective minimization measure for reducing bat fatalities at wind projects is to not operate turbines at lower wind speeds during the times of the year that bats are anticipated at the site (i.e., turbine curtailment). Research results suggest that more bat fatalities occur during low wind periods in summer and fall months (Arnett et al. 2008). Bats also fly less during periods of rain, low temperatures, and strong winds (Eckert 1982; Erickson and West 2002). On a local scale, strong winds can influence the abundance and activity of insects, which may influence the activity of insectivorous bats. The variables that are often adjusted to achieve lesser or greater fatality reductions from turbine operations include the cut-in speeds (i.e., the wind speeds at which blades turn such that the generators can begin creating energy), the number of hours per night the curtailment is applied, and the season during which turbine curtailment is applied. However, these adjustments represent a tradeoff between reduction in bat fatality and reduction in power generation (i.e., lost revenue).

In terms of the cut-in speed, CPP will implement turbine feathering below wind speeds of 5.0 mps from sunset to sunrise (the time when bats are active) from July 15 to October 15. This means that, below wind speeds of 5.0 mps, the turbine blades will be turned such that they do not catch the wind causing the turbine to rotate at a very slow speed, generally less than two rpm. Above wind speeds of 5.0 mps, the turbine blades will rotate back such that they catch the wind, the turbine begins to rotate, and eventually the turbine rotates at a speed sufficient enough for the generators to cut in and begin generating electricity.

Based on available data and study results, it is likely that at least a 50 percent reduction in bat mortality will be realized by implementing this cut-in speed (Arnett et al. 2011; Young et al. 2011). The Criterion project is relatively small (i.e., 28 turbines), and therefore, with a turbine curtailment strategy targeting the period of risk to Indiana bats, the project will have a low number of Indiana bat fatalities (less than 1 per year). The project is located at a site that is more than 30 miles from known Indiana bat hibernacula and is outside of the 10-mile radius area within which bats swarm as they move into the hibernaculum. Further, the site is not known to provide summer maternity habitat for Indiana bats. Acoustic monitoring data collected at the site in 2010 support the conclusion that maternity colonies are unlikely to be present at the site but that a small number of Indiana bats may pass through the area during migration or a small number of transient males or nonreproductive females may use the area during the summer season (Gruver 2011).

Considering cut-in speeds, the Service believes that the 5.0-mps cut-in speed adequately minimizes the amount of anticipated take of Indiana bats to a level that is biologically sufficient (less than one Indiana bat per year), and can be implemented while meeting the applicant's business objectives. Multiple studies have evaluated the bat fatality reductions associated with a range of turbine cut-in speeds compared to wind turbines that are not implementing turbine feathering below cut-in speeds. These studies include those most recently conducted at Fowler Ridge[6] (Good et al. 2012), Criterion (Young et al. 2013), Mount Storm (Young et al. 2011),

[6] A curtailment study conducted in 2010 at Fowler Ridge Wind Farm in northwestern Indiana showed that turbines with raised cut-in speeds of 5.0 mps and 6.5 mps all night killed fewer bats (57.5 percent and 78.0 percent, respectively) than normally operating turbines over the course of the fall migration season (Good et al. 2011). The turbine blades in this study were not feathered below the cut-in speeds, meaning they were rotating freely below cut-in speeds. The fall 2011 study at Fowler Ridge Wind Farm tested the effect of fully feathering turbine blades all night and demonstrated reduced bat fatality for the fall season by 36 percent, 57 percent, and 73 percent,

Pinnacle (Hein et al. 2013), Laurel Mountain (Stantec 2013a, b), Beech Ridge (Tidhar et al. 2013), and North Allegheny (Shoener Environmental 2013) wind projects (see table 3 in the BO).

Based on this comprehensive review of existing information, the Service concludes that CPP's turbine curtailment strategy (i.e., feathering turbine blades below wind speeds of 5.0 mps from sunset to sunrise between July 15 and October 15 annually) will achieve the biological goals identified in the final HCP (i.e., 50 percent annual reduction in total bat mortality). The studies show that feathering turbine blades below cut-in speeds of 5.0 mps all night have achieved an average reduction in bat fatalities of 60 percent for the season study period, ranging from 35 to 87 percent (Arnett et al. 2010, Good et al. 2011, Young et al. 2013, Hein et al. 2013).

The turbine curtailment studies recently conducted at the Fowler Ridge project (Good et al. 2011, 2012) serve as good examples of the level of effectiveness that could be achieved at CPP's project. In 2010, wind turbine blades that were not feathered (i.e., allowed to rotate freely or freewheel) below 5.0-mps turbine cut-in speeds had bat mortality approximately 50 percent less than that of normally operating turbines (i.e., cut-in speeds generally around 3.5 mps). In 2011, wind turbines were feathered below various cut-in speeds and the results suggested that blades feathered below a 4.5-mps turbine cut-in speed had approximately 57 percent less bat mortality than normally operating turbines and an even greater reduction at a lower cut-in wind speed. Based on these results, the Service believes that feathering turbine blades below a 5.0-mps cut-in speed potentially will achieve greater than a 50 percent reduction in bat mortality.[7]

For the purposes of the HCP and the Service's EA, the Service has assumed that at least a 50 percent reduction in total bat fatalities will be realized with implementation of the 5.0-mps cut-in speed. Results of the 2012 mortality monitoring study at the project site confirmed that the curtailment strategy reduced bat fatalities at the site by at least 50 percent (51 percent reduction) compared to the 2011 survey results where curtailment was not implemented. More importantly, no *Myotis* species (i.e., Indiana bats, little brown bats, northern long-eared bats, and eastern small-footed bats) were detected, suggesting that the probability of Indiana bat take is very small. This suggests that the curtailment strategy is biologically sufficient to greatly minimize (and perhaps even eliminate) take of Indiana bats at the site.

Further, CPP has committed to an adaptive management plan that will assess whether such a reduction in take is continuing to be achieved and, if it is not, CPP will increase curtailment. While higher cut-in speeds can likely achieve even greater fatality reduction (Good et al. 2011), the site-specific information at the project site suggests that a 50 percent (or more) reduction is biologically sufficient, based on the low level of anticipated take. The proposed curtailment plan will require the project to spend additional resources for implementation and monitoring and to reduce clean energy production, revenues from the project, turbine availability, and renewable energy credits. Increasing curtailment to higher cut-in speeds would increase costs and reduce

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respectively, at cut-in speeds of 3.5, 4.5, and 5.5 mps compared to normally operating turbines (Good et al. 2012).

[7] The take calculation presented in section 4.1 of the HCP is largely premised on a model incorporating data from wind projects within 200 miles of the Beech Ridge Wind Energy project site. However, in considering the effectiveness of curtailment strategies, we find it appropriate to consider the results from Fowler, which is outside the 200-mile distance, because it evaluated a turbine curtailment strategy similar to that proposed by CPP.

clean energy production and revenues even more while only reducing fatalities of bats by fractions annually since the 5.0 mps curtailment rate is anticipated to achieve fatalities of less than one bat per year.

The CPP will implement turbine feathering from sunset to sunrise. The timing of curtailment was based on other curtailment studies (Arnett et al. 2010) and was further refined based on an evaluation of high frequency bat activity at the site relative to times at sunrise and sunset. Indiana bats are included within the "high frequency" group. The analysis showed that, of all the high frequency bat passes identified from the acoustic monitoring data collected at the site from April 1 through November 15, 2010, less than 0.02 percent of the passes occurred before sunset, and no passes were recorded after sunrise. Therefore, applying the 5.0 mps cut-in speed from sunset to sunrise will target the time of the night that bats are active at the site. Based on the Service's independent review of the site-specific data, we concur that curtailing from sunset to sunrise will sufficiently capture the period of bat activity at the site. Additional hours of curtailment are not anticipated to result in any greater fatality reductions. It should also be noted that turbine curtailment during daytime hours is not anticipated to achieve fatality reductions for bats since bats are not active during daylight hours.

The CPP will implement turbine feathering from July 15 to October 15 annually. Several studies indicates that reductions in bat mortality can be achieved by implementing turbine cut-in speed adjustments during the late summer and fall (Arnett et al. 2010; Baerwald et al. 2009; Good et al. 2011, 2012; Taucher et al. 2012; Young et al. 2011, 2012). A recent summary of 12 full season surveys at Pennsylvania wind farms shows 79 percent of bat mortality occurred between July 15 and October 15 (Taucher et al. 2012). Data from the first and second year of postconstruction monitoring at the project show that 72 percent of the bat fatalities occurred from July 15 to October 15. Most of the fatalities that occurred at the project (Young et al. 2011 and 2012) were migratory tree bats, and none of the fatalities outside of the fall period were *Myotis* species.

Seasonality of curtailment is also based on site-specific factors, research (Arnett et al. 2008; Arnett et al. 2010), and postconstruction mortality data (Taucher 2012; Young 2011; Young 2012). Site-specific factors mentioned previously suggest that the primary times that Indiana bats may be present at the site are during spring and late summer/fall when bat migration occurs. During these periods Indiana bats may occasionally pass through the project site as they migrate from their winter to summer habitat. Based on our current understanding of Indiana bat migration, female Indiana bats move quickly from winter to summer habitat (i.e., spring migration) due to their limited fat reserves and food availability upon emergence; therefore, there would be a very short duration of exposure at the project site during spring migration. During the summer, male Indiana bats tend to remain close to the hibernaculum (USFWS 2007), which is at least 30 miles away from the project site. As a result, male Indiana bats at the site would also have a limited period of exposure during the spring and summer season; however, we do assume that there could be incidental use of the site by males during these seasons. Fall migration is somewhat more protracted, with individuals arriving at a hibernaculum over the course of 2 to 3 months to mate and increase body mass prior to hibernation (USFWS 2007). Due to the increased time Indiana bats may migrate through the project area, there is an increased exposure risk during that time. Therefore, the Service assumes the period of greatest fatality risk to Indiana bats at the project site is during this fall migration period. In the northern

United States, including the AMRU, the fall migration period to occur in the 12-week period between July 15 and October 15 (USFWS 2007). For that reason, CPP has tailored its turbine curtailment plan to minimize bat fatalities during this period.

The Service does not ignore the potential for Indiana bat fatalities occurs during the spring migration period or summer, but we anticipate that the greatest risk to Indiana bats will be during the fall migration period. Extending turbine curtailment beyond the fall season comes with a cost to CPP in terms of reduced power generation (and hence revenues from the project). Based on the available information regarding how Indiana bats use the project site, timing of known Indiana bat fatalities from other projects (i.e., generally during the late summer/fall migration period as summarized in the Service's BO, (USFWS 2013b)), and overall bat fatalities in the region, the Service believes that the proposed curtailment period (July 15 through October 15) is sufficient to minimize the risk of take.

The Service's analysis of the adequacy of the turbine curtailment strategy to effectively minimize the potential for take is in part based on the assumption that there are no Indiana bat maternity colonies at CPP's project site. That assumption is supported in part by the existing data collected at the site. Discovery of a reproductive female or young-of-the year juvenile Indiana bat fatality during the maternity season (May 15 to August 15) could indicate the presence of a maternity colony on or near covered lands. Therefore, CPP has considered this potential as a changed circumstance in the final HCP; such a discovery would require extending the curtailment period to cover the summer season. Because the risk of take is assumed to be greater with presence of a maternity colony, the cut-in speeds would also likely increase in the event new information triggers this response. This higher level of curtailment would need to be maintained unless and until CPP applied for a major ITP amendment to authorize additional take during the maternity season.

By incorporating curtailment at 5.0 mps from July 15 to October 15 annually, CPP will decrease the amount of anticipated take of Indiana bats by 50 percent (24 bats to 12 bats over the 20-year life of the project). The Service believes that CPP's curtailment strategy is biologically sufficient and that additional minimization measures (e.g., higher cut-in speeds, more hours of curtailment, or longer curtailment season) are not necessary. If project monitoring or new information suggests the minimization measures are not effective, the changed circumstances provisions of the HCP will allow CPP and the Service to make the necessary operational changes.

In addition to the turbine curtailment strategy, the final HCP describes the following additional minimization measures that address potential impacts that may occur during maintenance and decommissioning activities. As detailed in the Service's BO, we believe implementation of these minimization measures will reduce impacts to a level that avoids the potential for adverse effects, including incidental take, to Indiana bats (USFWS 2013b).

- Removal of hazard trees adjacent to the facilities or roadways will be scheduled to occur after November 15 and before April 1 each year, unless an emergency situation (e.g., a tree falls on a roadway impeding access) requires tree removal outside of this period. In emergency situations where removal of trees is to occur between April 1 and November 15, CPP will coordinate the tree removal with the Service. In nonemergency situations,

CPP will conduct a visual survey between sunset and 30 minutes after sunrise to determine if the hazard tree may be a roost tree for bats.

- The number of storm water control features in the immediate vicinity of the WTG will be minimized to the extent practicable, which will reduce habitat attractiveness to bats near turbines.

The Service believes the minimization measures in CPP's conservation plan adequately reduce the likelihood and extent of the take of Indiana bats from the project. The minimization measures related to maintenance and decommissioning activities are anticipated to reduce impacts to a level that avoids the potential for take. The minimization measures related to turbine operations are anticipated to achieve the HCP's fatality reduction objectives, and as stated previously, those objectives are biologically sufficient to reduce incidental take to a level that it will not have additive effects on Indiana bat populations. Therefore, the Service concludes that the minimization plan meets the maximum extent practicable criterion.

Mitigation Measures (final HCP Section 5.3.1)

To compensate for the impact of the take of Indiana bats associated with the covered activities (i.e., loss of individual bats), CPP will implement a hibernaculum gating project in the AMRU to eliminate or minimize existing threats to a population of wintering Indiana bats. The anticipated level of Indiana bat take from turbine operations is less than 1 bat per year for a total of 12 bats over the 20-year permit duration. We assume that these bat fatalities will involve Indiana bats migrating between different summer habitat locations and hibernacula. Therefore, the impact will have a small reduction (on average less than one bat per year) on the number of bats in one or several of these local concentrations. We find that a hibernaculum-gating project will mitigate for the impacts associated with the loss of 12 bats associated with the project, and the rationale for that conclusion is provided below. The criteria needed for offsite mitigation are also described below.

The Service and CPP discussed potential mitigation options based on recovery strategies identified in the Indiana Bat Draft Recovery Plan (USFWS 2007). As described in the draft recovery plan, priority 1 actions are those that "must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future," while priority 2 actions are those that "must be taken to prevent a significant decline in species population/habitat quality or some significant negative impact short of extinction." All of the recovery plan's priority 1 actions and all but three of the priority 2 actions are focused on hibernacula-related recovery actions and species-related research.

Initially, the Service and CPP were considering several mitigation options, including a cave-gating project, a hibernaculum acquisition project, or combination of both. The Service concluded that, with an adequate management plan assuring protection of the Indiana bat hibernaculum, and with no activities occurring on the property that could have direct or indirect effects on hibernating or swarming bats, similar levels of compensatory mitigation could be achieved by any of the options. Thus, in the final HCP, CPP narrowed the scope of the mitigation project to cave gating.

In addition, the Service initially considered the potential for protecting maternity or summer habitat located in Carroll County, Maryland but decided that there was no guarantee that the habitat would continue to be used due to the small, fragmented woodlots in which several Indiana bats were found. Additionally, summer and maternity habitat is not limiting in the AMRU; there is more than 39 million acres of forested habitat, which represents approximately 68 percent of the total area.

We contacted Ed Arnett at Bat Conservation International (BCI) to get his opinion on the value of conserving maternity or summer habitat in the AMRU. He stated that BCI is reluctant to put conservation easements on a specific maternity colony roosting site unless it could be done at minimal expense. He further stated that maternity roosts, and especially tree roosts, can be extremely ephemeral and bats must choose areas in the landscape that offer not only suitable existing roosts, but also immediate and future alternate roosts. "BCI would support easements that, based on best available science (including forest inventory records and associated ground-truth assessments), encompassed large areas of especially good Indiana bat maternity roost habitat. We find that efforts to manage and protect hibernacula would be the most effective use of funds for the return on investment and would have clearly measurable outcomes with the greatest impact on Indiana bat conservation (personal communication, Ed Arnett, BCI)."

The CPP is evaluating the feasibility of several potential cave projects in collaboration with BCI (table 5.1 in the HCP). These projects have been identified as feasible projects that would provide high conservation value to Indiana bats. All of the caves support more Indiana bats than will be potentially taken by the project. The objective of the hibernaculum-gating project would be to protect the cave by removing or minimizing threats to bats in the cave, such as winter time human disturbance. These types of cave protection measures have been shown to result in increases in winter bat populations presumably due to reduced disturbance to and improved survivorship of bats in the cave. Gating as a means of protecting bats during the critical and vulnerable hibernation period has been used since at least the early 1970s (MacGregor 1993). A lack of understanding of bat behavior and of airflow and temperature regimes in caves resulted in early cave gate designs that yielded effects opposite of those intended, by restricting ingress and egress (e.g., Ludlow and Gore 2000; Pugh and Altringham 2005; Spanjer and Fenton 2005), by altering airflow and temperature regimes inside the cave (e.g., Richter et al. 1993), or both, and resulted in declining cave populations in some cases (MacGregor 1993). However, with better understanding of the effects of gates on bat behavior and the importance of airflow, gate designs improved, and this measure has been effective in increasing wintering bat populations presumably due to removal of deleterious impacts and increased overwinter survival (Laval and Laval 1980; MacGregor 1993; Richter et al. 1993; Elliot 2003; Martin et al. 2003; Kennedy and Powers 2005; Martin et al. 2006; TNC 2012). For caves suffering chronic disturbances due to human entry during the season(s) of use, a well-designed and installed gate to minimize changes in internal conditions and bat behavior is likely to result in population-level benefits.

The Service finds that by removing disturbance-related impacts (e.g., lethal mortality events and disturbance events) to a wintering concentration of Indiana bats, over time a greater number of Indiana bats will be benefitted than will be impacted by the take of the project. In addition, the impact of take from the project will likely be distributed across several local population concentrations (i.e., maternity colonies and hibernacula) such that no one local population is

affected by the loss of such few individuals. However, by gating a known hibernaculum, supporting a sufficient population size, the local hibernacula population will be protected and is anticipated to have greater overwinter survivorship and higher reproductive capacity into the future. While it is difficult to quantify *a priori* the population benefit (i.e., the additional number of bats produced) by the hibernaculum gating, the Service will be able to quantify that benefit over time via the Service sponsored semi-annual hibernacula bat counts. At a minimum the project will benefit the 12 or more Indiana bats that use the hibernaculum. In addition, if any catastrophic events impact the mitigation project, a changed circumstance provision of the HCP will provide additional mitigation to offset the take that remains for the remainder of the ITP.

Based on available information, the Service considers the mitigation projects listed in table 5.1 of the HCP to be feasible options that could meet the objective of mitigating the loss of 12 bats over the 20-year term of the permit. The selected mitigation project must meet the following criteria: (1) the cave must be a priority 1, 2, 3, or 4 hibernaculum that is known to support more than the 12 Indiana bats than are anticipated to be impacted by the project; (2) a threats analysis of the cave must demonstrate that human activity presents a threat to the bats in the cave; (3) the cave must have a landowner (public or private) that is willing to have the project implemented and can ensure implementation of the gate maintenance plan and the management plan; (4) the Service, or a third party, should have future access to the site to monitor bat populations and/or use the cave; and (5) if there are multiple cave entrances for the hibernaculum, each entrance should be gated. The CPP will select, in coordination with and with written concurrence of the Service, the mitigation project based on potential conservation value to Indiana bats in the AMRU population. The selected project will also be based on feasibility as determined during the evaluation of the potential mitigation projects and ability to implement the project within 24 months of issuance of the ITP.

A formal threats analysis will be conducted for the property surrounding the cave to determine if there are potential land uses such as mineral extraction or forestry that could result in disturbances to hibernating or swarming bats. The CPP will develop a 20-year management plan for the cave and the surrounding area to ensure continued viability of the hibernaculum. There will also be actions identified to address any situation that would make the mitigation site unviable. Examples of this would be vandalism or other damage to the gate(s), land ownership changes, or a situation in which the buffer surrounding the cave can no longer be maintained or managed according to the management plan developed for the site. The management plan will be developed in coordination with the Service and the landowner.

The Service finds that mitigation measures in CPP's conservation plan adequately compensate for the impact of the taking of 12 Indiana bats over the 20-year permit term. We note that the cave-gating project will be in place for at least the 20-year period of ITP implementation. This is the period during which incidental take will be occurring and the impacts of take (i.e., mortality of 12 Indiana bats) needs to be mitigated. Permanent mitigation is generally preferable to the Service, especially when permanent impacts will occur. However, in this situation we believe that protecting hibernating bats over a 20-year period will provide ample protection for more bats than will be impacted by the project and that those bats will produce additional bats (particularly due to the additional protection provided by the mitigation) over the permit term.

While CPP has been working with the Service to develop a specific Indiana bat mitigation project that will meet the criteria identified in the HCP, that project is still under development. To comply with the permit, CPP must complete all of the mitigation within 24 months of permit issuance. This will ensure that the benefits of mitigation will be achieved and accrue over the permit term in advance of most of the anticipated incidental take occurring. The CPP will develop a binding contract with BCI or other qualified entity to implement the project within 60 days of approval of the project by the Service. In the event that circumstances do not allow a response within 60 days of receipt of the project proposal, then the time to implement the project will be extended by the amount of time beyond the 60 days necessary for concurrence to be provided. There is potential for some incidental take to occur prior to implementation of the mitigation; however, the performance bond (required by the ITP and IA) assuring available funding for all aspects of the mitigation project will be secured in advance of any take, and the impacts from the limited amount of potential take are anticipated to be small. Therefore, the Service concludes that the mitigation project for Indiana bats is commensurate with the anticipated incidental take and meets the maximum extent practicable criterion.

In conclusion, the above minimization and mitigation measures satisfy the maximum extent practicable standard. The minimization measures adequately reduce the likelihood and extent of incidental take of Indiana bats, while the mitigation is commensurate with the level of take anticipated by the project.

3. The applicant will ensure adequate funding for the HCP, and procedures to deal with unforeseen circumstances will be provided.

Funding

The Service finds that CPP has ensured adequate funding for implementation of the HCP. Section 6.0 of the HCP describes the costs associated with plan implementation. For the most part, the avoidance and minimization plans do not require additional funding. Rather, they are part of CPP's operational budget. Therefore, the primary costs for implementing the HCP include the mitigation project, the project compliance monitoring, and reporting. Other associated costs include general administration and management of the HCP and monitoring, onsite minimization, and mitigation measures (as presented in table 6.1 in the HCP). The CPP has incorporated several mechanisms to ensure adequate funding for plan implementation.

To provide the needed assurance that funding will be available, a performance bond in the amount of $1,449,750.00 will be maintained by a rated financial institution. The performance bond will be funded through a reduction and/or expenditure of a portion of CPP's earned revenue. The performance bond will provide funds for monitoring, mitigation, reporting, and contingencies for adaptive management and changed circumstances in advance of the time at which they are needed. The performance bond will be administered by an independent financial institution and will contain sufficient funds to assure CPP's performance and implementation of this HCP. The performance bond will be drawn upon in the event of a CPP revenue shortfall, inability or unwillingness to fund ITP implementation, insolvency, or dissolution. The CPP may, with concurrence from the Service, reduce the amount of the performance bond as CPP completes tasks set forth in the final HCP, and may be required to augment the amount of the

performance bond should the estimates provided in section 6.0 of the final HCP prove to be undervalued. Funds from the performance bond shall be used only if CPP is otherwise unable to meet its obligations under the IA, permit, or HCP. The CPP will provide the Service a draft of the performance bond to review and approve prior to its execution. The ITP requires CPP to provide a fully executed performance bond within 45 days of permit issuance. No take of covered species will occur during this 45-day period since Indiana bats are hibernating until early April. The 45-day period will allow CPP and the Service to ensure agreement on the terms of the performance bond and provide the time required for CPP to fully execute the bond. In addition, section 9.1 of the IA further describes the measures that CPP will take to assure mitigation and monitoring will be implemented.

The anticipated costs for the mitigation project include time and expenses for BCI to evaluate the potential project options and developing a project management plan. The project management plan will include a detailed threats analysis, project implementation and construction measures, long-term project operation and maintenance measures, and long-term project monitoring. Lease payments to the landowner for allowing the project on the property are included, as well as costs related to monitoring the project. The $176,250 for the mitigation project includes project construction costs plus overhead and administrative costs for implementing the project. The cost estimate was provided by BCI in a November, 2011, letter regarding a worst-case cave-gating example that would require gating multiple entrances (see table 5.1 in the HCP for possible mitigation projects).

The potential lease fee or compensation for the mitigation project landowner is estimated to be $51,700 based on a $2,000-per-year fee starting in 2015 and escalating by 3 percent per year for the life of the permit.

The mitigation project monitoring program was estimated to be $163,300 for the life of the permit. This cost was derived from the cost estimate provided by BCI of approximately $6,500 per year starting in 2015 and escalating to 3 percent per year for the life of the permit.

The compliance monitoring and reporting cost estimates assume monitoring is completed in the 5th (2018), 10th (2023) and 15th (2028) years of the permit. The first 3 years of project monitoring occurred from 2011 to 2013 and are complete; the project will incur no further financial obligations for those monitoring studies (with the exception of preparing the 2013 monitoring report). The three followup monitoring year costs were based on the 2013 year monitoring cost and escalated by 3 percent per year to the corresponding monitoring year.

The estimated cost for an adaptive management response was based on the average of annual compliance monitoring costs. Adaptive management monitoring could be triggered theoretically any year that compliance monitoring is conducted but, for the purposes of estimating costs of implementing the HCP, was assumed to occur in year 2014 after being triggered by 2013 monitoring.

General overhead and administrative costs were estimated to be $5,000 per year starting in 2013 and escalating by 3 percent per year for the life of the permit. These costs are for general administrative tasks such as onsite coordination of monitoring studies, preparing reports, and holding meetings as necessary.

As with the estimate for adaptive management, the estimate for addressing changed circumstances was based primarily on the need for an additional monitoring study. The costs for adjusting the turbine operational measures due to a changed circumstance are incurred as reduced revenue generation by the project. The costs of monitoring to verify the effectiveness of the changes was estimated to be $132,000 and could be incurred any year during the term of the permit in which a changed circumstance occurs. These costs are accounted for in the HCP in the event changed circumstances are triggered.

Changed Circumstances

Consistent with the issuance criteria, and the Service's five-point policy, CPP's HCP includes procedures to address unforeseen circumstances, as described below. In addition, the HCP (section 5.4) and IA include procedures for determining the occurrence of changed circumstances, which trigger procedures or changes in the conservation plan to adjust to new information or contingencies. Changed circumstances include

- Changes in Indiana bat distribution due to climate changes that may influence the species' survival and recruitment in previously unsuitable areas;
- Population declines or catastrophic population failure due to WNS;
- Listing of additional bat species, such as the eastern small-footed myotis (*Myotis leibii*) and northern long-eared myotis (*M. septentrionalis*), due to population declines;
- Development of new methods for monitoring mortality, the ability to estimate mortality by species, on the development of new technology to minimize bat mortality from wind turbines; and
- The mitigation site becomes unviable in that it no longer supports Indiana bats.

The Service negotiated these changed circumstances provisions to include certain requirements it felt necessary to issue a permit. These concerned key assumptions or uncertainties associated with the modeling of anticipated take or the potential impact of that take on the species. For instance, WNS is a significant threat to Indiana bats and is causing rapid declines in the population. The Service evaluated the impacts of incidental take from this project assuming population impacts from WNS in the AMRU are not worse than what has been found in the Northeast Recovery Unit. The Service felt that in the event that the population declines are worse, it will be imperative to re-assess the impacts of take from this project and potentially further reduce that level of take. The WNS changed circumstance allows such evaluation and changes if the triggers are met. As another example, the Service evaluated the potential for incidental take from this project assuming that Indiana bat maternity colonies do not occur on the project site. If that assumption is incorrect, then the level and potential impact of incidental take will be different than was accounted for by the Service's analysis. Therefore, the Service felt it was important to incorporate a changed circumstance that allowed a change in the conservation strategy in the event that new information demonstrated presence of a maternity colony.

The CPP, in coordination with the Service, will follow the procedures outlined in the HCP (section 8.2) and will propose additional or alternative measures as the need arises to deal with

changed circumstances. Some of the responses to changed circumstances, would result in modifications to the turbine curtailment strategy. These changes do not require additional funding assurances, but rather would reduce the amount of energy CPP would be able to generate. Some of the changed circumstances (e.g., new covered species) trigger permit amendments, in which case additional funding obligations would be incorporated into the amendment process. Finally, CPP will be required to annually report on funding and confirm that adequate funding is available for implementation of the HCP for the ensuing year, including implementation of changed circumstances provisions in the event they were triggered.

Unforeseen Circumstances

Unforeseen circumstances are defined as changes in circumstances affecting a species or geographic area covered by an HCP that could not reasonably have been anticipated by plan developers and the Service at the time of the development and negotiation of the plan and that result in substantial and adverse changes in the status of the covered species. They are those events that are completely unpredictable (e.g., an earthquake or the outbreak of a disease completely lethal to Indiana bat), or that exceed historical variability, and that result in a substantial and adverse change to the status of a covered species. The HCP includes a section detailing the obligations of CPP and the Service in the event of unforeseen circumstances. These incorporate the assurances guaranteed by the Service's "No Surprises" regulations (50 CFR 17. 22(b)(5) and 17.32(b)(5)), provided the HCP is being properly implemented, and only for species adequately covered by the HCP.

In conclusion, the Service finds that CPP, through the HCP and IA, has ensured adequate funding for the HCP and provided procedures to deal with changed and unforeseen circumstances.

4. The taking of the Indiana bat will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.

The ESA's legislative history indicates Congress intended this issuance criterion be based on a finding, among others, that, pursuant to section 7(a)(2) of the ESA, the proposed action is not likely to jeopardize the continued existence of a listed species or destroy or adversely modify its critical habitat. Therefore, the Service has reviewed the project pursuant to section 7 of the ESA. In the Service's BO (USFWS 2013b), we concluded that issuance of the proposed ITP is not likely to jeopardize the continued existence of the Indiana bat. Below we provide a brief summary of the jeopardy analysis.

Jeopardy determinations for the Indiana bat are made at the scale of the listed entity, which is the rangewide distribution of the species (*Federal Register* 32[48]:4001). The jeopardy analysis described in the Service's BO follows an analytical approach that assesses the project impacts at several scales in a stepwise fashion. The analysis first examines the impacts of the take of individuals on the local populations (i.e., the closest hibernaculum and maternity colonies that may be within the distance bats migrate from the action area). If take of individual Indiana bats from the project will reduce the fitness (i.e., short- or long-term persistence or reproductive potential) of these local populations, then the jeopardy analysis will need to further evaluate how reduced population fitness affects the likelihood of both survival and recovery of the species at

the AMRU scale. If, however, take of individual Indiana bats from the project will not reduce the fitness of local populations, then there will not be impacts to survival and recovery of the species at broader population levels and no additional analysis is required. If project impacts may affect the likelihood of survival and recovery at the RU scale, then the jeopardy analysis will need to take the final step of evaluating whether the species' rangewide reproduction, numbers, or distribution will be impacted.

As described earlier (and as described in the BO and chapter 5 of the HCP), we anticipate that effective implementation of the curtailment strategy will achieve the objectives of reducing *Myotis* fatality (and hence Indiana bat fatality) by at least 50 percent, resulting in net cumulative take of up to 12 Indiana bats over the 20-year period of the ITP. Further, we anticipate the Indiana bat take will largely occur during the fall migration period, thus bats that occur onsite would be coming from a much larger area.

Impacts of take to local hibernacula

Given that Indiana bats can migrate up to 100 miles between summer and winter habitat, bats traveling through the project site could be traveling to or from several hibernacula. The likelihood that a bat in the project vicinity is traveling to or from any specific hibernaculum is not known, but probably depends on the number of bats in each hibernaculum and the distance from the project site to the hibernaculum. We conducted a geographic information system (GIS) analysis to estimate how many Indiana bats could be flying through the project during migration and which hibernacula they are likely to be traveling to or from as follows. Details of the GIS analysis can be found in section 6.0 of the BO.

There are 31 hibernacula, each of which has at least 1 Indiana bat as of 2011, within 100 miles of the project site. If we assume migrating bats are evenly distributed within a 100-mile radius of each hibernaculum, there could be 11,065 Indiana bats flying within 100 miles of the project. However, it is important to note that 94 percent of these bats are from only five hibernacula; Hellhole (87 percent), Big Springs (3 percent), Hartman Mine (1.5 percent), Arbogast (2.3 percent), and Cornwell (1.1 percent). While this is a simple analysis and assumes bats are evenly distributed across the landscape, it underscores the likelihood of bats coming from more than one hibernaculum and the high likelihood that some would come from Hellhole or other large hibernacula in the AMRU. Thus, project mortality may include bats from the closest cave (Cornwell), but it is likely that this mortality would constitute only about 1 percent of the total bat mortality and that most of the bats killed would be from Hellhole Cave and other hibernacula simply because there are more bats likely to be entering the action area from larger hibernacula.

We have looked closely at the potential effects to the population at Cornwell Cave because it is the closest hibernaculum and a conservation goal is to keep all hibernaculum populations viable despite the take from wind projects. We examine the potential effects of take from this project by attributing 50 percent of the take to bats that use Cornwall Cave and 50 percent of the take to bats that use Hellhole Cave, the largest hibernaculum in the area. This represents a reasonable worst-case scenario since the GIS analysis suggests that only a small proportion of the take will be attributed to bats from Cornwell Cave. The allocation of 50 percent of the take to the closest hibernaculum and 50 percent to the largest hibernaculum is more skewed (i.e., more take is attributed to the smaller, closest cave) than we anticipate in reality, but we want to err on the side

of caution in considering population affects. We assume WNS to be present and impacting both hibernaculum populations for the purpose of our analysis.

We modeled the population-level effects of Indiana bat fatalities on both Cornwell Cave and Hellhole Cave from the project using this reasonably expected worst-case scenario using a demographic model (Thogmartin et al. 2013) (appendix B of the BO). The demographic model assumed that WNS is affecting the population of interest and used Indiana bat-specific assumptions about the response to WNS. For each take allocation scenario, we evaluated model outputs that compared population trajectories with and without the estimated take from the wind project. In this way, we could evaluate whether and the extent to which take from the proposed action was influencing the population. Because WNS was factored into all of the model runs, the Indiana bat populations decline quickly for all scenarios. The ultimate question we were evaluating was whether take from the proposed action changes the nature of that decline or potential recovery.

Model results indicate that, under the reasonable worst-case scenario where 50 percent of the Indiana bat fatalities came from the closest cave and 50 percent of the fatalities came from Hellhole, the difference between the with and without the project hibernaculum-population trajectories is largely indistinguishable. With or without the project-related fatalities at Cornwell Cave, the results of the population model are essentially the same. Further, the probabilities of extirpation at year 25 or year 50 were low (less than 4 percent) under both scenarios.

The model projections for Hellhole Cave began with a population of 2,530 Indiana bats, which is the estimate from 2013 after WNS has severely reduced the population in this large hibernaculum. Similar to the results for Cornwell Cave, with or without the project-related fatalities at Hellhole Cave, the results of the population model are essentially the same; the model projects recovery of the hibernaculum using the model parameters with and without the project-related losses. Overall, the model projected recovery of Hellhole Cave and did not project extirpation with or without the estimated project-related losses.

Therefore, we conclude that implementation of the project is not likely to impact the continued existence of Indiana bats at the scale of the local hibernaculum population.

Impacts of take to local maternity colonies

As discussed above, based on the mist-net and acoustic surveys at the site and the high elevation of the site, we consider it unlikely that there are any maternity colonies in the action area. However, female bats that may be killed in the action area during the fall migration period (estimated to be six females or 50 percent of the anticipated take over the life of the project) must be coming from a maternity colony somewhere on the landscape. Therefore, to evaluate the potential for population-level impacts from take within the action area, we also assessed the potential effects to maternity colonies by modeling several different take allocation scenarios using a demographic model (Thogmartin et al. 2013)(appendix B of the BO). The same approach was used as described above for the local hibernacula impacts.

We evaluated the potential effects to a theoretical maternity colony of 60 females. This is the average population estimate for known maternity colonies (Kurta 2004, table 2). We assumed

that the fatalities from the project will include equal numbers of males and females, and thus we would expect six females to be killed in 20 years or 0.15 females per year. We evaluated the worst-case scenario where all take from the project affects one maternity colony and WNS is present. Even under this worst-case scenario, the model projections of the maternity colony population are essentially the same with and without project-related fatalities. These model projections (using the Indiana bat assumptions for WNS) predict a 20 percent chance of extirpation by year 50 with or without the project. Overall, there is no difference in the population projections with and without the estimated project related fatalities.

It is probably more likely that the females that migrate through the CPP project area during fall are coming from more than one maternity colony and that the losses are not likely to affect only one maternity colony. We assume that the most realistic scenario is that take of bats from the project will be distributed among several maternity colonies, which means the conclusions reached for this worst-case scenario are conservative. In either case, however, this analysis shows that implementation of the project is not likely to impact continued viability of the Indiana bat at the scale of local maternity colonies.

While the population models enable us to evaluate the effects of the take on the local populations, we recognize that any model prediction on the response of bat populations to WNS are speculative to some extent, and models using different assumptions on how populations respond to WNS will have different outcomes. However, models that use Indiana bat metrics are the best information we have, and they indicate the project does not have a discernible effect on the local populations.

We note that there are 20 turbines within the AMRU that are currently operating less than 10 miles from CPP's project on Back Bone Mountain. They may be affecting the same bat populations that migrate through CPP's project. If we assume these turbines are impacting Indiana bats at a similar level as CPP's project (0.02 bats/turbine/year) these turbines may result in the fatality of 0.4 Indiana bats per year. We do not anticipate this will change the impact of the project on the viability of local populations (i.e., maternity colonies or hibernacula).

Impacts of take at the AMRU scale

Given that take from this project is not likely to impact the fitness or viability of Indiana bats at the local population scale, we do not anticipate a reduction in the likelihood of survival and recovery of the species at the AMRU scale. An average annual loss of 0.6 Indiana bats per year (12 bats spread across 20 years) from the project would represent 0.002 percent of the 2011 AMRU population of 32,468 individuals. This take combined with the estimated take of 45 Indiana bats per year from other existing wind energy projects in the AMRU would represent 0.14 percent of the 2011 AMRU population. As described earlier, we anticipated that as WNS causes population declines, the total annual take will decrease proportionally. No additional analysis is necessary since the annual loss of individuals from the project is small and will not result in population-level effects.

Impacts of take at the rangewide scale

As explained above, implementation of the project is not likely to impact the continued existence

of Indiana bats at the local population scale and therefore is not likely to appreciably reduce the likelihood of survival and recovery within the AMRU. By extension, the Service concludes that this project will not appreciably reduce both the survival and recovery of the Indiana bat at the rangewide scale, which is the listed entity for this species.

This conclusion is further supported by the following:

- The potential for take of Indiana bats from the project is greatest during the migratory period which means the population impacts from the low level of take will most likely be spread over several maternity colonies and hibernacula.

- The AMRU is one of four making up the rangewide distribution of Indiana bats (USFWS 2007). Further, it is the smallest RU and represents only 8 percent of the overall population.

No critical habitat for the Indiana bat is designated within the project area. Impacts from the proposed actions are anticipated to be localized and not likely to impact critical habitat at broader geographic scales. Further, it is not anticipated that there will be habitat-related impacts from implementation of the proposed action. Therefore, the Service does not anticipate the project will destroy or adversely modify Indiana bat critical habitat.

In summary, the Service finds that the level of authorized take will not significantly affect the local population of Indiana bat, will not have rangewide population effects, and will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.

5. Other measures, as required by the Director of the Service, have been met.

The HCP, minimization and mitigation measures, funding assurances, and all other aspects of the HCP incorporate all elements determined by the Service to be necessary for approval of the HCP and issuance of the permit. The IA and permit conditions include provisions to ensure that the HCP will be fully implemented. Therefore, the Service finds that other measures, as required by the Director of the Service, have been met.

III. Public Comments

On July 31, 2012, the Service published a notice of availability and request for comments in the *Federal Register* for CPP's permit application and draft HCP and the Service's draft EA (FR Doc # 2012-18633). The 60-day public comment period closed on October 1, 2012; the Service received 10 comment letters. Based on some of the comments we received, minor changes were made to the final EA and the final HCP. A description of these changes and responses to all substantive public comments are included as an appendix to the Service's final EA. Following final action on the permit application, the Service will publish a notice of permit decision in the *Federal Register*.

IV. National Environmental Policy Act – Analysis and Findings

Pursuant to the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq.*), the Service prepared an EA that considered the issuance of an ITP with implementation of the HCP (the proposed action) and an APP; a status quo (no action) alternative; a third alternative, which included full curtailment at the project (annual WTG shutdown from sunset to sunrise between April 1 and November 15) and implementation of an APP; and a fourth alternative, which is similar to the proposed action but authorizes take for only 5 years. The Service considered two other alternatives, which were eliminated from detailed analysis as they did not meet the purpose and need for the proposed action, are not practical or feasible, or both. One of these alternatives was not issuing an ITP and CPP not operating the project. The other one was CPP waiting for a programmatic HCP for the Indiana bat. The Service concluded its NEPA review with a final EA and Finding of No Significant Impact (FONSI)(40 CFR 1508.27).

V. General Criteria and Disqualifying Factors – Analysis and Findings

The Service has no evidence that would disqualify the applicant or make the applicant ineligible to receive a permit under our general permitting regulations in 50 CFR 13.21 (b through d).

VI. Recommendation on Permit Issuance

Based on our findings with respect to the ITP application (including the HCP and IA) and supporting Service documents (including the EA, FONSI, BO, and ITP conditions), I have determined that the application meets the issuance criteria found in section 10(a)(2)(B) of the ESA.

I therefore recommend issuance of the section 10(a)(1)(B) incidental take permit (number TE08441B-0) to CPP for incidental take of Indiana bats that may occur during turbine operation at the Criterion Wind Energy Project.

Approved by:

ACTING

1-29-14

Paul R. Phifer, Ph.D.
Assistant Regional Director, Ecological Services
Northeast Region

Date

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