Biological Assessment
on the
Northern Long-Eared Bat (*Myotis septentrionalis*)
and
Indiana Bat (*Myotis sodalis*)

Indian Point Nuclear Generating Units 2 and 3

Proposed License Renewal

July 2015

Docket Numbers 50-247 and 50-286

U.S. Nuclear Regulatory Commission
Rockville, Maryland

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Abbreviations, Acronyms, and Symbols

°C	degrees Celsius
°F	degrees Fahrenheit
ac	acre(s)
CFR	*Code of Federal Regulations*
cm	centimeter(s)
Davis-Besse	Davis-Besse Nuclear Power Station
Entergy	Entergy Nuclear Operations, Inc.
ESA	Endangered Species Act of 1973, as amended
FERC	Federal Energy Regulatory Commission
FSEIS	final supplemental environmental impact statement
ft	foot (feet)
ft^2	square foot (feet)
FWS	U.S. Fish and Wildlife Service
g	gram(s)
ha	hectare(s)
in.	inch(es)
IP1	Indian Point Nuclear Generating Unit 1
IP2	Indian Point Nuclear Generating Unit 2
IP3	Indian Point Nuclear Generating Unit 3
km	kilometer(s)
m	meter(s)
m^2	square meter(s)
mi	mile(s)
NMFS	National Marine Fisheries Service
NRC	U.S. Nuclear Regulatory Commission
NYSDEC	New York State Department of Environmental Conservation
oz	ounce(s)
SAFSTOR	safe storage condition
WNS	white nose syndrome

1.0 Introduction

This biological assessment has been prepared to support the U.S. Nuclear Regulatory Commission (NRC)'s review of Entergy Nuclear Operations, Inc.'s (Entergy or the licensee) application for renewal of Facility Operating Licenses DPR-26 and DPR-64 for an additional 20 years at Indian Point Nuclear Generating Units 2 and 3 (IP2 and IP3) and to comply with the provisions of section 7 of the Endangered Species Act of 1973, as amended (ESA). This biological assessment examines the potential impacts of the proposed IP2 and IP3 license renewal on the northern long-eared bat (*Myotis septentrionalis*) and Indiana bat (*M. sodalis*).

The NRC previously considered the potential effects of the proposed IP2 and IP3 license renewal on Federally listed species in its final Supplement 38 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (FSEIS), which the NRC issued in December 2010 (NRC 2010). The NRC subsequently supplemented the FSEIS in June 2013 to incorporate new and revised information related to the impacts from IP2 and IP3 on aquatic species (NRC 2013).

On April 2, 2015, the U.S. Fish and Wildlife Service (FWS) published a final rule that lists the northern long-eared bat as threatened throughout its range under the ESA (80 FR 17974). As part of the ongoing IP2 and IP3 license renewal environmental review, Entergy (2015) submitted to the NRC information concerning the northern long-eared bat and Indiana bat in a letter dated June 8, 2015.

This biological assessment evaluates the potential effects of the proposed license renewal on the northern long-eared bat, a species that was not considered in the FSEIS or subsequent supplement thereto, and considers whether Entergy's updated information affects the NRC staff's previous finding that IP2 and IP3 license renewal is "not likely to adversely affect" the Indiana bat.

Federally listed species under the jurisdiction of the National Marine Fisheries Service (NMFS) were previously considered during formal consultation, which resulted in the NMFS issuing a biological opinion to NRC for IP2 and IP3 in January 2013.

2.0 Description of the Proposed Action

2.1 Proposed Action

The proposed action is NRC's decision whether to renew the IP2 and IP3 operating licenses for an additional 20 years.

IP2 and IP3 are Westinghouse pressurized-water nuclear power reactors located on approximately 239 acres (ac; 97 hectares (ha)) of land in the Village of Buchanan in upper Westchester County, New York, approximately 24 miles (mi; 39 kilometers (km)) north of New York City. IP2 and IP3 began commercial operation in September 1973 and December 1975, respectively. The IP2 license was set to expire in September 2013. However, having met the requirements of section 2.109 of Title 10 of the *Code of Federal Regulations* (10 CFR 2.109), the facility is allowed to continue to operate under the existing license until the NRC reaches a decision on the license renewal request. The IP3 license is set to expire in December 2015. If approved, the license renewal would allow IP2 and IP3 to operate through 2033 and 2035, respectively. The proposed action is further described in Chapter 1 of the FSEIS (NRC 2010).

3.0 Proposed Action Area: IP2 and IP3 Site

The implementing regulations for section 7(a)(2) of the ESA define "action area" as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area effectively bounds the analysis of ESA-protected species and habitats because only species that occur within the action area may be affected by the Federal action.

For the purposes of the ESA analysis for the proposed IP2 and IP3 license renewal, the NRC staff considers the action area to be the 239-ac (97-ha) IP2 and IP3 site as described in Sections 2.1, 2.2.1, and 2.2.6 of the FSEIS (NRC 2010). The site includes 134 ac (54.2 ha) of developed areas occupied by the IP2 and IP3 generating facilities and associated infrastructure as well as developed areas occupied by Indian Point Nuclear Generating Unit 1 (IP1), which was shut down in 1974 and is currently in a safe storage condition (SAFSTOR; a decommissioning strategy that includes maintenance, monitoring, and delayed dismantlement to allow radioactivity to decay prior to decommissioning). Outside of the central developed portion of the site, small tracts of forest totaling approximately 25 ac (10 ha) are interspersed among paved areas and facilities. Maintained areas of grass cover about 7 ac (2.8 ha) of the site, and the northern portion of the site is covered by approximately 70 ac (28 ha) of hardwood forest. The forest vegetation of the site and adjacent areas was characterized by a survey performed in the early 1970s before the completion of construction of IP3. At that time, the forest canopy included a mixture of hardwoods such as red oak (*Quercus rubra*), white oak (*Q. alba*), black oak (*Q. velutina*), chestnut oak (*Q. prinus*), shagbark hickory (*Carya ovata*), black cherry (*Prunus serotina*), tulip tree (*Liriodendron tulipifera*), river birch (*Betula nigra*), and maple (*Acer* spp.), as well as conifers such as eastern hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*). The subcanopy included sassafras (*Sassafras albidum*) and sumac (*Rhus* spp.). The shrub layer included swamp juneberry (*Amelanchier intermedia*), summer grape (*Vitis aestivalis*), poison ivy (*Toxicodendron radicans*), and Virginia creeper (*Parthenocissus quinquefolia*); and the herbaceous layer included forbs such as wildflowers and ferns (NRC 1975). This forest community covers the riverfront north of the reactor facilities, surrounds the pond in the northeast corner of the site, and exists in fragmented stands in the eastern and southern areas of the site. The vegetation in the developed areas of the site consists mainly of turf grasses and planted shrubs and trees around buildings, parking areas, and roads.

The action area also includes those portions of the Hudson River affected by intake and discharge of cooling water, which consists of the IP2 and IP3 intakes, the discharge canal, and the area of the Hudson River into which the thermal plume extends. This area is consistent with the action area determined to be appropriate for IP2 and IP3 continued operation and license renewal by the NMFS in its 2013 biological opinion for shortnose and Atlantic sturgeons (*Acipenser brevirostrum* and *A. oxyrinchus oxyrinchus*) (NMFS 2013). The aquatic environment is further described in Section 2.2.5 of the FSEIS (NRC 2010).

The NRC staff expects all direct and indirect effects of the proposed action to be contained within these areas. The NRC staff recognizes that while the action area is stationary, Federally listed species can move in and out of the action area. For instance, a migratory fish species could occur in the action area seasonally as it travels up and down the river past IP2 and IP3. Similarly, a flowering plant known to occur near, but outside, of the action area could appear within the action area over time if its seeds are carried into the action area by wind, water, or animals. Thus, in its analysis, the NRC staff considers not only whether species occur directly within the action area, but

whether those species may passively or actively move into the action area. The staff then considers whether the life history of each species makes the species likely to move into the action area where it could be affected by the proposed IP2 and IP3 license renewal.

4.0 FWS Section 7 Consultation History

During the development of the FSEIS (NRC 2010), the NRC informally consulted with the FWS concerning Federally listed species under its jurisdiction. Correspondence related to the consultation is listed in Appendix E of the FSEIS (NRC 2010).

5.0 Federally Listed Species Considered

The FSEIS (NRC 2010) considered two Federally listed terrestrial species—the bog turtle (*Clemmys muhlenbergii*) and the Indiana bat—and one species that is a candidate for Federal listing—the New England cottontail (*Sylvilagus transitionalis*). The NRC determined in the FSEIS that the IP2 and IP3 site does not include suitable habitat for the bog turtle or New England cottontail. The U.S. Department of Interior (DOI 2009), on behalf of the FWS, stated that no further consultation or coordination with the FWS would be required for these species in a letter dated March 17, 2009. The NRC has not identified any information since that time that would indicate that the IP2 and IP3 action area would provide suitable habitat for either of these species. Accordingly, these species are not considered any further in this biological assessment.

On October 2, 2013, the FWS published a proposed rule to list the northern long-eared bat as endangered under the ESA (78 FR 61046), and on April 2, 2015, the FWS published a final rule to list the species as threatened throughout its range (80 FR 17974). The northern long-eared bat is known or believed to occur in Westchester County (FWS 2015). This species was not considered in the FSEIS.

On June 8, 2015, Entergy (2015) submitted updated information concerning bat habitat to the NRC to supplement its license renewal application. Although the NRC (2010) previously determined that the proposed IP2 and IP3 license renewal is not likely to adversely affect the Indiana bat and documented this conclusion in the FSEIS, this biological assessment considers whether Entergy's updated information or other available studies or information on the species would change this conclusion.

Accordingly, this biological assessment considers both the northern long-eared bat and the Indiana bat.

5.1 Northern Long-Eared Bat

The FWS listed the northern long-eared bat as threatened throughout its range on April 2, 2015 (80 FR 17974). The FWS did not designate critical habitat for the species because it found that such habitat is was not determinable at the time of listing.

Information on the species is organized according to the description of the species in the FWS's final rule (80 FR 17974) and is drawn from this source unless otherwise cited.

Taxonomy and Species Description

Although there have been few genetic studies on the northern long-eared bat, the FWS describes it as a monotypic species (i.e., having no subspecies). This species has been recognized by different common names, including Keen's bat, northern Myotis, and the northern bat.

The northern long-eared bat is a medium-sized bat that is distinguished from other *Myotis* species by its long ears, which average 0.7 in. (17 mm) in length. Adults weigh 5 to 8 grams (g; 0.2 to 0.3 ounces (oz)), and females tend to be slightly larger than males. Individuals are medium to dark brown on the back; dark brown on ears and wing membranes, and tawny to pale-brown on the ventral side. Within its range, the northern long-eared bat can be confused with the little brown bat (*Myotis lucifugus*) or the western long-eared myotis (*M. evotis*).

Distribution and Relative Abundance

The northern long-eared bat inhabits 37 states in the eastern and north central United States and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia. Populations tend to be patchily distributed across its range and are typically composed of small numbers. More than 1,100 winter hibernacula have been identified in the United States (90 in New York), most of which contain only a few (1 to 3) individuals. The FWS recognize four United States populations. Northern long-eared bats inhabiting New York are considered part of the Eastern population, which has historically been the most abundant population and consists of individuals inhabiting Maine south to Virginia and west to West Virginia. However, this population has experienced drastic declines since white nose syndrome (WNS) was first documented in New York in the winter of 2006-2007. In a study on the effects of WNS on North American bat species, Frick et al. (2015) documented the local extinction of northern long-eared bats from 69 percent of 468 sites in Vermont, New York, Pennsylvania, Maryland, West Virginia, and Virginia where WNS has been present for at least four years. In eastern New York, captures of the species have declined 93 percent compared to pre-white nose syndrome frequencies. Ford et al. (2011) conducted summer acoustic surveys in Fort Drum Military Installation in New York from 2003 to 2010, which include pre-white nose syndrome (2003-2007) and post-white nose syndrome (2008-2010) periods. Although bat activity rose from early summer to late summer, the overall activity levels for the species significantly declined from pre- to post-white nose syndrome years, and no northern long-eared bats have been collected in mist-nests at Fort Drum since 2011. Similarly, Nagel and Gates (2012 in 78 FR 61046) reported a 78 percent decrease in northern long-eared bat passes during acoustic surveys conducted from 2010 to 2012 in western Maryland.

Habitat

Winter Habitat. Northern long-eared bats predominantly overwinter in hibernacula of various sizes that include caves and abandoned mines. Hibernacula have relatively constant, cool temperatures with very high humidity and no air currents. Individuals most often roost in small crevices or cracks in cave or mine walls or ceilings but are also infrequently observed hanging in the open. Less commonly, northern long-eared bats have been observed overwintering in abandoned railroad tunnels, storm sewers, aqueducts, attics, and other non-cave or mine hibernacula with temperature, humidity, and air flow conditions resembling suitable caves and mines.

Summer Habitat. In summer, northern long-eared bats typically roost individually or in colonies underneath bark or in cavities or crevices of both live trees and snags. Males and nonreproductive females may also roost in cooler locations, including caves and mines. Individuals have also been observed roosting in colonies in buildings, barns, on utility poles, and in other man-made structures. The species has been documented to roost in many species of trees, including black oak (*Quercus velutina*), northern red oak (*Q. rubra*), silver maple (*Acer saccharinum*), black locust (*Robinia pseudoacacia*),

American beech (*Fagus grandifolia*), sugar maple (*A. saccharum*), sourwood (*Oxydendrum arboreum*), and shortleaf pine (*Pinus echinata*). Foster and Kurta (1999) found that northern long-eared bats are likely to use a variety of trees as long as they form suitable cavities or retain bark rather than being dependent on particular tree species. Owen et al. (2002) found that tree-roosting maternal colonies chose roosting sites in larger trees that were taller than the surrounding stand and in areas with abundant snags. Carter and Feldhamer (2005) indicate that resource availability drives roost tree selection more than the actual tree species. However, a number of studies have shown that the species more often roosts in shade-tolerant deciduous trees rather than conifers. Additionally, the FWS concludes in its final listing that the tendency for northern-long eared bats to use healthy live trees for roosting is fairly low.

Northern long-eared bats actively form colonies in the summer, but such colonies are frequently in flux because members will frequently depart to be solitary or to form smaller groups and later return to the main unit. This behavior is described as “fission-fusion,” and it also results in individuals often switching tree roosts (typically every two to three days). Roost trees are often close to one another within the species’ summer range with various studies documenting distances between trees ranging from 20 feet (ft; 6.1 meters (m)) to 2.4 mi (3.9 km).

Spring Staging. Spring staging is the time period between winter hibernation and spring migration to summer habitat when bats begin to gradually emerge from hibernation. Individuals will exit the hibernacula to feed, but re-enter the same or alternative hibernacula to resume periods of physical inactivity. The staging period is believed to be short for the northern long-eared bat and may last from mid-March through early May with variations in timing and duration based on latitude and weather.

Fall Swarming. Fall swarming is the time period between the summer and winter seasons and includes behaviors such as copulation, introduction of juveniles to hibernacula, and stop-overs at sights between summer and winter regions. Both males and females are present together at swarming sites, and other bat species are often present as well. For northern long-eared bats, the swarming period may occur between July and early October, depending on latitude within the species' range. Northern long-eared bats may use caves and mines during swarming. Little is known about roost tree selection during this period, but some studies suggest that a wider variation in tree selection may occur during swarming than during the summer.

Biology

Hibernation. Northern long-eared bats hibernate during winter months. Individuals arrive at hibernacula in August or September, enter hibernation in October and November, and emerge from hibernacula in March or April. The species has shown a high degree of repeated hibernaculum use, although individuals may not return to the same hibernacula in successive seasons. Northern long-eared bats often inhabit hibernacula in small numbers with other bat species, including little brown bats, big brown bats (*Eptesicus fuscus*), eastern small-footed bats (*Myotis leibii*), tri-colored bats (*Perimyotis subflavus*), and Indiana bats. Northern long-eared bats have been observed moving among hibernacula during the winter hibernation period, but individuals do not feed during this time, and the function of this behavior is not well understood.

Migration and Homing. Northern long-eared bats migrate relatively short distances (between 56 km (35 mi) and 89 km (55 mi)) from summer roosts and winter hibernacula. Spring migration period typically occurs from mid-March to mid-May, and fall migration typically occurs between mid-August and mid-October.

Reproduction. Northern long-eared bats mate from late July in northern regions to early October in southern regions. Hibernating females store sperm until spring, and ovulation takes place when females emerge from hibernacula. Gestation is estimated to be 60 days, after which time females give birth to a single pup in late May or early June. Females raise their young in maternity colonies, which generally consist of 30 to 60 individuals (females and young). Roost tree selection changes depending on reproductive stage with lactating females roosting higher in tall trees with less canopy cover. Maximum lifespan for northern long-eared bats is estimated to be up to 18.5 years, and the highest rate of mortality occurs during the juvenile stage.

Foraging Behavior. Northern long-eared bats are nocturnal foragers that use hawking and gleaning in conjunction with passive acoustic cues to collect prey. The species' diet includes moths, flies, leafhoppers, caddisflies, beetles, and arachnids. Individuals forage 1 to 3 m (3 to 10 ft) above the ground between the understory and canopy of forested hillsides and ridges with peak foraging activity occurring within five hours after sunset.

Home Range. Northern long-eared bats exhibit site fidelity to their summer home range, during which time individuals roost and forage in forests. Studies indicate a variety of home range sizes—from as little as 8.6 ha (21.3 ac) to as large as 172 ha (425 ac). Some studies indicate differences in ranges between sexes, while others find no significant differences.

Factors Affecting the Species

The FWS identifies WNS, a disease that affects hibernating bats and is caused by the fungus *Pseudogymnoascus destructans*, to be the predominant threat to this species' continued existence. Other factors include human disturbance of hibernacula and loss of summer habitat due to forest conversion and forest management.

Occurrence Within the Action Area

Hibernacula and roosting colonies are not known to be present in the IP2 and IP3 action area. A total of 90 hibernaculum have been identified in New York. Although northern long-eared bats tend to migrate short distances from winter hibernaculum to summer roosts, the NRC conservatively assumes that some hibernacula could be within migratory distance because the locations of New York hibernacula are not publically available to allow the NRC to determine proximity of the hibernacula to the IP2 and IP3 site. Additionally, during a 2014 acoustic survey associated with the Algonquin Incremental Market gas pipeline project, Barton & Loguidice, D.P.C. (B&L 2014) detected northern long-eared bats at a survey site that was within 3 mi (4.8 km) of the IP2 and IP3 site. In the *Northern Long-Eared Bat Interim Conference and Planning Guidance*, the FWS (2014) directs surveyors to assume that single acoustic detections of northern long-eared bats represent potential home range habitat within a 3-mi (4.8-km) radius of the detection site. Given the presence of possible roosting trees in the forest at the north end of the site and the positive detection of northern long-eared bats within 3 mi (4.8 km) of the IP2 and IP3 site in 2014, the NRC staff finds it possible that northern long-eared bats may use the IP2 and IP3 site as summer habitat.

5.2 Indiana Bat

The FWS listed the Indiana bat as endangered in 1967 (32 FR 4001). The FWS designated critical habitat for the Indiana bat in 1976 (41 FR 41914) to include 11 caves and 2 mines in six states. No designated critical habitat occurs in New York.

Information on the species is organized according to the description of the species in the FWS's Draft Recovery Plan (Pruitt and TeWinkel 2007) and is drawn from this source unless otherwise cited.

Taxonomy and Species Description

The FWS recognizes the Indiana bat to be a monotypic species. Alternative common names include Indiana myotis, social bat, pink bat, and little sooty bat.

The Indiana bat is a medium-sized bat that closely resembles the northern long-eared bat and little brown bat and is distinguished from the two by its ear size (northern long-eared bat) and distinctly keeled calcar and lighter nose color (little brown bat). Adults are generally 1.6 to 1.9 inches (in.; 4.1 to 4.9 centimeters (cm)) in length, grayish brown in color, and have ears and wing membranes that are flat in coloration and do not contrast with the fur.

Distribution and Relative Abundance

The Indiana bat may occur in 20 States in the eastern United States from New England to the Midwest, mainly within the central areas of this region from Vermont to southern Wisconsin, eastern Oklahoma, and Alabama. In summer, Indiana bat maternity colonies and individuals may occur throughout this range. In winter, populations are distributed among approximately 280 hibernacula in 19 States. New York has a total of 10 known hibernacula in caves and mines in Albany, Essex, Jefferson, Onondaga, Ulster, and Warren Counties (NYNHP 2013). The nearest of these counties to the IP2 and IP3 site is Ulster County, which is about 20 mi (32 km) to the north of the site at its closest point. The two largest hibernating colonies in the New York/New England area (estimated populations in 2005 of over 11,300 and 15,400 individuals) are in two abandoned mines located in Ulster County, New York, approximately 45 mi (72 km) north of the site near the Town of Rosendale (Pruitt and TeWinkel 2007; Sanders and Chenger 2001). Maternity colonies and bachelor colonies have been identified through radio-telemetry and mist-net captures in seven New York counties: Albany (bachelor only), Dutchess, Essex (maternity only), Jefferson, Onondaga (maternity only), Orange (bachelor only), and Ulster (NYNHP 2013). FWS (2013) rangewide population estimates indicate that the New York population was 17,772 in 2013, which represents a 13.5 percent increase from 2011 estimates. However, this number still represents a 57 percent decline from the FWS's 2005 estimate of 41,745 individuals.

Habitat

Winter Habitat. Indiana bats prefers hibernacula in areas with karst (limestone, dolomite, and gypsum), although it may also use other cave-like locations, such as mines. Suitable hibernacula have low temperatures (below 10 degrees Celsius (°C; 50.0 degrees Fahrenheit (°F)) with infrequent drops below freezing), high humidity, and little to no air currents.

Spring and Fall Roosts. During fall and spring, Indiana bats use roosting sites similar to those selected in the summer with the exception of pines (*Pinus* spp.), which are more commonly occupied in spring and fall. Indiana bats tend to roost individually more often than in the summer and switch trees every two to three days, although individuals tend to show fidelity to individual trees and roosting areas within and among years.

Summer Habitat. High quality summer habitat includes mature forest stands containing open subcanopies, multiple moderate- to high quality snags, and trees with exfoliating bark (Farmer et al. 2002). At least 33 species of trees have been documented to serve

as roosts for reproductive females and their young; these include various ash (*Faxinus* spp.), elm (*Ulmus* spp.), hickory (*Carya* spp.), maple (*A*cer spp.), poplar (*Populus* spp.), and oak (*Quercus* spp.). Most trees occupied by females are dead or dying, and individuals can also be found under the bark of dead sections of living trees. Primary roosts usually receive direct sunlight for more than half the day; are unimpeded by vines or small branches; are typically within canopy gaps in a forest, in a fenceline, or along a wooded edge; and are found within 15 m (50 ft) of a forest edge.

Biology

Fall Swarming and Mating. Indiana bats arrive at hibernacula as early as late July, and the number of bats increases throughout August and into September and early October. During this period, Indiana bats fly in and out of cave entrances from dusk to dawn with relatively low numbers of individuals roosting during the day. Mating occurs during the later period of the fall swarming months. Individuals also gain weight during this time to prepare for hibernation. Parsons et al. (2003) found that bats may travel relatively long distances (up to 27 km (17 mi) from swarming sites to roosting sites during the swarming season.

Hibernation. Hibernation typically lasts from October through April, although it may extend from September through May in northern areas, including New York, Vermont, and Michigan. Indiana bats tend to hibernate in the same hibernaculum at which they swarm, and individuals (especially females) return to the same hibernaculum each year. Indiana bats usually hibernate in large, dense clusters ranging from 300 to 484 bats per square foot, although both smaller clusters and large groups of up to 500 bats per square foot have been observed. Indiana bats often inhabit hibernacula with other species of bats, including gray bats (*Myotis grisescens*), Virginia big-eared bats (*Corynorhinus townsendii virginianus*), little brown bats, and northern long-eared bats.

Spring Emergence and Migration. Individuals begin to emerge from hibernacula in April, and emergence continues through May with peak emergence occurring in mid-April. Exact timing varies throughout the species' range depending on latitude and weather, although females tend to emerge in advance of males in most regions. Following emergence, individuals migrate to summer habitat. Indiana bats may migrate hundreds of kilometers from their hibernacula to summer habitat. Winhold and Kurta (2006 in Pruitt and TeWinkel 2007) found that twelve female Indiana bats from maternity colonies in Michigan migrated an average of 477 km (296 mi) to their hibernacula in Indiana and Kentucky, with a maximum migration of 575 km (357 mi). By contrast, in 2005, radiotelemetry studies of 70 spring emerging Indiana bats (primarily females) from three New York hibernacula found that most individuals migrated less than 64 km (40 mi) to their summer habitat.

Summer Life History and Behavior. Reproductive females arrive at summer habitats as early as mid-April and continuing through May. Most Indiana bats from hibernacula in New York fly directly to their summer range in Vermont and southeastern New York beginning in mid-April. Males and nonreproductive females disperse throughout their range and roost individually or in small numbers in the same areas as reproductive females.

Maternity Colony Formation. Maternity colonies typically use 10 to 20 trees each year, although only 1 to 3 of these trees are primary roosts that are used by the majority of females for some or all of the summer (Watrous et al. 2006; Pruitt and TeWinkel 2007). Maternity colonies exhibit fission-fusion characteristics with females switching roosts every two to three days depending on reproductive condition, roost type, and time of the

year. Maternity colonies typically consist of 60 to 80 adult females (Whitaker and Brack 2002). Once established, females usually return to the same colony each year, and fidelity to roost trees and foraging areas has also been observed.

Reproduction. Indiana bats mate during fall swarming, and hibernating females store sperm until spring, at which time ovulation takes place upon emergence. Females give birth to a single pup in June or early July. Females raise young in maternity colonies, as described above. Maximum lifespan for Indiana bats is unknown. One study estimated a survival rate of only 4 percent beyond 10 years, while another captured a single individual 20 years after initial banding.

Foraging Behavior. Indiana bats are nocturnal foragers that use hawking and gleaning in conjunction with passive acoustic cues to collect prey. The species' diet includes insects of the orders Coleoptera, Diptera, Lepidoptera, and Trichoptera. Indiana bats have been described as selective opportunists because they consistently eat moths, flies, beetles, and caddisflies, but will eat non-preferred prey, such as ants, when available. Individuals forage 2 to 30 m (6 to 100 ft) above ground level near streams, riparian areas, forest edges, and other linear landscape features.

Home Range. Studies on the home ranges of Indiana bats have varied widely in their results, and direct comparisons between studies are difficult due to differences in seasons, sexes, and reproductive status of the females studied, all of which appear to affect home range. In Illinois, mean summer range for 11 male and female Indiana bats was calculated to be 145 ha (357 acres), while in Vermont, mean summer range was calculated to be 83 ha (205 acres) for 14 female Indiana bats.

Factors Affecting the Species

The decline of Indiana bats is attributed to urban expansion, habitat loss and degradation, human caused disturbance of caves or mines, insecticide poisoning, and WNS.

Occurrence Within the Action Area

Hibernacula, maternity colonies, and bachelor colonies are not known to be present in in the IP2 and IP3 action area or in Westchester County as a whole. However, the FWS and New York State Department of Environmental Conservation (NYSDEC) have successfully tracked female Indiana bats from their hibernacula to spring roosts in New York and found that females traveled distances of 12 to 40 mi (19 to 64 km) (FWS 2012; NYNHP 2013). Additionally, during a 2014 acoustic survey associated with the Algonquin Incremental Market gas pipeline project, B&L (2014) detected Indiana bats at a survey site that was within 5 mi (8 km) of the IP2 and IP3 site. In the *Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects*, the FWS (2011) directs surveyors to assume that single acoustic detections of Indiana bats have a potential home range extending within a 5-mi (8-km) radius of the detection site. Given the presence of large hibernacula within migrating distance of the IP2 and IP3 site, the presence of suitable foraging habitat and possible roosting trees in the forest at the north end of the site, and the positive detection of Indiana bats within 5 mi (8 km) of the IP2 and IP3 site in 2014, the NRC staff finds it possible that Indiana bats may use the IP2 and IP3 site as summer habitat.

6.0 Proposed Action Effects Analysis

6.1 Direct Effects

This section considers the potential direct effects of the proposed IP2 and IP3 license renewal on the northern long-eared bat and Indiana bat. As stated in the description of the proposed action, the proposed license renewal would allow IP2 and IP3 to continue operating through 2033 and 2035, respectively. The types of direct impacts that the northern long-eared bat and Indiana bat could experience during the operation of a nuclear plant (generically) include (1) mortality or injury from collisions with plant structures; (2) habitat loss, degradation, disturbance, or fragmentation, and associated effects; or (3) behavioral changes resulting from construction or refurbishment activities, regular site maintenance, and infrastructure repairs during the proposed license renewal term. These impacts are discussed below specific to the proposed IP2 and IP3 license renewal.

Mortality or Injury from Collisions with Plant Structures

A number of studies have documented bat mortality or injury resulting from collisions with man-made structures. Saunders (1930) reported that five bats (of the species eastern red bat (*Lasiurus borealis*), hoary bat (*L. cinereus*), and silver-haired bat (*Lasionycteris noctivagans*)) were killed when they collided with a lighthouse in Ontario, Canada. In Kansas, Van Gelder (1956) documented five eastern red bats that collided with a television tower. In Florida, Crawford and Baker (1981) collected 54 bats of seven species that collided with a television tower over a 25-year period; Zinn and Baker (1979) reported 12 dead hoary bats at another television tower in the state over an 18-year period; and Taylor and Anderson (1973) reported one yellow bat (*Lasiurus intermedius*) victim at a third Florida television tower. Bat collisions have been reported with communications towers in North Dakota, Tennessee, and Saskatchewan, Canada; with convention center windows in Chicago, Illinois; and with power lines, barbed wire fences, and vehicles (Johnson and Strickland 2003). More recently, bat collisions with wind turbines have been of concern in North America. Bat fatalities have been documented at most wind facilities throughout the United States and Canada (USGS 2015). For instance, during a 1996-1999 study at the Buffalo Ridge wind power development project in Minnesota, Johnson et al. (2003) reported 183 bat fatalities, most of which were hoary bats and eastern red bats. The U.S. Geological Survey's Fort Collins Science Center estimates that tens to hundreds of thousands of bats die at wind turbines in North America each year (USGS 2015).

Bat collisions with man-made structures at nuclear power plants are not well documented but are likely to be rare based on the available information. In an assessment of the potential effects of Davis-Besse Nuclear Power Station (Davis-Besse) license renewal on northern long-eared bats, the NRC (2014) noted that four dead bats were collected at the plant during bird mortality studies conducted from 1972-1979. Two red bats (*Lasiurus borealis*) were collected at the cooling tower in 1974, and one big brown bat and one tri-colored bat were collected near other plant structures in 1973 and 1974, respectively. The NRC (2014) found that future collisions of bats would be extremely unlikely, and therefore, discountable given the small number of bats collected in the 1972-1979 study and the marginal suitable habitat that the Davis-Besse site provides. The FWS (2014) concurred with this determination.

Unlike Davis-Besse, IP2 and IP3 do not have cooling towers, which significantly reduces the potential for bat collisions on the site. The tallest structures associated with IP2 and

IP3 site are the 134-ft (40.8-m)-tall IP2 and IP3 turbine buildings and the 250-ft (76.2-m)-tall reactor containment structures (Entergy 2007). Additionally, because the Indiana bat has been listed under the ESA since IP2 and IP3 began operating, the ESA requires the NRC and the applicant to consult with the FWS if new information reveals effects of the action that may affect listed species in a manner or to an extent not previously considered (50 CFR 402.16(b)). No such information has been identified for which the NRC has determined initiation of consultation is appropriate. Entergy (2015) reviewed its condition reporting system records over the past five years (2010 through April 2015) and found no records of injured or dead bats of any species. Because no bat collisions are known to have occurred on the IP2 and IP3 site to date, the NRC staff finds it reasonable to assume that the likelihood of future collision resulting in injury or mortality of northern long-eared or Indiana bats would be extremely unlikely to occur. Therefore, the NRC staff finds this potential impact to the two species to be discountable.

Habitat Loss, Degradation, Disturbance, or Fragmentation, and Associated Effects

In its final rule listing the northern long-eared bat (80 FR 17974), the FWS states that forest conversion and forest modification (management) are two of the most common causes of habitat loss, degradation, disturbance, and fragmentation affecting the species. Forest conversion is the loss of forest to another land use type, such as cropland, residential, or industrial. Forest conversion can affect bats in several ways, including:

- Loss of suitable roosting or foraging habitat;
- Fragmentation of remaining forest patches, leading to longer flights between suitable roosting and foraging habitat;
- Removal of travel corridors, which can fragment bat colonies and networks; and
- Direct injury or mortality during active forest clearing and construction (80 FR 17974).

Forest management maintains forest habitat at the landscape level but includes practices that can have direct and indirect effects on bats. Impacts from forest management are typically temporary in nature and can include positive, neutral, and negative impacts, such as:

- Maintaining or increasing suitable roosting and foraging habitat within the species' home range (positive);
- Removing trees or small areas of forest outside of the species' summer home range or away from hibernacula (neutral);
- Removing potential roost trees within the species' summer home range (negative);
- Performing management activities near hibernacula that could disturb hibernating bats (negative); and
- Direct injury or mortality during forest clearing (negative) (80 FR 17974).

As previously indicated in Section 3.0, the IP2 and IP3 action area includes a 70-ac (28-ha) hardwood forest at the north end of the site as well as small tracts of forest totaling 25 ac (10 ha) interspersed among paved areas and facilities. Entergy does not intend to expand the existing facilities or otherwise perform construction or maintenance activities within the site's forested areas during the proposed license renewal term (Entergy 2015;

NRC 2010). Accordingly, any potential summer roosting habitat for either the northern long-eared bat or Indiana bat would be unaffected by the proposed license renewal. The continued preservation of the existing forested areas on the site would result in a positive impact to the two species, if present on or near the site.

Behavioral Changes Resulting from Construction and Other Site Maintenance Activities

Bats can be adversely affected through behavioral changes resulting from construction and site maintenance activities. For instance, bats could abandon previously used summer habitat due to increased noise, lighting, and other human activity during construction in a nearby area. Increased noise may also affect foraging success. Schaub et al. (2003) found that foraging success of the greater mouse-eared bat (*Myotis myotis*) diminished in areas with noise mimicking the traffic sounds that would be experienced within 15 m (49 ft) of a highway.

Continued operation of IP2 and IP3 during the proposed license renewal term would not include construction and would involve no other maintenance activities other than those routine activities already performed on the site. Impacts such as noise, lighting, and human activity associated with continued day-to-day activities and site maintenance during the proposed license renewal term would be similar to those that have been ongoing at the site since IP2 and IP3 began operating in the mid-1970s and would only occur on the developed, industrial-use portions of the site. As described in the FSEIS (NRC 2010), IP2 and IP3 comply with the Village of Buchanan's sound ordinance, which limits the combined sound frequencies at the property line to 48 decibels.

Ongoing noise, lighting, and human activity during the proposed license renewal period could result in behavioral changes of migrating or summer roosting individuals, such as the expenditure of additional energy to find alternative suitable roosts. However, the FWS (2010) has found that bats that are repeatedly exposed to predictable, loud noises may habituate to such stimuli over time. Accordingly, the NRC staff assumes that any northern long-eared bats or Indiana bats, if present in the action area, have already acclimated to regular site disturbances and that continued disturbances during the license renewal term would not be able to be meaningfully measured, detected, or evaluated and would never reach the scale where a take might occur.

In Chapter 3 of the FSEIS, the NRC (2010) addresses the potential for Entergy to replace the IP2 and IP3 reactor vessel head and control rod drive mechanisms. If replaced, this project would occur in a 60-day period during a regular refueling outage. Refueling outages at IP2 and IP3 typically require 950 workers, and the reactor vessel head and control rod drive mechanism replacements would require an additional 250 workers. The replacement project would require the construction of a permanent storage building for the old reactor vessel head and control rod drive mechanisms. This building would likely be constructed near the onsite structure storing the old IP2 and IP3 steam generators and would occupy less than 446 square meters (m^2; 4800 square feet (ft^2)) on previously disturbed land. Although the replacement project would result in additional noise, lighting, and workers on the site, the project would occur over a relatively short period of time and is unlikely to create noticeable impacts beyond those that bats would experience during a typical refueling outage. As indicated in the previous paragraph, northern long-eared bats and Indiana bats, if present in the action area, have likely acclimated to noise, lighting, and human activity associated with IP2 and IP3 day-to-day operations. The NRC staff does not believe that the replacement project, if completed, would result in long-term behavioral changes in bats beyond those resulting from day-to-day operations that would be able to be meaningfully measured, detected, or evaluated.

Additionally, such impacts would be temporary in nature and would be unlikely to reach the scale where a take might occur.

6.2 Indirect Effects

Indirect effects are those that are caused by the proposed action that are later in time, but are still reasonably certain to occur (50 CFR 402.02). The NRC did not identify any indirect effects associated with the proposed action. Termination of IP2 and IP3 operations and associated decommissioning of each reactor would occur eventually regardless of license renewal. While the proposed license renewal would delay the date of reactor shutdown, it would not significantly alter decommissioning impacts. Future effects on Federally listed species associated with decommissioning of IP2 and IP3 at the end of the proposed license renewal term would be addressed through section 7 consultation at the time of decommissioning.

6.3 Interrelated and Interdependent Effects

Interrelated actions are those actions that are part of a larger action and depend on the larger action for their justification (50 CFR 402.02). Interdependent actions are those actions having no independent utility apart from the proposed action (50 CFR 402.02). In its biological opinion on shortnose and Atlantic sturgeons for IP2 and IP3 continued operations and proposed license renewal, the NMFS (2013) did not identify any interrelated or interdependent actions associated with the proposed license renewal. The NRC staff has not identified any new information since that time that would constitute interrelated or interdependent actions and that might affect the northern long-eared or Indiana bat.

6.4 Cumulative Effects

Cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02).

The NRC did not identify any cumulative effects within the action area. The proposed Algonquin Incremental Market project includes construction of a gas pipeline that would cross a portion of the IP2 and IP3 property. However, because this project requires Federal approval, the Federal Energy Regulatory Commission (FERC) has consulted under ESA section 7 with the FWS regarding impacts to Federally listed species, including northern long-eared and Indiana bats, that could result from this project. FERC (2015) documented the results of its consultation, in which the FWS concurred with FERC's determinations that the proposed project would *not likely jeopardize the continued existence* of the northern long-eared bat and *may affect, but is not likely to adversely affect* the Indiana bat, in its final environmental impact statement for the project.

7.0 Conclusion and Determination of Effects

Summary of Effects

The proposed license renewal could result in injury or mortality of northern long-eared or Indiana bat individuals through collision with plant structures. However, the NRC staff find this impact to be *discountable* because this impact is extremely unlikely given that no bat collisions of any species have been documented on the site since IP2 and IP3 began operating in the mid-1970s. The proposed license renewal would result in no

habitat loss, degradation, disturbance, or fragmentation, and the continued preservation of forest habitat on the site would result in a *beneficial* impact to the two species, if present on the site. The NRC staff finds that site maintenance activities would not result in effects significantly different than those experienced by bats during the current license terms and that any additional impacts resulting from the replacement of the IP2 and IP3 reactor vessel head and control rod drive mechanisms would be temporary, *insignificant*, and *discountable*. Accordingly, the NRC makes the following conclusions.

Northern Long-Eared Bat

The NRC staff concludes that the proposed action *may affect, but is not likely to adversely affect* the northern long-eared bat.

Indiana Bat

The NRC staff concludes that the proposed action *may affect, but is not likely to adversely affect* the Indiana bat.

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