

ILLINOIS POLLUTION CONTROL BOARD
June 25, 2014

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STATE OF ILLINOIS
Pollution Control Board

EXELON GENERATION LLC (QUAD)
CITIES NUCLEAR GENERATING)
STATION),)
)
Petitioner,)
)
v.) PCB 14-123
) (Thermal Demonstration)
ILLINOIS ENVIRONMENTAL)
PROTECTION AGENCY,)
)
Respondent.)

HEARING OFFICER ORDER

To assist the Board in its determination, a written response to the following questions is due within 21 days of the service date.

Questions for Illinois Environmental Protection Agency

1. Has the Illinois Environmental Protection Agency (Illinois EPA) consulted with the United States Environmental Protection Agency (USEPA) regarding Exelon's demonstration under Section 316(a) of the Clean Water Act (CWA) submitted to the Board in this proceeding? Has Illinois EPA consulted with USEPA regarding the specific relief requested by Exelon in its petition? If so, describe, and provide copies of, any response provided by USEPA.
2. Illinois EPA's recommendation states that Illinois EPA together with Illinois Department of Natural Resources (Illinois DNR), Iowa Department of Natural Resources (Iowa DNR), United States Fish and Wildlife Service (USFWS), USEPA Region 7, and USEPA Region 5 "participated in developing the plan of study." Rec. at 6. In addition, USEPA's "Interagency 316(a) Technical Guidance Manual and Guide for Thermal Effects Sections of Nuclear Facilities Environmental Impact Statements (DRAFT)," May 1, 1977 (316(a) Manual) provides that the NPDES permitting authority:

checks with the Regional Director of the [U.S. Fish and Wildlife Service] and representatives of the [National Marine Fisheries Service] and States to make sure the study plan includes appropriate consideration of threatened or endangered species as well as other fish and wildlife resources. 316(a) Manual at 15.

State whether Illinois EPA consulted with the Illinois DNR and Iowa DNR on the inclusion of state-listed endangered or threatened species in the study plan for Exelon's

CWA Section 316(a) demonstration? If so, what did each department advise with respect to state-listed species?

3. Illinois DNR rules on endangered species provide:

As authorized by Section 11(a) of the Illinois Endangered Species Protection Act [520 ILCS 10/11] and by Section 17 of the Illinois Natural Areas Preservation Act [525 ILCS 30/17], state and local units of government shall evaluate, through a consultation process with the Department, whether actions authorized, funded, or carried out by them, as defined in Section 1075.30, are likely to jeopardize the continued existence or recovery of Illinois listed endangered or threatened species or are likely to result in the destruction or adverse modification of the essential habitat of such species or are likely to result in the adverse modification of a Natural Area. 17 Ill. Adm. Code 1075.40.

In addition, the list of “Actions Requiring Review for Consultation” includes “a discharge of pollutants into the air, water, or on the land.” 35 Ill. Adm. Code 1075.30(a)(5). Has Illinois EPA consulted with the Illinois DNR with respect to Exelon’s requested alternative thermal effluent limitations? If so, what did Illinois DNR advise?

4. Has Illinois EPA consulted with the Iowa DNR with respect to Exelon’s requested alternative thermal effluent limitations? If so, what did Iowa DNR advise?
5. As noted in Illinois EPA’s recommendation, Exelon reports that long-term electrofishing fish monitoring shows “decreases in the numbers of white crappie, black crappie, and sauger.” Pet. Exh. 1 App. C at C-17. Exelon states in response that it will further study these populations. Explain whether Exelon’s requested alternative thermal effluent limitations will assure the protection of the populations of white crappie, black crappie, and sauger in Pool 14 in the absence of, or prior to, further studying these populations.
6. Comment on requiring the following condition of Exelon:

Exelon will conduct a study of white crappie, black crappie, and sauger populations in Pool 14 of the Mississippi River. Exelon will conduct this study during the term of the first NPDES permit containing the alternative thermal effluent limitations ordered by the Board. The results of this study will be made available to Illinois EPA and Illinois DNR when the Quad Cities Nuclear Generating Station applies for renewal of its NPDES permit.

7. Table C-1 (Pet. Exh. 1 App. C at C-31) shows that a zone of passage only would be less than 75% (corresponding to mixing zone greater than 25%) when flow in Pool 14 is below 16,400 cubic feet per second and that Exelon’s proposed zone of passage of 66%

would not occur until flow drops to 13,200 cubic feet per second. Comment on the reliability of the data presented in this table.

8. Describe the availability of river flow data for Pool 14 and any requirements for Exelon to collect river flow data. Comment on whether Exelon is, or should be, required in the NPDES permit for the Quad Cities Station to collect river flow data.
9. Comment on the following alternative thermal effluent limitation:

The mixing zone for the Quad Cities Nuclear Generating Station shall allow for a zone of passage that includes at least 75% of the cross sectional area and volume of flow of the Mississippi River when the river flow is 16,400 cubic feet per second or more and no less than 66% when river flow is less than 16,400 cubic feet per second.

10. Comment on the following alternative thermal effluent limitation:

The mixing zone for the Quad Cities Nuclear Generating Station shall allow for a zone of passage that includes at least 66% of the cross sectional area and volume of flow of the Mississippi River when the river flow is 13,200 cubic feet per second or less.

11. Comment on the following alternative thermal effluent limitation:

The mixing zone for the Quad Cities Nuclear Generating Station shall allow for a zone of passage that includes at least 66% of the cross sectional area and volume of flow of the Mississippi River when the river flow is 13,200 cubic feet per second or less. The mixing zone shall allow for a zone of passage that includes at least 75% of the cross sectional area and volume of flow of the Mississippi River when the river flow is 16,400 cubic feet per second or more. For flows between 13,200 cubic feet per second and 16,400 cubic feet per second, the mixing will be as follows:

<u>Flow (cfs)</u>	<u>Zone of Passage</u>
13500	67%
13800	69%
14000	70%
14500	71%
15000	72%
15500	73%
16000	74%

12. Comment on using the zone of passage curve developed during the April 2002 Iowa Institute of Hydraulic Research Report (Jain, et al, 2002) (Pet. Exh. 1 App. C at C-20) to demonstrate compliance with the mixing zone size similar to what appears to be a similar provision in Special Condition 6 of the Quad Cities Station's NPDES permit (Pet. Exh. 1 App. D at D-7).
13. Explain how Illinois EPA will require Exelon to demonstrate compliance with the alternative thermal effluent limitations as proposed by Exelon in its petition.
14. Exelon requests relief from 35 Ill. Adm. Code 302.102(b)(8) of the Board's mixing zone rules. Explain whether Exelon has demonstrated that its requested 66% zone of passage meets the requirements for granting an adjusted standard under 415 ILCS 5/28.1(c)(1)-(4).
15. In its petition, Exelon notes that it would need to derate when river flow falls below 13,200 cubic feet per second to maintain the requested zone of passage of at least 66% (Pet. Exh. 1 App. C at C-23) and it would need to derate at certain low flows to maintain compliance with its proposed relief on excursion hours (Pet. Exh. 1 App. B at B-9, B-10). Comment on including a condition in the requested alternative thermal effluent limitation and NPDES permit for the Quad Cities Station requiring the Quad Cities Station to derate under specified conditions to maintain compliance with the requested alternative thermal effluent limitations.
16. Comment on the following alternative thermal effluent limitation:

When river flow is below 13,200 cubic feet per second, the Quad Cities Nuclear Generating Station will derate as needed to maintain a zone of passage of no less than 66% of the cross sectional area and volume of flow of the Mississippi River.
17. Comment on the following alternative thermal effluent limitation:

When river flow is below 15,000 cubic feet per second, the Quad Cities Nuclear Generating Station will derate as needed to comply with the annual allotment of excursion hours.
18. Comment on requiring the following condition of Exelon:

Exelon will assess the impact on aquatic life when the Quad Cities Nuclear Generating Station uses more than 219 excursion hours in any twelve-month period. Exelon will conduct this study during the term of the first NPDES permit containing the alternative thermal effluent limitations ordered by the Board. The results of this study will be made available to Illinois EPA and Illinois DNR

when the Quad Cities Nuclear Generating Station applies for renewal of its NPDES permit.

19. Comment as needed on any question posed to Exelon in Attachment 2 to this order.

Questions for Exelon

Board Record

1. Provide a copy of the current National Pollutant Discharge Elimination System (NPDES) permit for the Quad Cities Nuclear Generating Station (Quad Cities Station). The Illinois Environmental Protection Agency (Illinois EPA) and Iowa Department of Natural Resources (Iowa DNR) jointly issued this permit (IL 0005037) on August 26, 2010 and it is effective until August 31, 2015. Pet. Exh. 1 App. A at A-10; Agency Recommendation at 1-2.
2. Provide a copy of all provisional variances issued by Illinois EPA addressing thermal discharges from the Quad Cities Station, and any extensions of those variances.
3. Provide a copy of all reports or notices provided by Exelon to Illinois EPA or the Illinois Department of Natural Resources (Illinois DNR) as a condition of any provisional variance issued by Illinois EPA addressing thermal discharges from the Quad Cities Station.
4. Provide a copy of the zone of passage curve developed during the "April 2002 Iowa Institute of Hydraulic Research Report (Jain, et al, 2002)." Pet. Exh. 1 App. C at C-20. Provide a copy of any subsequent zone of passage curves developed for the Quad Cities Station.
5. Provide copies of the temperature monitoring curves developed by Exelon including TMC-1 (Pet. Exh. 1 App. A at A-11), TMC-2 (Pet. Exh. 1 App. A at A-11), the temperature monitoring curve last modified in 2001 (Pet. Exh. 1 App. A at A-12), "new" temperature monitoring curve (Pet. Exh. 1 App. E at E-5), "temperature monitoring curve identified as Figure 2 in December 2000 'Revised Temperature Monitoring Curve for Quad Cities Nuclear Generating Station' (Jain, 2000)" (Pet. Exh. 1 App. D at D-8), and all temperature monitoring curves used for compliance with the current NPDES permit.
6. Provide a larger copy of Figure 3 "Observed Temperatures, Date: September 16, 2003...LMS Thermal Survey" (Pet. Exh. 1, App. B at B-42) so that the numbers on the isotherms can be discerned.
7. Provide a copy of the Upper Mississippi River National Wildlife and Fish Refuge Comprehensive Conservation Plan (*see, e.g.*, Pet. Exh. 1, App. A at A-44), including any appendix or list that identifies the Illinois and Iowa listed endangered or threatened species.

Plant Location

8. 35 Ill. Adm. Code 303.331 applies to the section of the Mississippi River from the Wisconsin border to the Rock River. What is the distance from the Wisconsin border to the Rock River in river miles?
9. How many river miles downstream from the Wisconsin border is the Quad Cities Station?
10. How many river miles upstream from the Rock River is the Quad Cities Station?

Method for Heat Dissipation

11. Exelon states that a “diffuser system was installed in the Mississippi River in 1972 as an interim mode of discharge until the spray canal (closed cycle cooling) was completed.” Pet. Exh. 1 App. D at D-9. This diffuser system was operated until May 1, 1974 when the spray canal commenced operations with one unit discharging to the spray canal. *Id.* On May 1, 1975, both units began discharging to the spray canal. *Id.* On December 23, 1983, the facility “commenced the current full open cycle mode of operation via the diffuser pipes.” *Id.* at D-10. Clarify whether the diffuser pipe system currently in use (Pet. at 11-13) is the same system installed in 1972. Has Exelon modified the diffuser pipe since 1972 other than closing the 9 risers in the shallow zone of the river (Pet. at 12)?
12. Explain how and why the location of the current diffuser system was selected.
13. Exelon describes the diffuser pipe system used for cooling including measurements for the north and south pipes as well as spacing and orifice sizing of the discharge risers. Pet. at 11-13. Exelon depicts the diffuser pipe system graphically with two lines in Figures 1, 3, and E-1. Pet. Exh. 1 App. B at B-40, B-42, App. E at E-21. Provide a more detailed and dimensioned drawing of the diffuser pipe system, including risers with spacing, orifice dimensions, as well as depth and location in the receiving stream.
14. Describe how Exelon determines if the diffuser pipe system is performing as intended. Explain what data Exelon collects to evaluate this system and how Exelon uses field data for this purpose.
15. Describe how and when Exelon performs maintenance on the diffuser pipe system.
16. Exelon describes an investigation “to develop strategies and associated diffuser pipe modifications.” Pet. Exh. 1 App. A at A-11; Pet. Exh. 1 App. E at E-5. Who conducted this investigation and when was it conducted?
17. Would “reducing the condenser water discharge near the Iowa shore and increasing it in the deeper portion of the river section” (Pet. Exh. 1 App. A at A-11) improve the

performance of the diffuser pipe system? Explain. How would this strategy affect the size of the mixing zone? Has Exelon implemented this strategy?

18. Would “optimizing the sizes of the orifice plates for the risers of the diffuser pipe system” (Pet. Exh. 1 App. E at E-5) improve the performance of the diffuser pipe system? Explain. How would this strategy affect the size of the mixing zone? Has Exelon implemented this strategy?
19. 35 Ill. Adm. Code 302.102(b)(1) requires “Mixing must be confined in an area or volume of the receiving water no larger than the area or volume which would result after incorporation of outfall design measures to attain optimal mixing efficiency of effluent and receiving waters.” Does the operation of the diffuser pipe system provide optimal mixing efficiency of the thermal effluent and the receiving water?

Communication

20. Exelon generally describes presenting information in meetings and submitting information to governmental agencies. *See* Pet. at 14. Exelon also included with its petition an April 19, 2007 letter to the United States Environmental Protection Agency (USEPA). Pet. Exh. 2. Has Exelon specifically communicated with the United States Environmental Protection Agency (USEPA) regarding Exelon’s current demonstration under Section 316(a) of the Clean Water Act (CWA) submitted to the Board in this proceeding? Has Exelon communicated with USEPA regarding the specific relief requested by Exelon in its petition? Has USEPA informed Exelon of whether USEPA approves of or objects to Exelon’s proposed alternative thermal effluent limitations or Exelon’s demonstration? If so, describe, and provide copies of, any response provided by USEPA. Describe communications with USEPA after April 19, 2007 regarding Exelon’s CWA Section 316(a) demonstration.
21. Exelon states that in 2003, Exelon commenced studies “aimed at determining whether existing thermal limits could be relaxed without causing unacceptable environmental impacts.” Pet. at 14. Exelon presented these plans in committee meetings as well as to Illinois EPA and Illinois DNR “to obtain their input.” *Id.* In 2007, Exelon submitted to USEPA, with copies to United States Fish and Wildlife Service (USFWS), Illinois DNR, Iowa DNR, and Illinois EPA, its “detailed plans for additional studies to support its 316(a) Demonstration.” *Id.*; *see also* Pet. Exh. 2. Has Illinois DNR informed Exelon of whether Illinois DNR approves of or objects to Exelon’s proposed alternative thermal effluent limitation or Exelon’s demonstration? If so, describe, and provide copies of, any response provided by Illinois DNR.
22. Has Exelon communicated with Iowa DNR regarding Exelon’s demonstration under CWA Section 316(a) submitted to the Board in this proceeding? Has Exelon communicated with Iowa DNR regarding the specific relief requested by Exelon in its petition? Has Iowa DNR informed Exelon of whether Iowa DNR approves of or objects to Exelon’s proposed alternative thermal effluent limitations or Exelon’s demonstration? If so, describe, and provide copies of, any response provided by Iowa DNR.

Endangered and Threatened Species

23. USEPA's "Interagency 316(a) Technical Guidance Manual and Guide for Thermal Effects Sections of Nuclear Facilities Environmental Impact Statements (DRAFT)," May 1, 1977 (316(a) Manual) provides that the permitting authority:

checks with the Regional Director of the [U.S. Fish and Wildlife Service] and representatives of the [National Marine Fisheries Service] and States to make sure the study plan includes appropriate consideration of threatened or endangered species as well as other fish and wildlife resources. 316(a) Manual at 15.

State whether Exelon consulted with Illinois DNR on the inclusion of state-listed endangered or threatened species in the study plan for Exelon's CWA Section 316(a) demonstration? If so, what did Illinois DNR advise with respect to state-listed species? Provide copies of any response provided by Illinois DNR.

24. State whether Exelon consulted with Iowa DNR on the inclusion of state-listed endangered or threatened species in the study plan for Exelon's CWA Section 316(a) demonstration? If so, what did Iowa DNR advise with respect to state-listed species? Provide copies of any response provided by Iowa DNR.
25. USFWS approved a Habitat Conservation Plan and issued a Federal Fish and Wildlife Permit authorizing incidental taking of Higgins eye pearly mussel and Sheepnose mussel. Pet. at 25; Pet. Exh. 4 and 5. Is Exelon's requested alternative thermal effluent limitation an incidental taking of endangered or threatened species for these species or any other species under 17 Ill. Adm. Code 1080? If so, describe Exelon's plans for preparing an application for an incidental take authorization under Illinois rules. Has Exelon submitted the Habitat Conservation Plan to Illinois DNR?
26. Has Exelon addressed any requirements regarding endangered and threatened species for Iowa? Explain.
27. The state-listed species that occur on the Upper Mississippi River National Wildlife and Fish Refuge include: six mammals, 40 birds, 18 fish, seven reptiles, three amphibians, and 20 mussels. Pet. Exh. 1, App. A at A-44. Exelon states that state-listed threatened and endangered species "will be addressed in the Comprehensive Conservation Plan and appropriate step-down plans." *Id.* Does the Comprehensive Conservation Plan address the impacts from Exelon's requested alternative thermal effluent limitations on state-listed endangered or threatened species? If so, identify and provide the pertinent sections of the plan.
28. Describe the location of the Upper Mississippi River National Wildlife and Fish Refuge and, if not the entire refuge, which areas of the refuge are covered by the Comprehensive Conservation Plan. Describe the location of the refuge in relation to the Quad Cities

Station. To the extent Exelon relies on the Comprehensive Conservation Plan or studies performed for the refuge, explain how those materials provide relevant information for Exelon's CWA Section 316(a) demonstration for the Quad Cities Station.

Representative Important Species

29. In its prospective demonstration, Exelon states that, in selecting species for evaluating the impact of its requested alternative thermal effluent limitation, it started with "a master fish taxa list containing 93 species that had been developed for Pool 14 during the course of 32 years of monitoring studies." Pet. Exh. 1 App. B at B-7; *see also* App. A at A-60 (Table A-3). Of these 93 species, Exelon selected four as representative important species (RIS). *Id.* On selecting RIS, USEPA's 316(a) Manual states

The most thermally sensitive species (and species group) in the local area should be identified and their importance should be given special consideration, since such species (or species groups) might be most readily eliminated from the community if effluent limitations allowed existing water temperatures to be altered. Consideration of the most sensitive species will best involve a total aquatic community viewpoint. 316(a) Manual at 37.

Identify the most thermally sensitive species (and species group) of the 93 species. Explain how these thermally sensitive species were "given special consideration" and why they were not selected as RIS.

30. In the definition of RIS in USEPA's 316(a) Manual, RIS "specifically include[s]" threatened or endangered species. 316(a) Manual at 78-79; *see also id.* at 37. Exelon found federally endangered *Lampsilis higginsii* in seven of fifteen beds, most abundantly in the Albany bed (upstream) and the Cordova bed (downstream). Pet. Exh. 1 App. C at C-15. Exelon also states that the Sheepnose mussel is present and it is a candidate species. *Id.* at C-14. Exelon also found state-listed species *Lampsilis teres* (Iowa endangered species) and *Ellipsaria lineolata* (Illinois threatened species) in eight of the fifteen beds. *Id.* Explain why these species were not evaluated or selected as RIS.
31. USEPA's 316(a) Manual provides:

receiving water temperatures outside any (State established) mixing zone will not be in excess of the upper temperature limits for survival, growth, and reproduction, as applicable, of any RIS occurring in the receiving water. 316(a) Manual at 71.

Exelon's requested alternative thermal effluent limitation would allow temperatures as high as 91°F during excursion hours at the edge of the mixing zone. Pet. Exh. 1 App. B at B-4. The temperature tolerance polygons (Figure A2-1 thru A2-4) show acute and chronic mortality temperatures for the four selected RIS. Pet. Exh. 1 App. B at B-12, B-80 to B-83. Will the requested alternative thermal effluent limitation be in excess of the

upper temperature limits for survival, growth, and reproduction, as applicable, of any RIS?

Biotic Category Analysis

32. USEPA's 316(a) Manual sets forth decision criteria for six biotic categories. (*See* 316(a) Manual at Sections 3.3.1.1, 3.3.2.1, 3.3.3.1, 3.3.4.1, 3.3.5.1, and 3.3.6.1.) Exelon analyzed these categories in its petition. Summarize how Exelon's CWA Section 316(a) demonstration addresses each of the decision criteria for each of the biotic categories.
33. USEPA's 316(a) Manual provides that the receiving waters for a thermal discharge must not be "of such quality that in the absence of the proposed thermal discharge excessive growths of nuisance organisms would take place." 316(a) Manual at 71. Explain whether Pool 14 meets this provision.
34. Comment on whether Exelon has observed or received any reports of nuisance algal blooms in Pool 14 at any time since the Quad Cities Station began operations.
35. Exelon reports that three unionid beds occur within 3500 meters (approximately two river miles) of the thermal diffuser: Steamboat Slough Bed, Upstream Bed, and Cordova Bed. Pet. Exh. 1 App. A at A-33. USEPA's 316(a) Manual states, "Areas which serve as spawning and nursery sites for important shellfish and/or macroinvertebrate fauna are considered as zero allowable impact areas and will be excluded from consideration for the discharge of waste heat. Plants sited in locations which would impact these critical functions will not be eligible for a 316(a) waiver." 316(a) Manual at 24-25. Explain whether the unionid beds identified near the Quad Cities Station are covered by this provision of the manual. Are Exelon's requested alternative thermal effluent limitations precluded by this provision? Explain.
36. 35 Ill. Adm. Code 302.102(b)(4) states, "Mixing is not allowed in waters containing mussel beds, endangered species habitat, fish spawning areas, areas of important aquatic life habitat, or any other natural features vital to the well being of aquatic life in such a manner that the maintenance of aquatic life in the body of water as a whole would be adversely affected." Will Exelon's requested relief as to zone of passage comply with 35 Ill. Adm. Code 302.102(b)(4)? Explain.
37. During the periods covered by any provisional variance issued by the Illinois EPA addressing thermal discharges from the Quad Cities Station, has the station observed or received reports of any fish mortalities or other adverse impacts to aquatic life? If so, describe.
38. In 2006, the Quad Cities Station used 222.75 excursion hours. Pet. Exh. 1 App. A at A-35; *see also* Pet. at 23. Exelon states that "increased mortality was observed" in the Upstream and Cordova mussel beds in 2006. *Id.* at A-36. Exelon also appears to report that these mortalities declined and populations increased in subsequent years. *Id.*

Explain these population observations and the impact of the thermal discharge from the Quad Cities Station on this population decrease.

39. Describe the river flow and river temperature conditions in 2006 when the Quad Cities Station used 222.75 excursion hours. *See* above question. Identify the month and days in 2006 when the station used excursion hours. Did the station observe or receive reports of any fish mortalities or other adverse impacts to aquatic life during this period in 2006? If so, describe.
40. In Exelon's retrospective analysis, Exelon reports on trends in long-term electrofishing fish monitoring over the past 41 years for freshwater drum, channel catfish, largemouth bass, bluegill, white crappie, black crappie, sauger, and flathead catfish. Pet. Exh. 1 App. C at C-17. Figures C-1 and C-2 illustrate the numbers of fish caught from 1971 to 2011 for the above listed species as well as common carp, river carpsucker, and gizzard shad. Explain why Exelon chose these species for Figures C-1 and C-2. Does Exelon have population data for other species? If so, which species? Have any other species shown a decrease in population during 1971 to 2011? If so, identify the species.
41. Figure C-1 illustrates the numbers of fish caught from 1971 to 2011 and for these types of fish shows the highest numbers were caught in 1971 and decreases after 1971. Pet. Exh. 1 App. C. Exelon also states that thermal discharges from Quad Cities Station since 1983 have not caused appreciable harm to finfish in Pool 14. *Id.* at C-18. Explain the observed trends in white crappie, black crappie, and sauger populations between 1971 and 1983, between 1983 and 2011, and for the entire period of 1971 to 2011 and describe the Quad Cities Station's thermal discharges during these periods.
42. Exelon states that trends in fish populations appear both upstream and downstream of the diffuser pipes. Pet. Exh. 1 App. C at C-17. Has Exelon observed that "decreases in the numbers of white crappie, black crappie, and sauger" occur both upstream and downstream of the diffuser pipes? Explain any data showing this trend.
43. Exelon states that trends in fish populations are due to habitat changes and other factors such as fishing practices and regulation. Pet. Exh. 1 App. C at C-17. Explain how habitat changes and any other factors contribute to "decreases in the numbers of white crappie, black crappie, and sauger."
44. Exelon states that "backwater species, such as white and black crappies have generally decreased due to degradation of the backwater areas and sloughs from sedimentation associated with the operation of the 9-foot navigation channel." Pet. Exh. 1 App. A at A-39. Expand on and provide support for this conclusion.
45. In response to Illinois EPA's recommendation, Exelon states that it will conduct a study of the populations of white crappie, black crappie, and sauger in Pool 14 by studying fish population data obtained upstream from the Quad Cities Station in Pool 13. Explain the basis for Exelon's conclusion that its requested alternative thermal effluent limitations will assure the protection of the populations of white crappie, black crappie, and sauger in

Pool 14 in the absence of, or prior to studying, this data. Explain how such a future study will lead to an understanding of the cause or causes of a decrease in these populations between 1971 and 2011.

46. Comment on requiring the following condition of Exelon:

Exelon will conduct a study of white crappie, black crappie, and sauger populations in Pool 14 of the Mississippi River. Exelon will conduct this study during the term of the first NPDES permit containing the alternative thermal effluent limitations ordered by the Board. The results of this study will be made available to Illinois EPA and Illinois DNR when the Quad Cities Nuclear Generating Station applies for renewal of its NPDES permit.

Extent of Mixing Zone

47. The NPDES permit for the Quad Cities Station defines a mixing zone as “a straight line across the Mississippi River, 500 feet downstream of the diffuser pipes.” Pet. Exh. 1 at 3. Exelon states that the surface area of the river between the diffuser pipes and 500 feet downstream is 24.9 acres, slightly less than the 26 acres allowed by Board regulations as a mixing zone. Pet. Exh. 1 App. D at D-5; *see also* 35 Ill. Adm. Code 302.102(b)(12). What is the surface area of the mixing zone under Exelon’s requested 66% zone of passage?
48. Figure E-2 depicts the current mixing zone with a cross-hatched area in relation to unionid bed monitoring areas. Pet. Exh. 1 App. E at E-22. Provide a more close-up map depicting the current mixing zone.
49. Provide a map depicting the mixing zone under Exelon’s requested 66% zone of passage. Provide dimensions for the extent of the mixing zone upstream and downstream from the diffuser. Under a 66% zone of passage, at what distance downstream would be the edge of the designated mixing zone? Would that distance change based on river flow and plant flow?
50. Exelon notes that the NPDES permit contains monthly maximum temperature limits for “representative locations in the main river” at the edge of the mixing zone and requirements for daily determination of the temperature at a river cross-section 500 feet downstream from the diffuser system. Pet. Exh. 1 App. A at A-11, A-12. Under a 66% zone of passage, at what distance downstream from the diffuser system would Exelon monitor the temperature? Describe the monitoring protocol including number of temperature readings, monitoring locations, and frequency of monitoring. Describe the monitoring method, for example, manual sampling or continuous remote sampling.
51. Provide a copy of the temperature monitoring curve that would be used to demonstrate compliance with Exelon’s requested alternative thermal effluent limitations.

52. Comment on using the zone of passage curve developed during the April 2002 Iowa Institute of Hydraulic Research Report (Jain, et al, 2002) (Pet. Exh. 1 App. C at C-20) to demonstrate compliance with the mixing zone size similar to what appears to be a similar provision in Special Condition 6 of the Quad Cities Station's NPDES permit (Pet. Exh. 1 App. D at D-7).

River Flow and Zone of Passage

Table C-1 shows that a zone of passage only would be less than 75% (corresponding to mixing zone greater than 25%) when flow in Pool 14 is below 16,400 cubic feet per second when the plant is operating at full thermal load and the diffuser provides uniform mixing. (Pet. Exh. 1 App. C at C-31). Table C-1 also shows that Exelon's proposed zone of passage of 66% would not occur until flow drops to 13,200 cubic feet per second. *Id.* Further, the lowest 7-day average flow that occurs on average once every 10 years (7Q10) in Pool 14 is 13,800 cubic feet per second while the typical summertime flow is 30,000. *Id.*, see also Pet. Exh. 1 at 20. Based on Table C-1, the requested 66% zone of passage appears to occur only at flows less than the 7Q10. Historical flow records show that river flow was below 16,400 cubic feet per second on only four days during March to May and twenty-one days during October from 1986 to 2013. Pet. Exh. 1 App. B at B-5.

53. Explain how and when the flow in Pool 14 is measured. Does the NPDES permit for the Quad Cities Station require these measurements? If so, describe the permit requirements.
54. In Table 3 "Summary and Brief Explanation of the Values Selected for the Plan and River Design Conditions," Exelon states that the maximum level of heat discharged to the river is based on a cooling water flow rate of 2192 cubic feet per second at a temperature difference of 28°F. Pet. Exh. 1 App. B at B-27. Based on the full thermal load, explain whether the zone of passage could be smaller than the percentage values listed in Table C-1 for the corresponding flow rates.
55. Would Exelon's requested 66% zone of passage entitle Exelon to a 34% mixing zone at all times even when flows in Pool 14 are greater than 13,200 cubic feet per second?
56. Comment on the following alternative thermal effluent limitation:

The mixing zone for the Quad Cities Nuclear Generating Station shall allow for a zone of passage that includes at least 75% of the cross sectional area and volume of flow of the Mississippi River when the river flow is 16,400 cubic feet per second or more and no less than 66% when river flow is less than 16,400 cubic feet per second.

57. Comment on the following alternative thermal effluent limitation:

The mixing zone for the Quad Cities Nuclear Generating Station shall allow for a zone of passage that includes at least 66% of the

cross sectional area and volume of flow of the Mississippi River when the river flow is 13,200 cubic feet per second or less.

58. Comment on the following alternative thermal effluent limitation:

The mixing zone for the Quad Cities Nuclear Generating Station shall allow for a zone of passage that includes at least 66% of the cross sectional area and volume of flow of the Mississippi River when the river flow is 13,200 cubic feet per second or less. The mixing zone shall allow for a zone of passage that includes at least 75% of the cross sectional area and volume of flow of the Mississippi River when the river flow is 16,400 cubic feet per second or more. For flows between 13,200 cubic feet per second and 16,400 cubic feet per second, the mixing will be as follows:

<u>Flow (cfs)</u>	<u>Zone of Passage</u>
13500	67%
13800	69%
14000	70%
14500	71%
15000	72%
15500	73%
16000	74%

59. Exelon requests relief from 35 Ill. Adm. Code 302.102(b)(8) of the Board's mixing zone rules. State whether Exelon has demonstrated that its requested 66% zone of passage meets the requirements for granting an adjusted standard under 415 ILCS 5/28.1(c)(1)-(4).

Derating

60. In its petition, Exelon notes that it would need to derate when river flow falls below 13,200 cubic feet per second to maintain the requested zone of passage of at least 66% (Pet. Exh. 1 App. C at C-23) and it would need to derate at certain low flows to maintain compliance with its proposed relief on excursion hours (Pet. Exh. 1 App. B at B-9, B-10). The excursion hour analysis used a scenario allowing a 3% limit on excursion hours. Under a 2.5% limit (219 hours) as currently proposed by Exelon, identify the conditions which would require Quad Cities Station to begin derating to maintain compliance with the requested alternative thermal effluent limitations.

61. Comment on including a condition to the requested alternative thermal effluent limitations and in the NPDES permit for the Quad Cities Station requiring Quad Cities Station to derate under specified conditions to maintain compliance.

62. Comment on the following alternative thermal effluent limitation:

When river flow is below 13,200 cubic feet per second, the Quad Cities Nuclear Generating Station will derate as needed to maintain a zone of passage of no less than 66% of the cross sectional area and volume of flow of the Mississippi River.

63. Comment on the following alternative thermal effluent limitation:

When river flow is below 15,000 cubic feet per second, the Quad Cities Nuclear Generating Station will derate as needed to comply with the annual allotment of excursion hours.

Excursion Hours

64. Identify all twelve month periods (by beginning and ending day, month, and year) when the Quad Cities Station exceeded the maximum numerical temperatures in 35 Ill. Adm. Code 303.331 by any degree during more than 87.6 hours.

65. Identify all twelve month periods (by beginning and ending day, month, and year) when the Quad Cities Station exceeded the maximum numerical temperatures in 35 Ill. Adm. Code 303.331 by any degree during more than 219 hours.

66. Identify (by day, month, and year) all excursion hours when the Quad Cities Station exceeded the maximum numerical temperatures in 35 Ill. Adm. Code 303.331 by more than 3°F.

67. Identify (by day, month, and year) all excursion hours when the Quad Cities Station exceeded the maximum limits in 35 Ill. Adm. Code 303.331 by more than 5°F.

68. Identify all instances when Exelon requested a provisional variance from Illinois EPA for additional excursion hours based on a rolling twelve month calculation but Exelon would not have been required to obtain such a variance under a calendar year calculation.

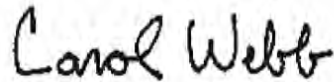
69. Identify all instances when Exelon curtailed operations during a rolling twelve month calculation but Exelon would not have been required to do so under a calendar year calculation.

70. Explain whether Exelon can use existing historic data to determine whether Exelon used more than 219 excursion hours in any twelve-month period and whether such thermal discharge adversely impacted aquatic life.

71. Comment on requiring the following condition of Exelon:

Exelon will assess the impact on aquatic life when the Quad Cities Station uses more than 219 excursion hours in any twelve-month period. Exelon will conduct this study during the term of the first NPDES permit containing the alternative thermal effluent limitations ordered by the Board. The results of this study will be made available to Illinois EPA and Illinois DNR when the Quad Cities Nuclear Generating Station applies for renewal of its NPDES permit.

IT IS SO ORDERED.



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CERTIFICATE OF SERVICE

It is hereby certified that true copies of the foregoing order were mailed, first class, on June 25, 2014, to each of the persons on the attached service list.

It is hereby certified that a true copy of the foregoing order was hand delivered to the following on June 25, 2014:

John T. Therriault
Illinois Pollution Control Board
James R. Thompson Center
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Chicago, Illinois 60601



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