



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 18, 2016

Mr. Bryan C. Hanson
Senior Vice President
Exelon Generation Company, LLC
President and Chief Nuclear Officer (CNO)
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2 - ENVIRONMENTAL ASSESSMENT
AND FINDING OF NO SIGNIFICANT IMPACT RELATED TO ULTIMATE HEAT
SINK MODIFICATION (TAC NOS. MF4671 AND MF4672)

Dear Mr. Hanson:

Enclosed is a copy of the environmental assessment and finding of no significant impact related to your application dated August 19, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14231A902), as supplemented by letters dated January 20, 2015 (ADAMS Accession No. ML15020A246), March 31, 2015 (ADAMS Accession No. ML15090A604), April 30, 2015 (ADAMS Accession No. ML15120A396), August 24, 2015 (ADAMS Accession No. ML15236A144), October 9, 2015 (ADAMS Accession No. ML15282A345), October 30, 2015 (ADAMS Accession No. ML15303A326), November 9, 2015 (ADAMS Accession No. ML15313A301), December 16, 2015 (ADAMS Accession No. ML15364A369), February 12, 2016 (ADAMS Accession No. ML16043A496), April 29, 2016 (ADAMS Accession No. ML16123A014), and June 16, 2016 (ADAMS Accession No. ML16169A139).

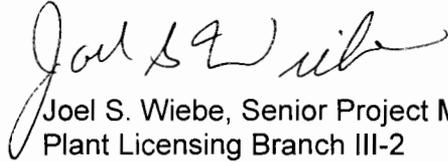
The amendments increase the ultimate heat sink temperature allowable limit in technical specification surveillance requirement 3.7.9.2 to $\leq 102^{\circ}$ F.

B. Hanson

-2-

The assessment is being forwarded to the Office of the Federal Register for publication.

Sincerely,

A handwritten signature in cursive script, appearing to read "Joel S. Wiebe".

Joel S. Wiebe, Senior Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. STN 50-456 and STN 50-457

Enclosure:
Environmental Assessment

cc w/encl: Distribution via Listserv

NUCLEAR REGULATORY COMMISSION

[Docket Nos. 50-456 and 50-457; NRC-2016-XXXX]

Exelon Generation Company, LLC

Braidwood Station, Units 1 and 2

AGENCY: Nuclear Regulatory Commission.

ACTION: Environmental assessment and finding of no significant impact; issuance.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is considering issuance of amendments to Renewed Facility Operating License Nos. NPF-72 and NPF-77 issued to Exelon Generation Company, LLC (Exelon, the licensee) for operation of Braidwood Station, Units 1 and 2 (Braidwood), located in Will County, Illinois. The proposed amendments would revise the maximum allowable technical specification (TS) temperature of the ultimate heat sink (UHS) for the plant. The NRC staff is issuing a final Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) associated with the proposed license amendments.

DATES: The environmental assessment and finding of no significant impact referenced in this document is available on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID **NRC-2016-XXXX** when contacting the NRC about the availability of information regarding this document. You may obtain publically available information related to this document using any of the following methods:

- **Federal Rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2016-XXXX**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**
You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number (no.) for each document referenced (if that document is available in ADAMS) is provided the first time that a document is referenced. For the convenience of the reader, the ADAMS accession numbers are also provided in a table in the "Availability of Documents" section of this document.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Joel S. Wiebe, Office of Nuclear Reactor Regulation; U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-6606; e-mail: Joel.Wiebe@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. Introduction

The NRC is considering issuance of amendments to Renewed Facility Operating License Nos. NPF-72 and NPF-77 issued to Exelon for operation of Braidwood located in Will County, Illinois. Exelon submitted its license amendment request in accordance with Title 10 of the *Code of Federal Regulation* (10 CFR), Section 50.90, by letter dated August 19, 2014 (ADAMS Accession No. ML14231A902). Exelon subsequently supplemented its request as described under "Description of the Proposed Action" in Section II of this document. If approved, the license amendments would increase the allowable TS temperature limit of the cooling water supplied to the plant from the UHS from less than or equal to (\leq) 100 degrees Fahrenheit ($^{\circ}$ F) (37.8 degrees Celsius [$^{\circ}$ C]) to \leq 102 $^{\circ}$ F (38.9 $^{\circ}$ C). The NRC staff prepared an EA to document its findings related to the proposed license amendments in accordance with 10 CFR 51.21. Based on results of the EA documented herein, the NRC did not identify any significant environmental impacts associated with the proposed amendments and is, therefore, issuing a FONSI in accordance with 10 CFR 51.32.

II. Environmental Assessment

Plant Site and Environs

Braidwood is located in Will County, Illinois approximately 50 miles (mi; 80 kilometers [km]) southwest of the Chicago Metropolitan Area and 20 mi (32 km) south-southwest of Joliet. The Kankakee River is approximately 5 mi (8 km) east of the eastern site boundary. An onsite 2,540-acre (ac; 1,030-hectare [ha]) cooling pond provides condenser cooling. Cooling water is

withdrawn from the pond through the lake screen house, which is located at the north end of the pond. Heated water returns to the cooling pond through a discharge canal west of the lake screen house intake that is separated from the intake by a dike. The pond typically holds 22,300 acre-feet (27.5 million cubic meters) of water at any given time. The cooling pond includes both “essential” and “non-essential” areas. The essential cooling pond is the portion of the cooling pond that serves as the UHS for emergency core cooling, and it consists of a 99-ac (40-ha) excavated area of the pond directly in front of the lake screen house. The essential cooling pond’s principle functions are to dissipate residual heat after reactor shutdown and to dissipate heat after an accident. It is capable of supplying Braidwood’s cooling system with 30 days of station operation without additional makeup water. For clarity, use of the term “UHS” in this document refers to the 99-ac (40-ha) essential cooling pond, and use of the term “cooling pond” or “pond” describes the entire 2,540-ac (1,030-ha) area, which includes both the essential and non-essential areas.

The cooling pond is part of the Mazonia-Braidwood State Fish and Wildlife Area, which encompasses the majority of the non-UHS area of the cooling pond as well as Illinois Department of Natural Resources (IDNR)-owned lands adjacent to the Braidwood site to the south and southwest of the cooling pond. Exelon and the IDNR have jointly managed the cooling pond as part of the Mazonia-Braidwood State Fish and Wildlife Area since 1991 pursuant to a long-term lease agreement. Under the terms of the agreement, the public has access to the pond for fishing, waterfowl hunting, fossil collecting, and other recreational activities.

The cooling pond is a wastewater treatment works as defined by Section 301.415 of Title 35 of the *Illinois Administrative Code* (35 IAC 301.415). Under this definition, the cooling pond is not considered waters of the State under Illinois Administrative Code (35 IAC 301.440) or

waters of the United States under the Federal Clean Water Act (40 CFR 230.3(s)), and so the cooling pond is not subject to State water quality standards. The cooling pond can be characterized as a managed ecosystem where IDNR fish stocking and other human activities primarily influence the species composition and population dynamics.

Since the beginning of the lease agreement between Exelon and IDNR, the IDNR has stocked the cooling pond with a variety of game species, including largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), blue catfish (*Ictalurus furcatus*), striped bass (*Morone saxatilis*), crappie (*Pomoxis* spp.), walleye (*Sander vitreum*), and tiger muskellunge (*Esox masquinongy* × *lucius*). IDNR performs annual surveys to determine which fish to stock based on fishermen preferences, fish abundance, different species' tolerance to warm waters, predator and prey dynamics, and other factors. Because of the high water temperatures experienced in the summer months, introductions of warm-water species, such as largemouth bass and blue catfish, have been more successful than introductions of cool-water species, such as walleye and tiger muskellunge. Since annual surveys began in 1980, IDNR has collected 47 species in the cooling pond. In recent years, bluegill (*Lepomis macrochirus*), channel catfish (*Ictalurus punctatus*), threadfin shad (*Dorosoma petenense*), and common carp (*Cyprinus carpio*) have been among the most abundant species in the cooling pond. Gizzard shad (*Dorosoma cepedianum*), one of the most frequently affected species during periods of elevated pond temperatures, have decreased in abundance dramatically in recent years, while bluegill, which can tolerate high temperatures with relatively high survival, have noticeably increased in relative abundance. IDNR-stocked warm water game species, such as largemouth bass and blue catfish, continue to persist in small numbers, while cooler water stocked species, such as walleye and tiger muskellunge, no longer appear in IDNR survey collections. No

federally listed species or designated critical habitats protected under the Endangered Species Act occur within or near the cooling pond.

The Kankakee River serves as the source of makeup water for the cooling pond. The river also receives continuous blowdown from the cooling pond. Water is withdrawn from a small river screen house located on the Kankakee River, and liquid effluents from Braidwood are discharged into the cooling pond blowdown line, which subsequently discharges into the Kankakee River.

The plant site and environs are described in greater detail in Chapter 3 of the NRC's November 2015, Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Braidwood Station, Units 1 and 2—Final Report (NUREG-1437, Supplement 55; ADAMS Accession No. ML15314A814) (herein referred to as "Braidwood FSEIS" [Final Supplemental Environment Impact Statement]). Figure 3-5 on page 3-7 of the Braidwood FSEIS depicts the Braidwood plant layout, and Figure 3-4 on page 3-6 depicts the cooling pond, including the portion of the pond that constitutes the essential cooling pond (or UHS) and the blowdown line to the Kankakee River.

Description of the Proposed Action

The proposed action would increase the allowable TS temperature limit of the cooling water supplied to the plant from the UHS from ≤ 100 °F (37.8 °C) to ≤ 102 °F (38.9 °C). Specifically, the proposed action would amend TS 3.7.9.2, which currently states, "Verify average water temperature of UHS is ≤ 100 °F." Under the current TS, if the average UHS temperature as measured at the discharge of the operating Essential Service Water system pumps is greater than 100 °F (37.8 °C), TS 3.7.9 Required Actions A.1 and A.2 would be entered concurrently and would require the licensee to place Braidwood in hot standby (Mode 3)

within 6 hours and cold shutdown (Mode 5) within 36 hours. The proposed action would allow Braidwood to continue to operate during times when the UHS indicated temperature exceeds 100 °F (37.8 °C) but is less than or equal to 102 °F (38.9 °C). The proposed action would not modify the TS Required Actions, Completion Times, Frequency of Surveillance Requirement performance, or any other portion of TS 3.7.9. Thus, the proposed amendments would require the licensee to place Braidwood in Mode 3 within 6 hours and Mode 5 within 36 hours if the UHS indicated temperature is greater than 102 °F (38.9 °C).

The proposed action to amend TS 3.7.9.2 is in accordance with the licensee's application dated August 19, 2014 (ADAMS Accession No. ML14231A902), as supplemented by letters dated January 20, 2015 (ADAMS Accession No. ML15020A246), March 31, 2015 (ADAMS Accession No. ML15090A604), April 30, 2015 (ADAMS Accession No. ML15120A396), August 24, 2015 (ADAMS Accession No. ML15236A144), October 9, 2015 (ADAMS Accession No. ML15282A345), October 30, 2015 (ADAMS Accession No. ML15303A326), November 9, 2015 (ADAMS Accession No. ML15313A301), December 16, 2015 (ADAMS Accession No. ML15364A369), February 12, 2016 (ADAMS Accession No. ML16043A496), April 29, 2016 (ADAMS Accession No. ML16123A014), and June 16, 2016 (ADAMS Accession No. ML16169A139).

Need for the Proposed Action

The proposed action is needed to provide the licensee with operational flexibility during periods of high UHS temperatures in order to avoid plant shutdown. These conditions include elevated air temperatures, high humidity, and low wind speed. For instance, in July 2012, Exelon requested, and the NRC approved, Enforcement Discretion to avoid plant shutdown and associated transient following unprecedented hot weather and drought conditions in northern

Illinois that resulted in the Braidwood average discharge temperature of the essential service water pumps used to monitor compliance with TS 3.7.9.2 to exceed the limit of ≤ 100 °F (37.8 °C) (ADAMS Accession Nos. ML12192A637 and ML12194A681). The NRC's Enforcement Discretion allowed Exelon to continue to operate Braidwood with an average UHS water temperature of up to ≤ 102 °F (38.9 °C) for a period of 24 hours before Exelon would be required to place Braidwood in hot standby (Mode 3) in accordance with TS 3.7.9 Required Action A.1. The Enforcement Discretion period extended from July 7, 2012, at 9:56 p.m. until July 8, 2012, p.m. (ADAMS Accession No. ML12194A681). During that time, the average UHS water temperature exceeded 100 °F (37.8 °C) (ADAMS Accession Nos. ML12249A256 and ML12349A174). Although Exelon did not anticipate making a license amendment request at the time of the NRC's Enforcement Discretion, Exelon is seeking the current license amendments in anticipation of future meteorological conditions that may continue to challenge the current UHS TS temperature limit of ≤ 100 °F (37.8 °C).

Environmental Impacts of the Proposed Action

With regard to radiological impacts, the proposed action would not result in any changes in the types of radioactive effluents that may be released from the plant offsite. No significant increase in the amount of any radioactive effluent released offsite or significant increase in occupational or public radiation exposure is expected from the proposed action. Separate from this EA, the NRC staff is evaluating the licensee's safety analyses of the potential radiological consequences of an accident that may result from the proposed action. The results of the NRC staff's safety analysis will be documented in a safety evaluation (SE). If the NRC staff concludes in the SE that all pertinent regulatory requirements related to radiological effluents are met by the proposed UHS temperature limit increase, then the proposed action would result

in no significant radiological impact to the environment. The NRC staff's SE will be issued with the license amendments, if approved by the NRC.

With regard to potential non-radiological impacts, raising the maximum allowable UHS temperature from ≤ 100 °F (37.8 °C) to ≤ 102 °F (38.9 °C) could result in periods of increased cooling pond water temperatures, especially during periods of extreme high air temperatures, high humidity, and low wind. Because the proposed action would not affect Braidwood's licensed thermal power level, the temperature rise across the condensers as cooling water travels through the cooling system would remain constant. Thus, if water in the UHS were to rise to 102°F (38.9 °C), heated water returning to the cooling pond through the discharge canal, which lies west of the river screen house, would also experience a corresponding 2 °F (1.1 °C) increase. That additional heat load would dissipate across some thermal gradient as discharged water would travel down the discharge canal and through the 99-ac (40-ha) UHS.

Fish kills are likely to occur when cooling pond temperatures rise above 95 °F (35 °C), the temperature at which most fish in the cooling pond are thermally stressed. For example, Section 3.7.4 of the Braidwood FSEIS describes six fish kill events for the period of 2001 through 2015. The fish kill events, which occurred in July 2001, August 2001, June 2005, August 2007, June 2009, and July 2012, primarily affected threadfin shad and gizzard shad, although bass, catfish, carp, and other game fish were also affected. Reported peak temperatures in the cooling pond during these events ranged from 98.4 °F (36.9 °C) to over 100 °F (37.8 °C), and each event resulted in the death of between 700 to as many as 10,000 fish. The event in which cooling pond temperatures exceeded 100 °F (37.8 °C) occurred on July 7 and 8, 2012, and resulted in the death of approximately 3,000 gizzard shad and 100 bass, catfish, and carp (ADAMS Accession No. ML14339A044). This event coincided with the NRC's granting of Enforcement Discretion to allow Braidwood to continue to operate above the

TS limit of ≤ 100 °F (37.8 °C) as previously described in the “Need for the Proposed Action” section of this document. The IDNR attributed this event, as well as four of the other fish kill events, to high cooling pond temperatures resulting from Braidwood operation. Appendix B, Section 4.1 of the Braidwood renewed facility operating licenses (ADAMS Accession Nos. ML053040362 and ML053040366), requires Exelon to report to the NRC the occurrence unusual or important environmental events, including fish kills. Since the issuance of the Braidwood FSEIS in November 2015, Exelon has not reported any additional fish kill events to the NRC.

In Section 4.7.1.3 of the Braidwood FSEIS, the NRC staff concluded that thermal impacts associated with continued operation of Braidwood during the license renewal term (i.e., with a UHS TS limit of ≤ 100 °F) would result in SMALL to MODERATE impacts to aquatic resources in the cooling pond. MODERATE impacts would primarily be experienced by gizzard shad and other non-stocked and low-heat tolerant species. As part of its conclusion, the staff also noted that because the cooling pond is a highly managed system, any cascading effects that result from the loss of gizzard shad (such as reduction in prey for stocked species, which in turn could affect those stocked species’ populations) could be mitigated through IDNR’s annual stocking and continual management of the pond.

Regarding the proposed action, the proposed increase in the allowable UHS temperature limit would not increase the likelihood of a fish kill event attributable to high cooling pond temperatures because the current TS limit for the UHS of ≤ 100 °F (37.8 °C) already results in cooling pond temperatures above those at which most fish species are thermally stressed (95 °F (35 °C)). In effect, if the UHS temperature rises to the current TS limit, fish within or near the discharge canal, within the flow path between the discharge canal and UHS, or within the UHS itself would have already experienced thermal stress and possibly died.

Thus, an incremental increase in the allowable UHS water temperature by 2 °F (1.1 °C) and the corresponding temperature increases within and near the discharge canal and within the flow path between the discharge canal and UHS would not significantly affect the number of a fish kill events experienced in the cooling pond.

While the proposed action would not affect the likelihood of a fish kill event occurring during periods when the average UHS water temperature approaches the TS limit, the proposed action could increase the number of fish killed per high temperature event. For fish with thermal tolerances at or near 95 °F (35 °C), there would likely be no significant difference in the number of affected fish per high temperature event because, as already stated, these fish would have already experienced thermal stress and possibly died and the additional temperature increase would not measurably affect the mortality rate of these individuals. For fish with thermal tolerances above 95 °F (35 °C), such as bluegill, increased mortality is possible, as described below.

The available scientific literature provides conflicting information to support a clear determination of whether the incremental increase of 2 °F (1.1 °C) would result in a subsequent increase in the mortality rate of bluegill or other high-temperature-tolerant fish at temperatures exceeding 100 °F (37.8 °C). For instance, in laboratory studies, Banner and Van Arman (1973) demonstrated 85 percent survival of juvenile bluegill after 24 hours of exposure to 98.6 °F (37.0 °C) water for stock acclimated to 91.2 °F (32.9 °C). At 100.0 °F (37.8 °C), survival decreased to 25 percent, and at 100.4 °F (38.0 °C) and 102.0 °F (38.9 °C), no individuals survived. Even at one hour of exposure to 102.0 °F (38.9 °C) water, average survival was relatively low at between 40 to 67.5 percent per replicate. However, in another laboratory study, Cairns (1956 *in* Banner and Van Arman 1973) demonstrated that if juvenile bluegill were

acclimated to higher temperatures at 3.6 °F (2.0 °C) per day, individuals could tolerate water temperatures up to 102.6 °F (39.2 °C) with 80 percent survival after 24 hours of exposure.

Although these studies provide inconsistent thermal tolerance limits, information from past fish kill events indicates that Cairns' results better describe the cooling pond's bluegill population because Exelon has not reported bluegill as one of the species that has been affected by past high temperature events, including the July 2012 event during which the cooling pond exceeded 100 °F (37.8 °C). Thus, bluegill are likely acclimating to temperature rises at a rate that allows those individuals to remain in high temperature areas until temperatures decrease or that allows individuals time to seek refuge in cooler areas of the pond. Alternately, if Banner and Van Arman's results were more predictive, 75 percent or more of bluegill individuals in high temperature areas of the cooling pond could be expected to die at temperatures approaching or exceeding 100 °F (37.8 °C) for 24 hours, and shorter exposure time would likely result in the death of some reduced percentage of bluegill individuals. Exposure to temperatures approaching 102.0 °F (38.9 °C) for at least one hour would also result in observable deaths. However, as stated previously, Exelon has not reported bluegill as one of the species that has been affected during past fish kills. Consequently, the NRC staff assumes that bluegill and other high-temperature-tolerant species in the cooling pond would experience effects similar to those observed in Cairn's study.

Based on Cairn's results, the proposed action's incremental increase of 2 °F (1.1 °C) could result in the death of some additional high-temperature-tolerant individuals, especially in cases where cooling pond temperatures rise dramatically over a short period of time (more than 3.6 °F (2.0 °C) in a 24-hour period). These additional deaths would likely occur in the region of the UHS nearest to the intake because this water, which is likely near or slightly above 100 °F (37.8 °C) under current operations, could rise by an average of an additional 2 °F (1.1 °C). This

scenario could create conditions just above those individuals' thermal tolerances. Effectively, this area of the UHS, which would have been within the upper thermal limit of habitable conditions for high-temperature-tolerant individuals under the current TS limit, would likely become uninhabitable under the proposed action's TS limit of ≤ 102 °F (38.9 °C). Thus, high-temperature-tolerant individuals in this area that would survive under current conditions could experience thermal stress and possibly die under the proposed action.

Nonetheless, for all fish species (those with thermal tolerances above and below 95 °F [35 °C]), the discharge canal, flow path between the discharge canal and the UHS, and the UHS itself is a small portion of the cooling pond. Thus, while an incremental increase of the UHS to ≤ 102 °F (38.9 °C) would likely increase the area over which cooling pond temperatures would rise, the majority of the cooling pond would remain at tolerable temperatures, and individuals would be able to seek refuge in those cooler areas. Therefore, only fish within or near the discharge canal, within the flow path between the discharge canal and UHS, or within the UHS itself at the time of elevated temperatures would likely be affected, and fish would experience such effects to lessening degrees over the thermal gradient that extends from the discharge canal. This would result in no significant difference in the number of fish killed per high temperature event resulting from the proposed action when compared to current operations for those species with thermal tolerances at or near 95 °F (35 °C) and an insignificant increase in the number of individuals affected for species with thermal tolerances above 95 °F (35 °C), such as bluegill. Additionally, the cooling pond is a managed ecosystem in which fish stocking, fishing pressure, and predator-prey relationships constitute the primary population pressures. Fish populations affected by fish kills generally recover quickly, and thus, fish kills do not appear to significantly influence the fish community structure. This is demonstrated by the fact that the species that are most often affected by high temperature events (threadfin shad and gizzard

shad) are also among the most abundant species in the cooling pond. Managed species would continue to be assessed and stocked by the IDNR on an annual basis in accordance with the lease agreement between Exelon and IDNR. Continued stocking would mitigate any minor effects resulting from the proposed action. Accordingly, the NRC staff concludes that the proposed action would not result in significant impacts to aquatic resources in the cooling pond.

Some terrestrial species, such as birds or other wildlife, rely on fish or other aquatic resources from the cooling pond as a source of food. The NRC staff does not expect any significant impacts to birds or other wildlife because, if a fish kill occurs, the number of dead fish would be a small proportion of the total population of fish in the cooling pond. Furthermore, during fish kills, birds and other wildlife could consume many of the floating, dead fish. Additionally and as described previously, the NRC staff does not expect that the proposed action would result in a significant difference in the number or intensity of fish kill events.

With regard to water resources and ecological resources along and within the Kankakee River, the Illinois Environmental Protection Agency (IEPA) imposes regulatory controls on Braidwood's thermal effluent through Title 35, *Environmental Protection*, Section 302, "Water Quality Standards," of the Illinois Administrative Code (35 IAC 302) and through the National Pollutant Discharge Elimination System (NPDES) permitting process pursuant to the Clean Water Act. Section 302 of the Illinois Administrative Code stipulates that "[t]he maximum temperature rise shall not exceed 2.8 °C (5 °F) above natural receiving water body temperatures," (35 IAC 302.211(d)) and that "[w]ater temperature at representative locations in the main river shall at no time exceed 33.7 °C (93 °F) from April through November and 17.7 °C (63 °F) in other months" (35 IAC 302.211(e)). Additional stipulations pertaining to the mixing zone further protect water resources and biota from thermal effluents. Special Condition 4 of Braidwood NPDES permit no. IL0048321 (ADAMS Accession No. ML14227A712) mirrors these

temperature requirements and also requires that water temperature at the edge of the mixing zone not exceed 60 °F (15.6 °C) from December through March during more than 1 percent of the hours in a 12-month period and that at no time shall the water temperature at such locations exceed the maximum limits by more than 3 °F (1.6 °C) (i.e., 63 °F [17.2 °C]). Under the proposed action, Braidwood thermal effluent would continue to be limited by the Illinois Administrative Code and the Braidwood NPDES permit to ensure that Braidwood operations do not create adverse effects on water resources or ecological resources along or within the Kankakee River. In the past 5 years, Exelon applied for and the IEPA granted one provisional variance to allow higher-than-permitted temperatures at the edge of the discharge mixing zone caused by a period of extremely warm weather and little to no precipitation. Exelon reported no fish kills or other events to the IEPA or the NRC that would indicate adverse environmental effects resulting from the provisional variance. The details of this provisional variance are described in Section 4.7.1.3 of the Braidwood FSEIS. Under the proposed action, Exelon would remain subject to these Federal and State regulatory controls. The NRC staff finds it reasonable to assume that Exelon's continued compliance with, and the State's continued enforcement of, the Illinois Administrative Code and the Braidwood NPDES permit would ensure that Kankakee River water resources and ecological resources are protected. Further, the proposed action would not alter the types or amount of effluents being discharged to the river as blowdown. Therefore, the NRC staff does not expect any significant impacts to water resources or ecological resources within and along the Kankakee River as a result of raising the maximum allowable UHS temperature limit.

During its license renewal environmental review, the NRC staff consulted with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act concerning Federally listed species. During that consultation, the NRC found that the

sheepnose (*Plethobasus cyphus*) and snuffbox (*Epioblasma triquetra*) mussels, northern long-eared bat (*Myotis septentrionalis*), and eastern massasauga (*Sistrurus catenatus*) had the potential to occur in the areas that would be directly or indirectly affected by license renewal (i.e., the action area). In September 2015, Exelon transmitted to the NRC and FWS the results of a mussel survey, which documented the absence of federally listed mussels near the Braidwood discharge site in the Kankakee River (ADAMS Accession No. ML15274A093). Based on this survey and other information described in the Braidwood FSEIS, the NRC concluded that the license renewal may affect, but is not likely to adversely affect the sheepnose mussel. For the remaining species, the NRC determined that license renewal would have no effect on the snuffbox, northern long-eared bat, and eastern massasauga. The FWS concurred with the NRC's "not likely to adversely affect" determination in a letter dated October 20, 2015 (ADAMS Accession No. ML15299A013). The results of the consultation are further summarized in the Record of Decision for Braidwood license renewal (ADAMS Accession No. ML15322A317). As previously described, the proposed increase in the allowable UHS temperature limit would not affect water resources or ecological resources along and within the Kankakee River. The proposed action would also not result in any disturbance or other impacts to terrestrial habitats. Because impacts would be confined to the cooling pond and no federally listed species or designated critical habitats have been identified within or near the cooling pond, the NRC staff concludes that the proposed action would have no effect on federally listed species or critical habitat. Accordingly, consultation with the FWS for the proposed action is not necessary because Federal agencies are not required to consult with the FWS if the agency determines that an action will have no effect on listed species or critical habitat (ADAMS Accession No. ML16120A505).

The NRC staff has identified no foreseeable land use, visual resource, noise, or waste management impacts given that the proposed action would not result in any physical changes to Braidwood facilities or equipment or changes any land uses on or off site. The NRC staff has identified no air quality impacts given that the proposed action would not result in air emissions beyond what would be experienced during current operations. Additionally, there would be no socioeconomic, environmental justice, or historic and cultural resource impacts associated with the proposed action since no physical change would occur beyond the site boundaries and any impacts would be limited to the cooling pond.

Based on the foregoing analysis, the NRC staff concludes that the proposed action would have no significant environmental impacts.

Environmental Impacts of the Alternatives to the Proposed Action

As an alternative to the proposed action, the NRC considered denial of the proposed amendments (i.e., the “no-action” alternative). Denial of the proposed amendments would result in no change in current environmental conditions and impacts at Braidwood.

Alternative Use of Resources

This action does not involve the use of any resources not previously considered in NUREG-1437, Supplement 55, Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Braidwood Station, Units 1 and 2—Final Report.

Agencies and Persons Consulted

The staff did not enter into consultation with any other Federal agency or with the State of Illinois regarding the environmental impact of the proposed action. However, on May 11, 2016, the NRC notified the Illinois State official, Mr. Alwyn C. Settles, Nuclear Facility Section

Head, of the Bureau of Nuclear Facility Safety of the proposed amendments. The State official had no comments.

III. Finding of No Significant Impact

The NRC is considering issuing amendments for Renewed Facility Operating License Nos. NPF-72 and NPF-77, issued to Exelon for operation of Braidwood to increase the allowable TS 3.7.9.2 temperature limit of the cooling water supplied to the plant from the UHS from ≤ 100 °F (38.9 °C) to ≤ 102 °F (38.9 °C).

On the basis of the EA included in Section II above and incorporated by reference in this finding, the NRC concludes that the proposed action would not have significant effects on the quality of the human environment. The NRC's evaluation considered information provided in the licensee's application and associated supplements as well as the NRC's independent review of other relevant environmental documents. Section IV below lists the environmental documents related to the proposed action and includes information on the availability of these documents. Based on its findings, the NRC has decided not to prepare an environmental impact statement for the proposed action.

IV. Availability of Documents

The following table identifies the documents cited in this document and related to the NRC's FONSI. These documents are available for public inspection online through ADAMS at <http://www.nrc.gov/reading-rm/adams.html> or in person at the NRC's PDR as previously described.

DOCUMENT	ADAMS ACCESSION NO.
License Amendment Request and Associated Supplements	
Exelon Generation Company, LLC. Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, "Ultimate Heat Sink." Dated August 19, 2014.	ML14231A902
Exelon Generation Company, LLC. Supplemental Information in Support of Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical specification 3.7.9, "Ultimate Heat Sink." Dated January 20, 2015.	ML15020A246
Exelon Generation Company, LLC. Response to Request for Additional Information Regarding Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, "Ultimate Heat Sink." Dated March 31, 2015.	ML15090A604
Exelon Generation Company, LLC. Response to Request for Additional Information Regarding Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, "Ultimate Heat Sink." Dated April 30, 2015.	ML15120A396
Exelon Generation Company, LLC. Supplemental Information in Support of Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical specification 3.7.9, "Ultimate Heat Sink." Dated August 24, 2015.	ML15236A144
Exelon Generation Company, LLC. Response to Request for Additional Information Regarding Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, "Ultimate Heat Sink." Dated October 9, 2015.	ML15282A345

DOCUMENT	ADAMS ACCESSION NO.
Exelon Generation Company, LLC. Response to Request for Additional Information Regarding Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, "Ultimate Heat Sink." Dated October 30, 2015.	ML15303A326
Exelon Generation Company, LLC. Response to Request for Additional Information Regarding Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, "Ultimate Heat Sink." Dated November 9, 2015.	ML15313A301
Exelon Generation Company, LLC. Response to Request for Additional Information Regarding Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, "Ultimate Heat Sink." Dated December 16, 2015.	ML15364A369
Exelon Generation Company, LLC. Supplemental Information in Support of Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical specification 3.7.9, "Ultimate Heat Sink." Dated February 12, 2016.	ML16043A496
Exelon Generation Company, LLC. Response to Request for Additional Information Regarding Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, "Ultimate Heat Sink." Dated April 29, 2016.	ML16123A014
Exelon Generation Company, LLC. Supplemental Information Regarding Request for a License Amendment to Braidwood Station, Units 1 and 2, Technical Specification 3.7.9, "Ultimate Heat Sink." Dated June 17, 2016.	ML16169A139

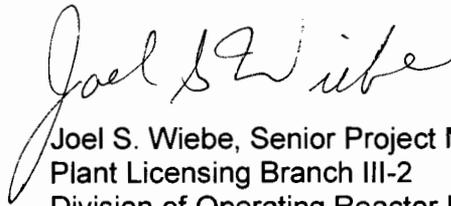
DOCUMENT	ADAMS ACCESSION NO.
Other Referenced Documents	
Cairns J. 1956. Effects of heat on fish. <i>Industrial Wastes</i> , 1:180-183.	n/a ⁽¹⁾
Banner A, Van Arman JA. 1973. Thermal effects on eggs, larvae and juveniles of bluegill sunfish. Washington, DC: U.S. Environmental Protection Agency. EPA-R3-73-041.	n/a ⁽¹⁾
<p>Ecological Specialists, Inc.</p> <p>Final Report: Five Year Post-Construction Monitoring of the Unionid Community Near the Braidwood Station Kankakee River Discharge.</p> <p>Dated September 2015.</p>	ML15274A087
<p>Exelon Generation Company, LLC.</p> <p>Request for Enforcement Discretion for Technical Specification 3.7.9, "Ultimate Heat Sink."</p> <p>Dated July 10, 2012.</p>	ML12192A637
<p>Exelon Generation Company, LLC.</p> <p>Licensee Event Report 2012-004-01 – Notice of Enforcement Discretion Received for Ultimate Heat Sink Temperature Exceeding Technical Specifications Requirements Due to Prolonged Hot Weather.</p> <p>Dated September 5, 2012.</p>	ML12249A256
<p>Exelon Generation Company, LLC.</p> <p>Licensee Event Report 2012-004-01 – Notice of Enforcement Discretion Received for Ultimate Heat Sink Temperature Exceeding Technical Specifications Requirements Due to Prolonged Hot Weather.</p> <p>Dated December 13, 2012.</p>	ML12349A174

DOCUMENT	ADAMS ACCESSION NO.
<p>Exelon Generation Company, LLC.</p> <p>Byron and Braidwood Stations, Units 1 and 2, License Renewal Application, Braidwood Station Applicant's Environmental Report, Responses to Requests for Additional Information, Environmental RAIs AQ-11 to AQ-15.</p> <p>Dated April 30, 2014.</p>	ML14339A044
<p>Illinois Environmental Protection Agency.</p> <p>Exelon Generation Company, LLC—Braidwood Station, Units 1 and 2, National Pollutant Discharge Elimination System (NPDES) Permit No. IL0048321.</p> <p>Issued on July 31, 2014.</p>	ML14227A712
<p>U.S. Fish and Wildlife Service.</p> <p>Endangered Species Consultations: Frequently Asked Questions.</p> <p>Dated July 15, 2013.</p>	ML16120A505
<p>U.S. Fish and Wildlife Service.</p> <p>Concurrence Letter Concluding Informal Consultation with the NRC for Braidwood License Renewal.</p> <p>Dated October 20, 2015.</p>	ML15299A013
<p>U.S. Nuclear Regulatory Commission.</p> <p>Notice of Enforcement Discretion for Exelon Generation Company, LLC Regarding Braidwood Station.</p> <p>Dated July 12, 2012.</p>	ML12194A681
<p>U.S. Nuclear Regulatory Commission.</p> <p>Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Braidwood Plant, Units 1 and 2—Final Report (NUREG-1437, Supplement 55).</p> <p>Dated November 30, 2015.</p>	ML15314A814
<p>U.S. Nuclear Regulatory Commission.</p> <p>Exelon Generation Company, LLC; Docket No. STN 50-456; Braidwood Station, Unit 1 Renewed Facility Operating License.</p> <p>Issued on January 27, 2016.</p>	ML053040362

DOCUMENT	ADAMS ACCESSION NO.
U.S. Nuclear Regulatory Commission. Exelon Generation Company, LLC; Docket No. STN 50-457; Braidwood Station, Unit 2 Renewed Facility Operating License. Issued on January 27, 2016.	ML053040366
U.S. Nuclear Regulatory Commission. Record of Decision; U.S. Nuclear Regulatory Commission; Docket Nos. 50-456 and 560-457; License Renewal Application for Braidwood Station, Units 1 and 2. Dated January 27, 2016.	ML15322A317
⁽¹⁾ These references are subject to copyright laws and are, therefore, not reproduced in ADAMS.	

Dated at Rockville, Maryland, this 18th day of July, 2016.

For the Nuclear Regulatory Commission.



Joel S. Wiebe, Senior Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

B. Hanson

- 2 -

The assessment is being forwarded to the Office of the Federal Register for publication.

Sincerely,

/RA/

Joel S. Wiebe, Senior Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. STN 50-456 and STN 50-457

Enclosure:
Environmental Assessment

cc w/encl: Distribution via Listserv

DISTRIBUTION:

PUBLIC
LPL3-2 R/F
RidsNrrPMBraidwoodResource
RidsAcrs_MailCTR Resource
RidsRgn3MailCenter Resource

RidsNrrDorlLpl3-2 Resource
RidsNrrDirRerb Resource
RidsNrrLASRohrer Resource
RidsNrrDorlDpr Resource

ADAMS Accession Nos. Letter (NRR-106) **ML16181A007**

EA FRN (ADM-012) **ML16181A009**

*via e-mail

OFFICE	NRR/DORL/LPL3-2/PM	NRR/DORL/LPL3-2/LA	NRR/DLR/RERB/BC
NAME	JWiebe	SRohrer	JDanna*
DATE	6/29/16	6/29/16	6/28/16
OFFICE	OGC – NLO	NRR/DORL/LPL3-2/BC(A)	NRR/DORL/LPL3-2/PM
NAME	CScott	EMiller	JWiebe
DATE	7/15/16	7/18/16	7/18/16

OFFICIAL RECORD COPY