BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

In the Matter Of:	)	
	)	
EXELON GENERATION LLC,	)	
Petitioner,	)	
	)	
v.	)	PCB NO. 15 - 204
	)	
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,	)	
Respondent.	)	

NOTICE OF FILING

TO: Office of the Clerk of the
Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph Street, Suite 11-500
Chicago, Illinois 60601

Division of Legal Counsel
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield IL 62794-9276

Office of Legal Services
Illinois Department of Natural Resources
One Natural Resources Way
Springfield IL 62702-1271

ORIGINAL

PLEASE TAKE NOTICE that on the 12th day of June, 2015, on behalf of Exelon Generation LLC, a **Petition to Approve Alternative Thermal Effluent Limitations**, an **Appearance of Alan Bielawski**, an **Appearance of William Dickett**, and an **Appearance of Katharine Newman**, were filed with the Office of the Clerk of the Illinois Pollution Control Board.

Respectfully submitted,

EXELON GENERATION LLC

By: Wm G. Dickett
One of its attorneys

Alan P. Bielawski
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PROTECTION AGENCY,	)	
Respondent.	)	

APPEARANCE

I hereby file my appearance in this proceeding, on behalf of Exelon Generation LLC.

Dated: June 12, 2015

Alan P. Bielawski /mw

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

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PROTECTION AGENCY,	)	
Respondent.	)	

APPEARANCE

I hereby file my appearance in this proceeding, on behalf of Exelon Generation LLC.

Dated: June 12, 2015

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

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Respondent.	)	

APPEARANCE

I hereby file my appearance in this proceeding, on behalf of Exelon Generation LLC.

Dated: June 12, 2015

Katharine F. Newman

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

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	)	
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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,	)	
Respondent.	)	

CERTIFICATE OF SERVICE

I, the undersigned, certify that I have filed the attached Petition to Approve Alternative Thermal Effluent Limitations, Appearance of Alan Bielawski, Appearance of William Dickett and Appearance of Katharine Newman, with:

Office of the Clerk of the Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph Street, Suite 11-500
Chicago, Illinois 60601

Copies of these filings were also served on the following by Federal Express:

Division of Legal Counsel
Illinois Environmental Protection Agency
1021 North Grand Avenue East
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Office of Legal Services
Illinois Department of Natural Resources
One Natural Resources Way
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Dated: June 12, 2015

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ILLINOIS ENVIRONMENTAL	)	
PROTECTION AGENCY,	)	
Respondent.	)	

ORIGINAL

PETITION TO APPROVE ALTERNATIVE THERMAL EFFLUENT LIMITATIONS

Pursuant to 35 Ill. Adm. Code § 304.141(c), Section 316(a) of the Clean Water Act and 35 Ill. Adm. Code Part 106, Subpart K, Exelon Generation LLC ("Exelon") requests that the Illinois Pollution Control Board ("Board") determine that the alternative thermal effluent limitations set forth in this petition should apply to discharges from Exelon's Dresden Nuclear Generating Station ("Dresden Station" or the "Plant") in lieu of effluent limits derived from 35 Ill. Adm. Code § 302.211(e).

I. INTRODUCTION

Dresden Station is a two unit nuclear generating station located at the confluence of the Kankakee and Des Plaines Rivers, where they join to form the Illinois River. Water used to cool and condense steam from the generating process is obtained from and discharged to a 1,275 acre cooling pond designed and constructed as part of Dresden Station. Water for the cooling pond is obtained from the Kankakee River and water is discharged from the cooling pond to the Illinois River. During winter months, the

Dresden Station cooling pond is operated in a closed cycle mode, with limited blowdown flow from the cooling pond to the Illinois River. During the summer months, the Station operates in an indirect open cycle mode, with increased blowdown flow to the Illinois River.

Discharges from the Dresden Station cooling pond to the Illinois River are subject to thermal effluent limits in the Plant's NPDES permit. The thermal effluent limits in the NPDES permit that govern closed cycle operations are based on the thermal standards set forth in 35 Ill. Adm. Code § 302.211(e). In contrast, the thermal effluent limits in the permit that govern indirect open cycle operations are alternative effluent limits that were authorized by the Board in 1981, pursuant to Section 316(a) of the Clean Water Act ("Section 316(a)") and 35 Ill. Adm. Code § 304.141(c). In the Matter of 410(c) Petition for Dresden Nuclear Generating Station, PCB 79-134 (July 9, 1981). The Board's decision relied upon studies and a demonstration conducted pursuant to Section 316(a) in support of the alternative thermal limits for the Plant.

Dresden Station's current NPDES permit requires that Exelon update the Section 316(a) demonstration that support the alternative thermal limits for the Plant prior to submittal of the next permit renewal application. (The NPDES permit's expiration date is November 30, 2016.) To satisfy that requirement, Exelon commenced studies in 2013 to support a new, updated Section 316(a) demonstration for Dresden Station. The studies were conducted in 2013 and 2014; the results of the studies are presented in Exhibit 1 - *Dresden Nuclear Station § 316(a) Demonstration, May 29, 2015* (the "316(a) Demonstration"). As discussed in this Petition, the 316(a) Demonstration shows that

renewal and revision of the existing alternate thermal effluent limits for Dresden Station are warranted and appropriate.

II. LEGAL STANDARDS APPLICABLE TO SECTION 316(a) RELIEF

Section 316(a) of the Clean Water Act grants a discharger of heated effluent the right to obtain specific effluent limits for its discharge that differ from generally applicable limits that would otherwise govern. Specifically, Section 316(a) provides:

> With respect to any point source otherwise subject to the provisions of Section 301 or Section 306 of the [Clean Water] Act, whenever the owner or operator of any such source, after opportunity for public hearing, can demonstrate to the satisfaction of the Administrator (or, if appropriate, the State) that any effluent limitation proposed for the control of the thermal component of any discharge from any such source will require effluent limitations more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made, the Administrator (or, if appropriate, the State) may impose an effluent limitation under such section on such plant, with respect to the thermal component of such discharge (taking into account the interaction with other pollutants), that will assure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife in and on that body of water.

In Illinois, Section 316(a) is implemented through 35 Ill. Adm. Code § 304.141(c) and 35 Ill. Adm. Code 106, Subpart K. Section 304.141(c) authorizes the Board to determine that specific thermal standards should apply to a particular discharger in lieu of those imposed by the Board's generally applicable rules. Specifically, Section 304.141(c) provides:

> The standards of this Chapter shall apply to thermal discharges unless, after public notice and an opportunity for public hearing, in accordance with section 316 of the CWA, applicable federal regulations, and procedures in 35 Ill. Adm. Code 106, Subpart K, the Board has determined that different standards shall apply to a particular thermal discharge.

Part 106, Subpart K sets forth the procedural rules for review of and issuance by the Board of alternative thermal effluent limitations under Section 316(a). Prior to filing a petition seeking alternative limitations, the petitioner must submit early screening information and a detailed plan of study to Illinois EPA, describing the proposed alternative limits, how the petitioner will make the required demonstration, and types of data the petitioner intends to submit. The petitioner must then consult with Illinois EPA to discuss the early screening information and seek Illinois EPA's recommendations regarding the detailed plan of study. 35 Ill. Adm. Code 106.1115(b). The petitioner must then complete the plan of study prior to filing a petition with the Board. 35 Ill. Adm. Code 106.1120(g).

The burden of proof is on the petitioner to demonstrate that an applicable thermal effluent limitation is more stringent than necessary to assure the protection and propagation of a balanced and indigenous population of shellfish, fish, and wildlife in and on the receiving water. *See* 35 Ill. Adm. Code 106.1160(a), (b). The petitioner must also demonstrate that the requested alternative thermal effluent limitation assures the protection and propagation of a balanced and indigenous population of shellfish, fish, and wildlife in the receiving water. *See* 35 Ill. Adm. Code 106.1160(c).[1] The demonstration must consider the cumulative impact of its thermal discharge together with all other significant impacts on the species affected. *Id.*

In addition to showing that proposed alternative limits are protective of the BIC, the regulations implementing Section 316(a) allow an existing discharger to support

[1] The "balanced, indigenous population" of shellfish, fish and wildlife is synonymous with the "balanced, indigenous community" (35 Ill. Adm. Code § 106.1110) and is referred to in this Petition as the "BIC".

alternative thermal limits based on the absence of prior appreciable harm related to historical thermal discharges. Specifically, such a demonstration must show:

> (i) That no appreciable harm has resulted from the normal component of the discharge, taking into account the interaction of such thermal component with other pollutants and the additive effect of other thermal sources to [the BIC]; or
>
> (ii) That despite the occurrence of such previous harm, the desired alternative effluent limitation (or appropriate modifications therefore) will nevertheless assure the protection and propagation of a [BIC].

35 Ill. Adm. Code § 106.1160(d); 40 C.F.R. § 125.73(c)(1).

In 1977, the United States Environmental Protection Agency ("USEPA") issued draft guidance on Section 316(a) demonstrations in "Interagency 316(a) Technical Guidance Manual and Guide for Thermal Effects Sections of Nuclear Facilities Environmental Impact Statements (DRAFT)" dated May 1, 1977 ("316(a) Manual"). The 316(a) Manual provides that it "is intended to be used as a general guidance and as a starting point for discussions," and that delegated state agencies "are not rigidly bound by the contents of this document." 316(a) Manual at 8-9. In recent decisions by the Board on petitions for alternative thermal limits under Section 316(a), the Board has used the 316(a) Manual decision criteria in its analysis of whether the petitioner has met the requirements for obtaining relief under 316(a). *See* Exelon Generation LLC v. Illinois Environmental Protection Agency, PCB 14-123 (September 18, 2014).

III. PETITION

Pursuant to 35 Ill. Adm. Code § 106.1130 (a) – (c), Exelon submits the following information regarding Dresden Station and the 316(a) Demonstration.

A. General Plant Description

1. Generating Capacity and Type of Fuel Used

Dresden Station is a nuclear-fueled steam electric generating facility located at the confluence of the Des Plaines and Kankakee Rivers near Morris, Illinois, at River Mile 272.3. Unit 1 started commercial service on August 1, 1960. Unit 2 started commercial service on April 13, 1970 and Unit 3 started commercial service on July 22, 1971. Dresden Unit 1 was permanently shut down in 1978 and is in long term safe storage. In 2004, the Nuclear Regulatory Commission granted Dresden Units 2 and 3 a 20-year extension of their operating licenses until 2029 and 2031, respectively. The two boiling water reactors have a combined maximum generating capacity of 2006 megawatts electric. (316(a) Demonstration, Appendix D.)

2. Operating Characteristics of the Condenser Cooling System

The Kankakee River is the only surface cooling water source for Dresden Station. River water enters the intake canal and splits into two canals, one for Unit 1 (that is shutdown) and the other for Units 2 and 3. The Unit 2 and 3 Intake Canal continues for approximately 2400 ft to the Unit 2/3 intake. When both units are at power, cooling water flows through the Unit 2 and 3 condensers and service water systems at a rate that varies from 688,000 gallons per minute (gpm) (1,533 cfs) to 1,017,000 gpm (2,266 cfs). (316(a) Demonstration, Appendix D.)

3. History of the Load Factor for the Past 5 Years

The load factor for Dresden Station for the past 5 years was as follows:

- 2010: 95.1 %
- 2011: 95.8 %
- 2012: 94.1%
- 2013: 95.5%
- 2014: 93.6 %

4. Projected Load Factor for the Next 5 Years

The projected load factor for Dresden Station for the next 5 years is as follows:

- 2015: 94.0 %
- 2016: 94.0%
- 2017: 95.2 %
- 2018: 93.9%
- 2019: 93.7 %

5. Estimated Retirement Dates for Dresden Station

The NRC licenses for Dresden Station Units 2 and 3 expire in 2029 and 2031, respectively.

6. History of Plant Shutdowns for the Past 5 Years – Planned and Emergency

The planned and emergency shutdowns of Dresden Station, Units 2 and 3, for the past 5 years were as follows:

- 2010: Unit 2 was never shutdown in 2010. Unit 3 had 2 shutdowns of approximately 3 days and 26 days.
- 2011: Unit 2 was shutdown once for approximately 25 days. Unit 3 was never shutdown in 2011.

- 2012: Unit 2 was shutdown once for approximately 7 days. Unit 3 was shutdown once for approximately 24 days.
- 2013: Unit 2 was shutdown once for approximately 19 days. Unit 3 was shutdown once for approximately 8 days.
- 2014: Unit 2 was shutdown 3 times in 2014 for approximately 17 days, 4 days, and 1 day. Unit 3 was shutdown once for approximately 16 days.

7. Planned and Projected Shutdowns for the Next 5 Years

The planned and projected shutdowns for Dresden Station, Units 2 and 3, for the next 5 years are as follow:

- 2015: Unit 2 has already had two shutdowns of approximately 3 and 6 days. Unit 2 has one more planned shutdown projected to be 18 days. There are no planned shutdowns for Unit 3.
- 2016: Unit 3 has one planned shutdown projected to be 17 days. There are no planned shutdowns for Unit 2.
- 2017: Unit 2 has one planned shutdown projected to be 16 days. There are no planned shutdowns for Unit 3.
- 2018: Unit 3 has one planned shutdown projected to be 16 days. There are no planned shutdowns for Unit 2.
- 2019: Unit 2 has one planned shutdown projected to be 16 days. There are no planned shutdowns for Unit 3.

B. Description of Method for Heat Dissipation

1. Type of Cooling System

Dresden Station uses a cooling pond and cooling tower system to cool condenser cooling water. The cooling pond for Dresden Station is located southeast of the Station and has an area of approximately 1,275 acres.

Dresden Station operates the cooling pond in a closed cycle mode from October 1 through June 14. In this mode, approximately 700,000 gpm of cooling water is drawn into the Plant's intake structure, passes through the Plant's heat exchangers, and discharges to a hot canal that routes the water approximately two miles to a lift station. The lift station is used to transfer the water from the hot canal up to the cooling pond. The water flows through the cooling pond and over a spillway into the cold canal. The water continues to flow through the cold canal approximately two miles back to the Plant's intake structure. Flow regulating gates are used to direct the majority of the cooling water back to the intake structure for reuse. A small portion of the water, approximately 72 million gallons per day (mgd), is diverted as blowdown flow to the Illinois River via the discharge canal. Makeup water to replace water lost through blowdown and evaporation is obtained through the Unit 2 and 3 intake canal feed from the Kankakee River.

Dresden Station's NPDES permit authorizes the Plant to operate in an indirect open cycle mode from June 15 through September 30. In the indirect open cycle mode, up to approximately 1,000,000 gpm passes through the Station's heat exchangers. The cooling water flow from the Plant through the canal and pond system is the same as during the closed cycle process except that, in the indirect open cycle mode, the flow regulating gates divert all the cooling water from the cold canal to the Illinois River via

the discharge canal. The maximum design flow during indirect open cycle mode is 1,548 mgd.

From 2000 to 2003, Exelon installed cold canal and hot canal cooling tower systems to provide supplemental cooling capacity to the cooling pond prior to water being discharged to the Illinois River. The hot canal cooling towers take water from the hot canal, cool the water via a counter flow of air, and return the cooled water back into the hot canal downstream of the cooling tower intake. Likewise, the cold canal system takes water from the cold canal, cools the water via a counter flow of air, and discharges back to the cold canal downstream of the intake.

2. Summary Information on Temperature of Discharge

Because the alternative thermal limits for Dresden Station apply only to the June 15 through September 30 time period, during which indirect open cycle operations are authorized, discharge temperature information for Dresden Station summarized below is limited to that time period. Discharge temperature data covering 1998 – 2014 are presented in Tables D-1 and D-3 of Appendix D to the 316(a) Demonstration. The highest discharge temperatures were during July with a median (50-percentile) temperature of 87.4°F and the upper 10-percentile temperatures were above 90.7°F. The upper 10-percentile August discharge temperatures were 89.9°F. In June and September, approximately 3.5 percent and less than 1 percent of the discharge temperatures were above 90°F, respectively. Discharge flows to the river were predominately at 1,465 mgd and power production was above 1,800 MWe (98 percent capacity) 85 percent of the time during the June 15 to September 30 period (Appendix D, Table D-2).

Table D-3 in Appendix D presents the number of hours the Dresden Station with discharge temperatures exceeded 90°F during the 1998 – 2014 time period. During July,

the number of hours with discharge temperatures above 90.7°F exceeded 200 in 1998, 1999 and 2012, and exceeded 100 hours in 2001 and 2011. During August, 100 hours were exceeded in 1998, 1999, 2001, and 2011. There were no years during which discharge temperatures were above 90°F for more than 200 hours in August. The greatest number of hours the Plant's discharge temperature exceeded 90.7°F in June was 81 hours, in 2009, and in September, 8 hours, in 1998.

C. Summary of Thermal Compliance History

During the past 5 years, Dresden Station has operated in compliance with the thermal discharge limits in its NPDES, with the exception of 2011 and 2012, when Dresden Station was granted provisional variances that allowed the Plant to exceed its NPDES thermal limits.

In 2011, Dresden Station was granted an additional 100 hours during which the discharge temperature could exceed 90° F.

In 2012, Dresden Station was granted 4 provisional variances, as follows:

- March 21 through March 31, 2012 - Water temperature at edge of mixing zone shall not exceed 60 ° F by more than 5° F or 2° F above ambient river temperature, whichever is greater.
- July 6 through July 16, 2012 - Temperature of Plant's discharge cannot exceed 95° F.
- July 18 through August 1, 2012 - Temperature of Plant's discharge cannot exceed 95° F.
- August 3 through August 16, 2012 - Station is granted an additional 14 days during which the Plant's discharge may exceed 90° F.

D. Plan of Study for 316(a) Demonstration

In 2013, in response to the condition in the Dresden Station NPDES permit that the Section 316(a) demonstration for the Plant be updated, Exelon commenced a hydrothermal modeling study of the Plant's thermal discharge. Following the February 24, 2014 issuance of 35 Ill. Adm. Code 106, Subpart K, the Board's procedural rules for obtaining alternate thermal limits under Section 316(a), Exelon submitted to Illinois EPA and Illinois DNR screening information and detailed study plans for updating the Section 316(a) Demonstration for Dresden Station. (*See* Exhibit 2 – *Letter from Alan Bielawski to Stephanie Flowers, dated April 14, 2014.*). Exelon then met and consulted with the agencies to review the study plans, and, in response to the agencies' comments and recommendations, Exelon agreed to modify the study plans. (*See* Section 1.2, Section 316(a) Demonstration Summary.) Thereafter, the agencies provided verbal approval to Exelon to proceed with the studies in support of the 316(a) Demonstration, as modified.

E. 316(a) Study Results

1. Background on the Proposed Thermal Standards

Dresden Station's thermal effluent discharges into the Illinois River. 35 Ill. Adm. Code § 302.211(e) limits water temperatures in the Illinois River to 60° F during the months of December through March and 90° F for all other months, with an exception that allows these temperature limits to be exceeded by up to 3° F for up to 1 percent of the hours per rolling twelve month period. The Board's rules allow compliance with these thermal limits to be measured at the edge of a 26 acre mixing zone.

In 1979, Dresden Station petitioned the Board to issue alternative thermal limits for the Plant, pursuant to Section 316(a). The requested limits would allow Dresden

Station to operate its cooling pond in an indirect open cycle mode from June 15 through September 30, during which time discharges from the cooling pond to the Illinois River could exceed 90° F by up to 3° F (i.e. up to 93° F) for 10 percent of the time during that period. Compliance with the limits was to be measured at the end of the discharge pipe from the cooling pond to the River, not at the edge of a mixing zone. During the balance of the year, the cooling pond would be operated in a closed cycle mode, subject to the temperature limits imposed by 35 Ill. Adm. Code § 302.211(e). The Board granted the petition in 1981;[2] Dresden Station has operated under the alternate thermal limits granted by the Board since that time.

On October 28, 2008, the Director of the Office of Water Management at USEPA sent a memorandum to the USEPA regional offices discussing the requirements of Section 316(a). In that document, USEPA expressed its view that Section 316(a) alternate thermal limits included in NPDES permits need to be reviewed with each NPDES permit renewal. Consistent with USEPA's directive, Illinois EPA included a condition in the Dresden Station NPDES permit requiring Exelon to update the Section 316(a) demonstration for the Plant, to be reviewed and considered in connection with the next Dresden Station NPDES permit renewal proceeding.

In response to the permit condition, Exelon undertook a new Section 316(a) Demonstration for Dresden Station. The Demonstration was conducted to consider whether the existing thermal limits, that have been in effect since 1981, continue to meet the Section 316(a) criteria for alternative thermal limits. The 316(a) Demonstration also

[2] In the Matter of 410(c) Petition for Dresden Nuclear Generating Station, PCB 79-134 (July 9, 1981).

addresses whether revised, less stringent alternative thermal limits are justified under the Section 316(a) criteria.

As shown in the Demonstration, and as discussed in this Petition, there is no evidence that operation of Dresden Station under the alternative thermal limits granted by the Board has caused appreciable harm to the balanced, indigenous community of shellfish, fish and wild life in the Illinois River. In addition, the Demonstration shows that the BIC will be adequately protected if the 3° F temperature increase above 90° F, currently allowed for 10 percent of the time from June 15 through September, is raised to 5° F (i.e., to 95° F), provided that (1) discharges above 93° F are allowed only when Dresden Station intake temperatures are above 90° F, and (2) any single episode of such discharges does not exceed 24 hours in duration. Accordingly, this Petition seeks renewal of the existing alternate thermal limits, adjusted to allow temperature increases up to 5° F under the above-described conditions.

2. Data Collection Program and Methodologies

a. Historical Studies

As discussed above, Dresden Station began operating in 1960, when Unit 1 came on line, and added Unit 2 in 1970 and Unit 3 in 1971. Studies to assess potential impacts associated with Dresden Station operations on the biota of the Illinois River were initiated in 1968 by Exelon's predecessor, Commonwealth Edison Company, prior to Units 2 and 3 becoming operational and have continued during the subsequent 46 years of the Plant's operation. The earliest studies investigated a wide scope of potential biological effects; later studies have focused on fish and benthic macroinvertebrate communities near the Dresden Station discharge, reflecting the understanding that if there were any long-term impacts to the BIC, these components of the biota are most likely to

exhibit detectable changes that are representative of the entire aquatic community. These historical data collection programs and studies are described in detail in Appendix E to the 316(a) Demonstration.

Commonwealth Edison conducted a Section 316(a) demonstration in connection with its 1979 request to the Board for alternative thermal limitations. That demonstration relied upon a retrospective analysis of aquatic community monitoring data collected during Dresden Station operations in indirect open-cycle mode, between 15 June and September 30 from 1971 to 1974, and showed no prior appreciable harm to the aquatic community resulted from indirect open cycle operations.

b. 316(a) Update Studies

In connection with the NPDES permit condition requiring Exelon to update the Section 316(a) studies for Dresden Station, Exelon commissioned EA Engineering, Science, and Technology ("EA") to review the above-referenced historical data and studies and to conduct any additional studies needed to evaluate whether the Plant's thermal discharges under the currently-effective alternative thermal limitation have caused appreciable harm to the BIC. In view of the fact that Dresden Station has, in recent years, required provisional variances from the alternative thermal limitations to operate in the summer months,[3] EA also was asked to evaluate the extent to which the existing alternative thermal limits could be revised to address circumstances similar to those that required provisional variance relief, and remain protective of the BIC.

With regard to monitoring aquatic life potentially affected by Dresden Station's thermal discharge, EA conducted extensive sampling of the fish and macroinvertebrate

[3] See Section III. C. above.

communities in the vicinity of the Plant's discharge to the Illinois River in 2013 and 2014, and conducted a survey of the mussel community in 2014. These efforts are reported in Appendices F, G and H, respectively, to the 316(a) Demonstration. In addition, EA conducted hydrothermal surveys and modeling of the Dresden Station thermal discharge in the Illinois River to predict river temperatures associated with plant operations under alternative thermal limits. The survey results and modeling analyses are presented in Appendix D to the 316(a) Demonstration.

These historical and recent data collection efforts and studies conducted by EA were used to perform a retrospective evaluation of the effects on aquatic biota associated with Dresden Station operations under the existing alternative thermal limits. In addition, EA conducted a predictive evaluation of biological effects associated with the existing thermal limits as well as the revised alternative thermal limits requested in this Petition. As explained in the following sections, the retrospective evaluation, presented in Appendix C to the 316(a) Demonstration, shows that existing operation of the Dresden Station cooling pond in an indirect open cycle mode, as authorized by the Board's 1981 Order, has not caused prior appreciable harm to the BIC of the Illinois River. The predictive evaluation, presented in Appendix B to the 316(a) Demonstration, shows that Plant operations under the proposed revised alternative thermal limits will have negligible effects on the BIC, as well.

3. Retrospective Assessment

The retrospective assessment of the Dresden Station is presented in Appendix C to the 316(a) Demonstration. The assessment reviews the extensive monitoring data obtained concerning Dresden Station's thermal discharge, including nearly two decades of studies conducted while the Plant's cooling pond operated in an indirect open cycle

mode (under the approved alternative effluent limits), relative to the biotic categories the 316(a) Manual recommends for evaluation in §316(a) demonstrations: phytoplankton, habitat formers, zooplankton, shellfish and macroinvertebrates (including freshwater mussels), fish, and other vertebrate wildlife. Section 5 of the 316(a) Demonstration Summary evaluates each of these biotic categories against the decision criteria for a successful Section 316(a) demonstration set forth in the 316(a) Manual and shows that any thermal effects to each biotic category are sufficiently inconsequential that the protection and propagation of the BIC will be assured. EA's assessment also shows that after more than 30 years of operating under the Board-approved alternative thermal limits, the aquatic community in the vicinity of the Dresden Station discharge is similar to the community in adjacent areas of the lower Des Plaines and Kankakee Rivers, and Illinois River upstream of the Dresden Station discharge, which are not influenced by the Plant's thermal plume, thereby corroborating that no appreciable harm to the BIC has occurred as a result of the existing alternative thermal limits.

4. Predictive Assessment

EA also conducted a predictive assessment, evaluating potential biological effects related to the thermal plume that results from operating the Dresden Station cooling pond under the existing and proposed revised alternative thermal limits. (Appendix B to the 316(a) Demonstration.) The predictive assessment used a three-dimensional, hydrodynamic model to characterize and predict hydrothermal conditions in the lower Des Plaines and Kankakee Rivers and the Illinois River from their confluence downstream to the Dresden Island Lock and Dam, located approximately 1,000 meters downstream of the Dresden Station discharge. The predicted thermal plume dimensions and distributions under three river flow and temperature scenarios were compared to

available biothermal metric data related to survival, avoidance, spawning, and growth of 12 species of fish, selected as representative[4] of the BIC in the area of the Dresden Station discharge. The three scenarios evaluated were:

(i) Typical —50th percentile river flow and 60th percentile ambient river temperature;

(ii) Typical High Temperature —5th percentile river flow and 95th percentile ambient river temperature; and

(iii) Extreme High Temperature —Based on modeled conditions reflecting unusual heat wave event of July 2012, when ambient river temperatures exceeded 90°F. River flows were in the lower 1-4th percentile for the Des Plaines River and 15-20th percentile for the Kankakee River.

The evaluation shows that the Dresden Station discharge was not predicted to exceed 88°F under the Typical Scenario or 92°F under the Typical High Temperature Scenario, or cause temperatures in the Illinois River to exceed 90°F under either scenario. For the Extreme High Temperature scenario, water temperatures upstream of the Dresden Station discharge in the Illinois, Des Plaines, and Kankakee Rivers reached 93.9°F and the maximum Plant discharge temperature reached 94.9°F, the approximate maximum discharge temperature limit sought in the revised alternative thermal limit.

Evaluating the thermal plumes for the modeled scenarios in light of the biothermal metric data for the RIS, EA reached the following conclusions:

[4] The selected species are referred to as representative important species ("RIS").

(i) **Potential for Thermal Mortality**. Although under extreme conditions, temperatures exist within the Dresden Station thermal plume that have the potential to cause mortality under extended exposure, these conditions are rare and of relatively short duration. Fish generally are able to avoid high temperatures and extensive and diverse aquatic habitat is available upstream of the Dresden Station discharge. Consequently, temperatures in the plume, even under extreme meteorological conditions, are unlikely to result in any significant mortality. During the 2012 July heat event (similar to what was modeled for the Extreme High Temperature scenario) no fish kills were observed during monitoring in the vicinity of the Dresden Station discharge and the Dresden Island Lock and Dam.

For white sucker, the upper thermal tolerance limit for chronic exposure for juveniles appears to be about 93°F, at an acclimation temperature of 90°F; however, the highest thermal tolerance chronic exposure reported for adult white sucker is at an acclimation temperature of 78.8°F. White sucker is the only RIS for which the potential exists for mortality associated with chronic exposure to temperatures above 90.5°F in the Dresden Station thermal plume that are predicted to occur during extreme conditions. These conditions did not persist for more than 24 hours in the thermal plume and throughout this period ambient temperatures in 10-25 percent of the area immediately upstream of the Dresden Station discharge was less than 90.5°F, thereby providing refuge for white sucker from the elevated plume temperatures.

(ii) **Temperature Avoidance and Habitat Avoidance**. Although the ability to avoid stressful water temperatures minimizes the potential for fish mortality, it can result causing fish to avoid important habitat areas affected by elevated temperatures in a thermal plume. Avoidance data available for gizzard shad, channel catfish, largemouth bass, smallmouth bass, and bluegill indicate that these RIS would not avoid any portions of the plume under extreme ambient and discharge temperature conditions. Other RIS for which avoidance data were not available, generally exhibited acute and/or chronic mortality metrics within a similar range to the five RIS for which avoidance information is available. This assessment supports the finding that the Dresden Station thermal plume would not be expected to cause avoidance of aquatic habitat for any of these species, even at very low river flow conditions (1-4 percentile), high air temperatures 100°F, and high Dresden Station discharge temperatures 94.9°F.

(iii) **Temperatures during Critical Spawning Periods**. Most spawning by the RIS in the vicinity of Dresden Station appears to occur prior to 15 June, and, therefore, is not affected by indirect open cycle operations. Gizzard shad, white sucker, golden redhorse, black crappie, and logperch typically finish spawning prior to mid-June; emerald shiner, common carp, smallmouth bass, largemouth bass, and freshwater drum typically spawn during May and June; the only RIS reported to spawn after June are channel catfish and bluegill, which may continue to spawn into July or

August in some regions. However, because ambient temperatures in the Des Plaines, Kankakee and Illinois Rivers typically exceed the reported upper temperatures range for spawning by these species before the end of June, particularly during warmer years, the Plant's discharge is not likely to have any effect spawning for these species.

(iv) **Critical Temperatures for Growth.** For most of the RIS, temperatures in the Dresden Station thermal plume are not expected to adversely affect normal patterns of growth. The RIS all exhibit a seasonal growth pattern typical of temperate zone fishes with zero growth over winter, with growth resuming in the spring and peaking during the summer. If river temperatures rise above a critical level, growth may decline or cease for a period during the summer. Between the reported upper temperature for optimum growth and the upper zero growth temperature, growth continues, but at a slower rate. While elevated temperatures in portions of a thermal plume may inhibit growth during peak summer periods, they may also stimulate growth earlier and later in the year than typically observed without an artificial source of heat in the water body. The reported upper zero growth temperatures for gizzard shad, emerald shiner, common carp, channel catfish, largemouth bass, and smallmouth bass exceed 93°F. It is unlikely that temperatures in the Dresden Station thermal plume, even under the extreme conditions of July 2012, would adversely affect growth or cause a cessation of growth for these RIS. For white sucker and black crappie, ambient river temperatures during July

and August can exceed the upper temperature for optimum growth and the zero growth temperature level. During rare, but extremely warm years represented by July 2012, the observed high ambient temperatures are predicted to limit growth for a brief period of several days for thermally sensitive species such as white sucker and black crappie. The brief period of extreme ambient temperatures is not predicted to have an extended long-term effect on growth patterns. Both of these species are uncommon in the fish community near Dresden Station due largely to existing physical habitat constraints.

Based on these findings, EA concluded that the Dresden Station discharge would not be predicted to have more than minimal and transitory effects on a few RIS, even under rare and extreme meteorological conditions.

F. Overall 316(a) Demonstration Conclusions

The retrospective assessment shows that Dresden Station operations for over 30 years under the exiting alternative thermal limits have not caused adverse impacts to the BIC. The predictive assessment further supports this conclusion, showing that known physiological and behavioral responses of RIS to the predicted Dresden Station thermal plume resulting from Plant operations under the existing limits does not have the potential to adversely affect the reproduction, growth, and survival of these key species.

The predictive assessment also demonstrates that the operations under the proposed, revised alternative thermal limits will not interfere with the successful completion of key life history functions of the RIS. Adequate area is available for migratory and resident species to avoid thermal stresses associated with Dresden Station, by moving upstream and downstream of the discharge. Under the proposed thermal

limits, temperatures in the thermal plume may cause avoidance behavior in certain RIS. However, any such behavior will not preclude or prevent RIS access to rare, unique, or critical habitat. Temperatures that could adversely affect development and maturation of eggs, larvae, and early juvenile life stages of RIS are limited to a very small portion of the thermal plume; due to their planktonic nature or limited swimming ability, these life stages are not expected to remain within these small high temperature areas long enough to exhibit permanent adverse effect.

G. Requested Relief

Exelon requests that the Board enter an order finding that the generally applicable requirements of 35 Ill. Adm. Code §302.211(e) that limit discharges from the Dresden Station from exceeding specified monthly maximum temperature standards from June 15 through September 30 are more stringent than necessary to assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in the waters that receive the Plant's discharge.

In lieu of the generally applicable requirements of 35 Ill. Adm. Code §302.211(e), Exelon requests that the Board approve the following alternate thermal limits for discharges from Dresden Station:

> During the period June 15 through September 30, the temperature of the Dresden Station discharge shall not exceed 90° F more than 10% of the time in the period and will never exceed 95° F, provided that (1) discharges above 93° F are allowed only when Dresden Station intake temperature is above 90° F, and (2) any single episode of such discharges does not exceed 24 hours in duration. At all other times, Dresden Station will be operated in accordance with 35 Ill. Adm. Code §302.211(e).

WHEREFORE, for all the foregoing reasons Exelon respectfully requests that its Petition to Approve Alternative Thermal Effluent Limits be granted and that the Board provide Exelon the relief requested herein.

Respectfully submitted,

EXELON GENERATION LLC

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