BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

SOUTHERN ILLINOIS POWER, COOPERATIVE,	)	
	)	
Petitioner,	)	
	)	**PCB _____**
v.	)	**(Thermal Demonstration)**
	)	
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,	)	
	)	
Respondent.	)	

NOTICE OF FILING

To: ALL PARTIES ON THE ATTACHED SERVICE LIST

PLEASE TAKE NOTICE that we have today filed with the Office of the Clerk of the Illinois Pollution Control Board a PETITION FOR ALTERNATE THERMAL EFFLUENT LIMITATIONS, and APPEARANCES OF GABRIEL RODRIGUEZ, RENEE CIPRIANO, AND AMY ANTONIOLLI, copies of which are herewith served upon you.

Amy Antoniolli

Amy Antoniolli

Dated: May 13, 2014

Gabriel Rodriguez
Renee Cipriano
Amy Antoniolli
SCHIFF HARDIN LLP
233 South Wacker Drive
Suite 6600
Chicago, Illinois 60606
312-258-5500

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

SOUTHERN ILLINOIS POWER, COOPERATIVE,	)	
	)	
Petitioner,	)	
	)	**PCB _____**
v.	)	**(Thermal Demonstration)**
	)	
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,	)	
	)	
Respondent.	)	

APPEARANCE

I, Gabriel Rodriguez, hereby file my appearance in this proceeding on behalf of Southern Illinois Power Cooperative.

Gabriel Rodriguez
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Dated: May 8, 2014

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

SOUTHERN ILLINOIS POWER, COOPERATIVE,	)	
Petitioner,	)	
v.	)	**PCB _____ (Thermal Demonstration)**
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,	)	
Respondent.	)	

APPEARANCE

I, Renee Cipriano, hereby file my appearance in this proceeding on behalf of Southern Illinois Power Cooperative.

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Dated: May 13, 2014

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

SOUTHERN ILLINOIS POWER, COOPERATIVE,	)	
Petitioner,	)	
v.	)	**PCB _____ (Thermal Demonstration)**
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,	)	
Respondent.	)	

APPEARANCE

I, Amy Antoniolli, hereby file my appearance in this proceeding on behalf of Southern Illinois Power Cooperative.

Amy Antoniolli
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Dated: May 9, 2014

BEFORE THE
ILLINOIS POLLUTION CONTROL BOARD

SOUTHERN ILLINOIS POWER COOPERATIVE,	)	
Petitioner,	)	
v.	)	PCB _____
	)	(Alternate Thermal Limit)
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY	)	
Respondent.	)	

PETITION FOR ALTERNATE THERMAL EFFLUENT LIMITATIONS

Submitted on behalf of
Southern Illinois Power Cooperative

TABLE OF CONTENTS

BEFORE THE
ILLINOIS POLLUTION CONTROL BOARD

SOUTHERN ILLINOIS POWER COOPERATIVE,	)	
Petitioner,	)	
v.	)	PCB _____
	)	(Thermal Demonstration)
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY	)	
Respondent.	)	

PETITION FOR ALTERNATE THERMAL EFFLUENT LIMITATIONS

Southern Illinois Power Cooperative ("SIPC" or "the Company"), by and through its attorneys, Schiff Hardin, LLP, and pursuant to Section 316(a) of the Clean Water Act ("CWA"), 33 U.S.C. §1326(a), 35 Ill. Adm. Code 304.141(c), and 35 Ill. Adm. Code Part 106, Subpart K, that the Illinois Pollution Control Board ("Board") grant alternate thermal effluent limit applicable to SIPC's discharges to Lake of Egypt.

This petition ("Petition") is divided into five parts. Part I provides the Board with an overview of SIPC's Petition and framework for the Board's decision. Part II reviews the factual background of the Marion Generating Station, its thermal discharges, and Lake of Egypt. Part III discusses SIPC's 316(a) demonstration and petitions the Board to apply alternate thermal effluent limits to SIPC's discharges to Lake of Egypt in lieu of current temperature limits. SIPC supports this request by showing that the current limits are more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on Lake of Egypt. Part IV requests a hearing on the Petition, and Part V concludes SIPC's petition.

I. INTRODUCTION

SIPC petitions the Board to grant alternate thermal effluent limits applicable to the Marion Generating Station's discharge to Lake of Egypt under Section 316(a) of the Clean Water Act (CWA).[1] That section of the CWA allows a thermal discharger to obtain a thermal effluent variance if it can demonstrate that less stringent thermal effluent standards would be protective of aquatic life in the receiving water body. The showing under federal regulations is both site-specific and fact intensive. Section 304.141(c) of the Board's effluent standards authorizes the Board to make alternate thermal standard determinations in Illinois. Section 304.141(c) states:

> 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.

35 Ill. Adm. Code 304.141(c). SIPC seeks to make this showing in accordance with the Board's recently promulgated procedural rules for establishing alternate effluent limitations, found at 35 Ill. Adm. Code 106.1100 *et seq.*[2] These regulations require an applicant to submit supporting information and demonstrations consistent with those identified and described in 40 C.F.R. §§125.72 and 125.73. Together, Section 316(a) of the CWA, Section 304.141(c), and Section 106.1100 *et seq*. set forth the burden of proof necessary for obtaining alternate thermal standards.

[1] 33 U.S.C. §1326(a).

[2] *In the Matter of: Procedural Rules for Alternative Thermal Effluent Limitations Under Section 316(a) of the Clean Water Act: Proposed New 35 Ill. Adm. Code 106, Subpart K, and Amended Section 304.141(c),* R13-20 (Feb. 20, 2014) ("*Alternative Thermal Effluent Limitations Rule*").

Once SIPC makes the required showing to the Board's satisfaction and the Board then grants SIPC's request for alternate thermal standards, those alternative standards may then be incorporated by the Illinois Environmental Protection Agency ("IEPA") in SIPC's National Pollutant Discharge Elimination System ("NPDES") permit.[3] 35 Ill. Adm. Code 106.1170(a).

SIPC seeks alternate thermal effluent limits that reflect the station's current operating conditions in lieu of the limits in Special Condition 4 of its NPDES permit. Special Condition 4 of SIPC's NPDES permit, which is based on the Illinois general use water quality standards for temperature,[4] states:

> Discharge of wastewater from this facility must not alone or in combination with other sources cause the receiving stream to violate the following thermal limitations at the edge of the mixing zone which is defined by Section 302.211, Illinois Administration [sic] Code. Title 35, Chapter 1, Subtitle C, as amended:
>
> A. Maximum temperature rise above natural temperature must not exceed 5 F (2.8 C).
>
> B. Water temperature at representative locations in the lake shall not exceed the maximum limits in the following table during more than one (1) percent of the hours in the 12-month period ending with any month. Moreover, at no time shall the water temperature at such locations exceed the maximum limits in the following table my more than 3 F (1.7 C).

	ºC	ºF		ºC	ºF
Jan.	16	60	Jul.	32	90
Feb.	16	60	Aug.	32	90
Mar.	16	60	Sept.	32	90
Apr.	32	90	Oct.	32	90

[3] SIPC's NPDES Permit No. IL0004316 is attached to this Petition as Exhibit A.

[4] As explained in more detail below, Board precedent establishes that the Illinois water quality standards on which Special Condition 4 is based do not apply to lakes and, therefore, do not apply to SIPC's discharges to Lake of Egypt. *See* infra footnote 12.

May	32	90	Nov.	32	90
Jun.	32	90	Dec.	16	60

This Petition and attached exhibits demonstrate that these limits are more stringent than necessary to assure the protection and propagation of a balanced aquatic community in and on Lake of Egypt. Experts have studied the Lake of Egypt fishery over a period of several decades and concluded that it supports a balanced aquatic community and wildlife consistent with other artificial cooling lakes in Illinois. From 1977 through 2007, Southern Illinois University-Carbondale ("SIUC") conducted various studies and reports on the effect of the station's thermal discharge on aquatic life. (Heidinger, 1977; Heidinger, 1986; Heidinger 1988; Heidinger 1990; Heidinger, 1995, Heidinger, 2000, and Heidinger, 2007). More recently, SIPC retained AMEC (formerly known as MACTEC) to perform thermal studies on Lake of Egypt. AMEC collected data regarding the Lake of Egypt fishery and water quality, including water temperatures and dissolved oxygen ("DO") at several locations and various depths in Lake of Egypt. In addition, AMEC examined and summarized the SIUC studies and synthesized all of the information in a report entitled *Evaluation of Site-Specific Thermal Standards at Marion Power Plant: Submitted in Support of NPDES Permit Renewal* ("AMEC Report"), William Elzinga and Matthew C. Basler, AMEC (October 2013) (attached as Exhibit B).[5] The AMEC Report found that the temperature limits in Special Condition 4 are more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on Lake of Egypt.

[5] SIPC's consultant, AMEC Environment & Infrastructure, Inc. gathered data related to SIPC's thermal discharges and synthesized the data in the AMEC Report.

Based on this report, SIPC requests a set of seasonally-based thermal effluent limitations that reflect current operating conditions. Specifically, SIPC requests the Board to grant the following thermal effluent limitations applicable to its discharge to Lake of Egypt and order IEPA to incorporate them into the Marion Station NPDES permit in lieu of Special Condition 4:

> In lieu of the temperature water quality standards defined by Section 302.211, the thermal discharge to Lake of Egypt from SIPC's Marion Generating Station shall not exceed the following maximum temperatures, measured at the outside edge of the 26-acre mixing zone in Lake of Egypt, by more than 1 percent of the hours in a 12-month period:
>
> 1. 72°F from December through March;
> 2. 90°F from April through May;
> 3. 101°F from June through September; and
> 4. 91°F from October through November.
>
> At no time shall the water temperature at the edge of the mixing zone exceed these maximums by more than 3°F.

In summary, SIPC asks the Board to grant alternate thermal standards under 35 Ill. Adm. Code 304.141(c) and Section 106.1100 *et seq*. applicable to its discharge to Lake of Egypt in lieu of the limits in Special Condition 4.

II. FACTUAL BACKGROUND

A. Marion Generating Station Is a Consumer-Owned Coal-Fired Power Plant.

SIPC is a consumer-owned generation and transmission cooperative, headquartered in Marion, Illinois. The Marion Generating Station is a coal-fired power plant located approximately seven miles south of the City of Marion and consists of two coal-fired units and two additional combined-cycle units. A 173 megawatt ("MW") cyclone boiler came online in 1978 and provides steam to one turbine (Unit 4). A second 109 MW circulating fluidized bed boiler came online in 2003 and provides steam to three small turbines (Unit 123). Altogether,

Units 123 and 4 produce approximately 300 MW. The two simple-cycle units (Units 5 and 6) are nominally rated at 83 MW (dependent upon ambient air temperature).

SIPC owns 4,674 acres around the station and employs 130 people. Agriculture is the dominant land use of the area surrounding the plant. Marion Generating Station uses Illinois basin bituminous coal. The condensate system consists of the main condenser, two condensate pumps, air ejection equipment, drain cooler, two low pressure heaters and associated piping and valves. Circulating water serves as the coolant.

The following table provides the history of the plant's load factor for the past five years:

Year	**Unit 123**	**Unit 4**
2009	75%	71%
2010	81%	72%
2011	80%	77%
2012	80%	69%
2013	78%	71%

The projected load factors should follow past load factors for each unit for the life of the plant. The plant has no plans to retire either unit, or to add units. The following table shows a history of plant shutdowns over the past five years for each unit:

Unit 123			
Year	**Number of shutdowns**	**Scheduled Hours**	**Unscheduled Hours**
2009	12	537	416
2010	5	713	65

2011	8	748	37
2012	8	839	63
2013	9	1129	98

Unit 4			
Year	**Number of shutdowns**	**Scheduled Hours**	**Unscheduled Hours**
2009	23	785	538
2010	13	1256	373
2011	13	963	387
2012	11	1109	372
2013	13	864	330

*Planned or scheduled shutdowns are indicated in the Scheduled Hours column, unplanned or emergency shutdowns would be indicated in the Unscheduled Hours.

Pyramid Acres Marina, located on Lake of Egypt, has already hosted 34 fishing tournaments during the winter and spring months of 2014. Lake of Egypt is home to a number of other fishing tournaments that are either undocumented or held at other marinas on Lake of Egypt. The popularity of Lake of Egypt as a fishing destination demonstrates that the lake is a valuable resource for Illinois citizens.

B. SIPC Constructed Lake of Egypt to Cool Thermal Discharges from Marion Generating Station.

Marion Generating Station draws water from Lake of Egypt to cool Unit 123 and Unit 4 and then discharges the heated effluent back into Lake of Egypt. SIPC created Lake of Egypt in 1963 by impounding the South Fork of the Saline River for the very purpose of cooling thermal effluent from the station. This privately owned lake was constructed before Illinois water

quality standards or effluent limits existed, and even before artificial cooling lakes were deemed waters of the State.[6]

The dam impounding the lake is located at the north end because South Fork Saline River flows to the north. Lake of Egypt is located in both Williamson and Johnson Counties, has a surface area of 2,300 acres and approximately 93 miles of shoreline.[7] The average depth in Lake of Egypt is 18 feet, with a maximum depth of 52 feet.[8] The Lake of Egypt Water District withdraws water from the lake to supply approximately 1 million gallons per day of drinking water to Union, Jackson, and Williamson Counties.[9] The plant is located along the northwest bank, which is considered the "lower" end of the lake.

While the lake was created to provide cooling water for the station, it has since become a resource for recreational fishing and boating. There are four public access points on the lake including the Hickory Ridge boat launch and campground located within the Shawnee National Forest. A map of private subdivisions and public access areas located along the lake is attached as Exhibit C. The Shawnee National Forest includes trails for hiking and horseback riding along with places to hunt and rock climb. A map of the Shawnee National Forest, which also shows the location of Lake of Egypt, is attached as Exhibit D.

[6] The Board adopted water quality standards in *In the Matter of Effluent Criteria*, R70-8; *Water Quality Standards Revisions*, R71-14; *Water Quality Standards Revisions for Intrastate Waters*, R71-20 (Mar. 7, 1971). The Board defined artificial cooling lakes as waters of the state in *Water Quality and Effluent Standards Amendments, Cooling Lakes ("Cooling* Lakes*")*, R75-2 (Sept. 29, 1975).

[7] AMEC Report, p. 1.

[8] *Id*., at 1-2.

[9] *Id*.

C. SIPC Uses Lake of Egypt to Dissipate Waste Heat from the Station.

SIPC utilizes once-through cooling for all four turbines with a common intake from and discharge to Lake of Egypt to dissipate waste heat from the Station. SIPC constructed Lake of Egypt with a dike that extends into the lake, providing a flow path for warm discharge water to allow for a greater duration of mixing, evaporative cooling, and convective heat dissipation before the water is recirculated back to the plant.

Water is discharged into Lake of Egypt at an average flow rate of approximately 187,000 gallons per minute and with the maximum instantaneous temperature occurring during each reporting month ranging from 78°F to 124°F based on data over the past ten years. The discharge temperature is typically approximately 25°F to 30°F above the intake water temperature. Approximately 90% of the time, the discharge is between approximately 18°F and 37°F warmer than the intake water. The variation in temperature increase is mostly related to change in pumping rate. Flow rates will change depending on the number of circulation water pumps in operation and applied resistance to flow in the condensers. The heated water flows into the lake mixing zone where it settles into an upper layer of heated water over the existing lake water with some amount of mixing at the boundary between the two layers. This separation is caused by differences in density and is referred to as “stratification,” a common natural phenomenon in lakes. The heated water is cooled by evaporation, convection heat transfer with the air, convection heat transfer with the lower water layers, and thermal radiation to the atmosphere. A reduction in temperature is also obtained due to mixing of the heated water with lower temperature water from the other portions of the lake or from precipitation and runoff into the mixing zone. Discharge water over time dissipates the accumulated thermal energy to the greater environment or is recirculated into the unit once again. Repeated passes

through the condensers results in a steady increase in the size of the heated water in the lake during summer months.

Changes in local conditions have a distinct impact on the ability of the lake to dissipate thermal energy. Prolonged droughts or periods of elevated air temperatures and humidity reduce the overall ability of the lake to dissipate heat. Droughts result in lower lake levels, reducing the total surface area available for heat transfer. Elevated air temperatures reduce the total temperature difference between the heated water and the environment at large, so temperature difference and convection and conduction heat transfer cannot occur. High humidity levels reduce the heat transfer caused by evaporative cooling. Uncommon weather conditions such as those seen in December 2012 can result in periods where the lake is incapable of dissipating thermal energy so as to meet the existing permit limits. Observed air temperature was in the mid 60's during daylight hours with the dew point at or above 60°F. These conditions, where lake surface temperature is at or near air temperature, result in the lake behaving as a thermal energy storage device rather than as a means of dissipation.

D. Plan of Study to Address Thermal Discharges.

Beginning in the 1970s, SIUC conducted various studies and reports on the effect of the station's thermal discharge on aquatic life. The operation of Unit 123 in 2003 changed the volume and frequency of thermal water discharged into the lake. While the volume of effluent did not increase appreciably, the frequency of thermal discharges increased dramatically. Before the new boiler came online, Units 1, 2, and 3 served primarily as peaker units, operating during the times of highest demand in the summer and winter months. The new boiler, Unit 123, now operates around the clock.

SIPC retained AMEC to perform studies and collect data beginning in 2006. Studies continued in 2010. Meetings and communications with IEPA on AMEC's findings began in

2010 and have continued to the present. As the positions of USEPA and IEPA regarding the available options for seeking thermal relief in Illinois continued to evolve, SIPC met and discussed plans for additional studies with IEPA. Though they occurred prior to the promulgation of the Board's procedural rules for seeking alternate thermal limits, the communications between IEPA and SIPC regarding plans for continuing thermal studies satisfy the Board's new "Early Screening" and "Detailed Plan of Study" requirements. 35 Ill. Adm. Code 106.1115, 1120. A letter from IEPA confirming this is attached as Exhibit E.

III. SIPC HAS SHOWN THAT CURRENT EFFLUENT LIMITS ARE MORE STRINGENT THAN NECESSARY TO ASSURE THE PROTECTION AND PROPAGATION OF A BALANCED, INDIGENOUS COMMUNITY OF SHELLFISH, FISH AND WILDLIFE IN AND ON LAKE OF EGYPT.

The Board regulation authorizing alternate thermal limits provides that the Board's water pollution standards apply to thermal discharges unless the Board has determined that different standards should apply.[10] The petitioner must demonstrate to the Board that the currently applicable thermal limitations are more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the receiving water body. 35 Ill. Adm. Code 106.1105(a). There are no applicable effluent limitations for temperature and SIPC notes that not all of the Illinois temperature general use water quality standards apply to Lake of Egypt. Specifically, the Board has held that the seasonal temperature limits found in Section 302.211(e) do not apply to lakes.[11] Accordingly, Section 302.211(e) does not apply to Lake of Egypt and Special Condition 4(B) of SIPC's NPDES permit should not be included upon reissuance. The remaining applicable

[10] 35 Ill. Adm. Code 304.141(c).

[11] *See Board of Trustees of Southern Illinois University Governing Southern Illinois University, Edwardsville v. IEPA*, PCB 02-105, slip op. at 13 (Aug. 4, 2005) (holding that Section 302.211(e) applies only to rivers).

section of Special Condition 4 prohibits a temperature rise of more than 5°F above natural temperatures at the edge of the mixing zone and is based on Section 302.211(d) of the Board's water quality standards.[12] SIPC asserts that this effluent limit is more stringent than necessary to assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on Lake of Egypt. In lieu of this standard, SIPC requests that the following limits apply:

> In lieu of the temperature water quality standards defined by Section 302.211, the thermal discharge to Lake of Egypt from SIPC's Marion Generating Station shall not exceed the following maximum temperatures, measured at the outside edge of the 26-acre mixing zone in Lake of Egypt, by more than 1 percent of the hours in a 12-month period:
>
> 1. 72°F from December through March;
> 2. 90°F from April through May;
> 3. 101°F from June through September; and
> 4. 91°F from October through November.
>
> At no time shall the water temperature at the edge of the mixing zone exceed these maximum temperature limits by more than 3°F.

Over a period spanning more than three decades, Southern Illinois University, Carbondale ("SIUC") conducted studies on the effect of the station's thermal discharge on aquatic life. The data collected in those SIUC studies demonstrated that Lake of Egypt, like many other Illinois artificial cooling lakes, assures the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife. AMEC's studies on SIPC's thermal discharges after the 2003 boiler replacement found that the increased frequency of discharges caused no prior appreciable harm. Further, AMEC's modeling demonstrates the proposed

[12] 35 Ill. Adm. Code 302.211(d).

alternate thermal limits will continue to assure the protection and propagation of a BIP even under worst case conditions.[13]

A. Illinois Regulations Authorize the Board to Grant Alternate Thermal Limits Based on a Successful Showing Pursuant to Section 316(a) of the CWA.

The Board has adopted a mechanism for determining, in accordance with Section 316(a) of the CWA, that specific thermal standards apply to a particular discharger in lieu of the generally applicable thermal standards. 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.

Under Section 304.141(c), dischargers can petition the Board for alternative discharge limits and the Board will conduct a public hearing on the proposed limits and process requests in accordance with 35 Ill. Adm. Code Part 106, Subpart K. Demonstrations made pursuant to Section 316(a) are commonly referred to as "316(a) demonstrations." Section 316(a) establishes a flexible variance process that allows dischargers relief from otherwise applicable thermal standards on a case-by-case basis. Section 316(a) of the CWA provides:

> With respect to any point source otherwise subject to the provisions of Section 306 of this 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 of such thermal component with other pollutants), that will assure the protection and propagation of a balanced

[13] AMEC Report, Exhibit B.

> indigenous population of shellfish, fish and wildlife in and on that body of water.[14]

Section 316(a) requires "reasonable assurance of the protection and propagation of a balanced, indigenous population" as opposed to a "no effects" standard.[15] Under this standard, some changes to the population are acceptable as long as the water body will continue to assure a balanced population. The Board adopted the same showing requirement that is provided in the federal regulations[16] and, therefore, the "reasonable assurance" approach applies equally to a showing pursuant to Part 106, Subpart K.[17]

Moreover, the existence of some unanswered questions does not mean the demonstration is unsuccessful. Experts can use analyses of higher trophic levels to make conclusions about lower ones. In fact, the Environmental Appeals Board ("EAB") has noted that "a biologist experienced with thermal discharges, who reviews evidence as to certain species, can often conclude with assurance (based upon his knowledge and experience) that adverse effects will not be suffered by other species or life stages not mentioned."[18] There is no hard and fast rule as to how much data is adequate to support a 316(a) demonstration. It depends on the circumstances of the particular discharge and receiving waters.[19] Generally, the greater the risk

[14] 33 U.S.C. §1326(a).

[15] *In re: Dominion Energy Brayton Point, LLC, Permit No. MA 0003654*, 13 E.A.D. 407 (EAB 2007).

[16] 35 Ill. Adm. Code 106.1160.

[17] "CWA Section 316(a) provides the standard for granting an alternative thermal effluent limitation and federal regulations at 40 C.F.R. §§ 125.70 through 125.73 provide the procedures for considering such requests. While the Board may establish a more stringent procedure for these demonstrations, the Board was not *persuaded* that it was necessary in this instance." *Alternative Thermal Effluent Limitations Rule*, R13-20, slip op. at 7 (Feb. 20, 2014).

[18] *In the matter of Public Service* Company *of New Hampshire, et al (Seabrook Station) (NPDES Permit No. 0020338)*, 1 E.A.D. 332 (Jun. 10, 1977).

[19] *In re Public Service Co. of* New *Hampshire*, 1 E.A.D. 332, p. 8.

posed by the thermal discharge, the greater the degree of certainty regarding the biological situation that should be required.[20] SIPC's thermal discharge poses minimal risk since it has remained consistent for the past ten years and is not expected to increase.

Importantly, economic factors are not a petition content requirement of Part 106, Subpart K and we do not ask the Board to consider economic factors in rendering its decision. Indeed, the decision to grant or deny a request for less stringent thermal limitations hinges solely on proof of the biological effects of the discharges. Terms commonly used to convey cost considerations are notably absent from Section 316(a) and Part 106, Subpart K, in contrast to other provisions of the Clean Water Act and the Board's regulations.[21]

If a discharger makes the requisite showing, the discharger is entitled to effluent limits for its thermal discharges that are consistent with protecting and propagating the BIP. USEPA's draft guidance provides that if the applicant's rationale is convincing, supported by other sections of the demonstration, and not "convincingly negated by outside evidence, the applicant's 316(a) demonstration is successful."[22] The Board is authorized to grant alternative thermal limitations pursuant to the Act and Board regulations.

B. SIPC Can Demonstrate the Absence of Prior Appreciable Harm in Lake of Egypt.

The Board has adopted regulations that describe the criteria and standards to be used to determine whether alternate effluent limits are appropriate. As an existing discharger with no intention of increasing discharges, consistent with Section 106.1160(d), SIPC can rely on the

[20] *Id.,* at 9; *see also* 44 Fed. Reg. 32894 (Jun. 7, 1979).

[21] *In the matter of: Public Service Company of Indiana, Inc. Wabash River Generating Station NPDES Permit No. IN 0002810* Cayuga *Generating Station NPDES Permit No. IN 002763*, 1 E.A.D. 590, Pg. 10 (E.A.D. 1979).

[22] *1977 Draft* USEPA *316(a) Technical Guidance*, pg. 17.

absence of prior appreciable harm in lieu of predictive studies to show that the station's thermal discharges will assure the protection and propagation of a balanced, indigenous community of shellfish, fish, and wildlife in and on Lake of Egypt:

> Existing dischargers may base their demonstration upon the absence of prior appreciable harm in lieu of predictive studies.
>
> 1) When the petitioner bases the alternative thermal effluent limitation demonstration upon the absence of prior appreciable harm, the demonstration must show:
>
> A) That no appreciable harm has resulted from the [thermal] component of the discharge, taking into account the interaction of such thermal component with other pollutants and the additive effects of other thermal sources to a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge has been made; or
>
> B) That despite the occurrence of such previous harm, the desired alternative effluent limitations (or appropriate modifications thereof) will nevertheless assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made.
>
> 2) In determining whether or not appreciable harm has occurred, the Board shall consider the length of time in which the applicant has been discharging and the nature of the discharge.[23]

In evaluating the substantively equivalent federal regulation, the EAB has found that if there has been no prior appreciable harm as a result of the thermal discharges, it may be reasonably assumed that a balanced aquatic community will be maintained in the future. [24] In such cases the EAB has held that the requirements of Section 316(a) and the regulations are satisfied and no further demonstrations are required. Conversely, if prior appreciable harm has

[23] 35 Ill. Adm. Code 106.1160(d)

[24] *In the matter of: Public Service Company of Indiana, Inc. Wabash River Generating Station NPDES Permit No. IN 0002810 Cayuga* Generating *Station NPDES Permit No. IN 002763,* 1 E.A.D. 590, Pg. 4 (E.A.D. 1979).

occurred, it may be reasonably assumed that it will continue in the future and a balanced aquatic community will not be maintained. Either of these assumptions may be rebutted by evidence to the contrary.[25]

Though, as an existing discharger, SIPC has satisfied its burden under 40 C.F.R. §125.73(c)(1)(i) by demonstrating the absence of prior appreciable harm in Lake of Egypt, the regulations also allow for predictive studies. Considering the potential for "stressed conditions," SIPC also conducted a predictive study to show that even under these potential less typical conditions, the lake will continue to assure the protection and propagation of a balanced, indigenous population.

USEPA has issued draft guidance specifically for power companies on preparing predictive studies to support a request for an alternate thermal limit.[26] The draft guidance defines three types of predictive 316(a) demonstrations to estimate "what will happen," and outlines what information may be considered in each type.[27] The draft guidance suggests that "a Type III demonstration provides for the submittal of any information that may be necessary or appropriate to facilitate evaluation of a particular discharge."[28] AMEC's report represents a Type III hybrid demonstration because it uses a combination of predictive and retrospective assessment methods and data to assess and analyze the biological effects of the proposed thermal limits.

[25] *Id*., p. 7.

[26] *DRAFT* Interagency *316(a) Technical Guidance Manual and Guide for Thermal Effects Sections of Nuclear Facilities* Environmental *Impact Statements ("1977 Draft USEPA 316(a) Guidance Manual")*, U.S. EPA, May 1, 1977.

[27] *Id*., at 11.

[28] *Id*., at 64.

The draft guidance also advocates assessing the site before undertaking "large-scale, expensive, inappropriate studies which supply massive amounts of raw data but are not necessarily helpful to regulatory agencies in decision-making."[29] Specifically, USEPA's 1977 draft guidance was intended to "result in studies, demonstrations, and environmental reports which make more sense and are easier to interpret" and "discourage the collection of masses of costly, unnecessary data which may actually confuse the issue by diverting attention from more important information."[30] Accordingly, AMEC reviewed studies on the lake done over the past three decades that indicated a stable aquatic environment both before and after the 2003 boiler replacement. The analysis determined that the Company's discharges pose little or no potential threat to the balanced, indigenous population in Lake of Egypt and makes certain that the proposed discharge will assure the protection and propagation of a balanced, indigenous community in Lake of Egypt. In addition, SIPC has considered the interaction of its thermal discharges with other pollutants.

1. A Retrospective Analysis Demonstrates the Absence of Prior Appreciable Harm to Lake of Egypt Since the 2003 Boiler Replacement.

The AMEC Report concludes not only that SIPC's discharges have not caused significant ecological damage to Lake of Egypt, but also that the lake's aquatic community actually benefits from the discharges. A recent study found a retrospective assessment of fish species "provides the strongest evidence of the effects of existing and proposed thermal standards in that it integrates all aspects of the thermal environment on the life cycle for the fish species and the various trophic levels in the lake, expressed at the uppermost consumer

[29] *Id.*, at 6.

[30] *Id*. at 7.

levels."[31] AMEC's retrospective assessment found that fish populations have indeed adapted and thrived in the thermal environment of Lake of Egypt, which is indicative of the lower trophic levels in the lake, such as phytoplankton, epiphyton, macrophytes, zooplankton and benthos.

USEPA's draft guidance calls for at least two years of data for baseline aquatic ecology studies.[32] SIPC has the fortunate circumstance of relying on fish studies conducted during selected years in the area of the Marion Generating Station since 1977.[33] The author of these studies, Dr. Roy Heidinger of SIUC, studied primarily game fish and their forage base and his studies were used to support management recommendations for the fishery (Heidinger, 1977; Heidinger, 1986; Heidinger 1988; Heidinger 1990; Heidinger, 1995, and Heidinger 2007). The 1990 report noted "overall the fish community is [sic] Lake of Egypt is in fairly good shape and in balance."[34] SIUC performed the most extensive investigation of the aquatic biota of the lake between 1997 and 1999 (the "2000 Report") before the 2003 boiler replacement.[35] Heidinger's 2000 Report compared the health and condition of fish species in Newton Lake, Lake of Egypt, and Coffeen Lake. Specifically, Heidinger looked at the effects of thermal stress on fish condition, because stress has the potential to limit a fish's physiological system, reduce growth, impair reproduction, and reduce the integrity of the immune system, making the fish more

[31] *Ameren* Energy *Generating Co. v. IEPA*, PCB 09-38 (Mar. 18, 2010) (Petition, Exhibit 11, pg. 1-3 (filed Dec. 15, 2008)).

[32] *1977 Draft USEPA 316(a) Technical Guidance*, p. 11.

[33] AMEC Report, Appendix A (Impingement Study), p. 6.

[34] AMEC Report, Appendix E, p. 17.

[35] AMEC Report, Appendix C.

susceptible to disease and additional stressors.[36] Heidinger concluded that data showed that fish in Lake of Egypt and two other power plant cooling lakes, Newton Lake and Coffeen Lake, were similar in health. Also, fluctuations in condition and physiological variables seen in the fish can be primarily attributed to season, forage base, reproductive demands, and size rather than thermal influence.[37] According to the report, for example, the growth rate of largemouth bass in the cooler Lake of Egypt was slower than in either Newton Lake or Coffeen Lake.[38] The higher growth rate in Newton Lake and Coffeen Lake is most likely attributable to the effects of a longer growing season that is the result of a greater thermal load from these generating stations. The report also studied phytoplankton, zooplankton, benthos, phytomacrobenthos, shellfish, and macroinvertebrates. After reviewing these historical studies, AMEC concluded they demonstrate an absence of prior appreciable harm to the balanced, indigenous population.[39]

AMEC's studies include biological, hydrographical, and meteorological data, physical monitoring data, and engineering models. Moreover, the studies correlate with plant operations and meteorological conditions, account for typical seasonal and worst-case conditions, and indicate the three-dimensional effects of the source's thermal discharges. Beginning in 2006, AMEC collected near-surface and depth profile measurements near the cooling water intake structure ("CWIS") and along various transects in the lake. AMEC collected additional water temperature measurements in 2010. Based on these actual observations and using actual plant

[36] AMEC Report, Appendix C, p. 9-2.

[37] AMEC Report, Appendix C, p. 9-22.

[38] AMEC Report, Appendix C, p. 1-5.

[39] AMEC Report, p. 15.

operation and meteorological conditions data, AMEC defined the three-dimensional area of the plume.

The AMEC Report concluded that data it collected and analyzed since the 2003 boiler replacement demonstrate that discharges from the Marion Generating Station since that time have not caused appreciable harm.[40] While thermal discharges increased after the 2003 boiler replacement, SIPC has been operating under these conditions for more than ten years.

SIPC measures temperature at the point of discharge. Therefore, compliance with SIPC's NPDES permit limits must be modeled. In addition to modeling, AMEC performed two rounds of sampling in the past 5 years, which both occurred during 2010. The modeling shows that temperatures above the 90ºF permit limit have been routinely present in the summer over the past five years. AMEC's sampling data show that in 2010 temperatures in the lower lake ranged from 91ºF to 94ºF in July and from 88ºF to 101ºF in August.[41] Temperatures in the upper lake ranged from 85ºF to 88.5ºF during both periods. During these two events, samples taken in the lower areas of the lake showed exceedances of the 90ºF degree limit, but the samples collected in the upper lake showed no exceedances.[42] These measurements are consistent with historical data (pre-2003 boiler replacement) showing that summer high temperatures ranged in the low 90ºs near the intake structure.[43]

The results of field measurements and modeling show that even ambient lake temperatures have at times exceeded the Illinois water quality standards for temperature in the

[40] AMEC Report, pp. 20-22.

[41] AMEC Report, Table 5-1, Figure 5-7.

[42] AMEC Report, Table 5-7.

[43] AMEC Report, p. 24.

warmest periods of the year.[44] As noted previously, the temperature limits included in SIPC's NPDES permit, Special Condition 4(B), are based on the Board's water quality standards for temperature which the Board has determined no longer apply to lakes.[45] The proposed thermal limits reflect current operating conditions. AMEC focused on data relating to populations of representative important species ("RIS"), and specifically, whether and how the populations have adapted to the current thermal environment in the lake.[46]

Given these circumstances, AMEC's study showed no clear evidence of any population change for either species since the 2003 boiler replacement. With respect to threadfin shad and gizzard shad, AMEC's analysis of the available data shows that both are crucial forage fish in support of the food web for the Lake of Egypt ecosystem. Results of impingement sampling between 2005 and 2007 demonstrate that threadfin shad young of the year are more abundant in the lower portions of Lake of Egypt (closer to the plant discharges) during winter months since the boiler replacement in 2003.[47] In fact, since both species are more difficult to catch due to their small size and off shore habitat, AMEC's count may actually present an underrepresentation of the species.

Likewise, channel catfish abundance does not appear to have decreased since the boiler replacement in 2003. In fact, the 2010 survey revealed the greatest catch rates for this species and all specimens appeared in excellent condition. Bluegill numbers have varied considerably

[44] AMEC Report, p. 3.

[45] *See* footnote 12 supra.

[46] RIS play a pivotal role in Type II demonstrations which interpret field data to demonstrate whether "prior appreciable harm" has occurred. As discussed above (pg. 18), SIPC performed a Type III demonstration, which used RIS to support both Type I and II demonstrations.

[47] AMEC Report, Appendix A, Tables 4-7 and 4-11.

over the years but have not decreased since the boiler replacement in 2003. The bluegills collected were in very good condition.[48]

The population of largemouth bass shows annual variability in abundance likely due to fishing tournaments on Lake of Egypt. Abundance does not appear to have decreased since the boiler replacement in 2003, since catch rates were similar for this species in the 1997 and 2007 surveys. Largemouth bass showed prevalent external abnormalities (such as hook scars on the mouth, lesions on the mouth and body, and emaciation) attributable to angling pressure rather than degraded environmental conditions.[49]

AMEC chose black and white crappie as additional RIS after discussions with IEPA. The crappies fit USEPA's RIS criteria because they are a sought-after sportfish and are more thermally sensitive than the other RIS.[50] SIPC stocked Lake of Egypt with black crappie fingerlings in 2008, 2009, and 2010. More importantly, AMEC's electrofishing collections in 2005 and 2006 represent a lower overall effort than previous surveys.[51] Historical studies show that crappie populations were likely at a cyclical low point in 1988 and 1990. More recent surveys reported both black and white crappie populations, but also variable abundances between years and areas of the lake. According to AMEC, the variability was likely due to the relatively small sample sizes, extensive fishing pressure, and characteristic cyclical population

[48] AMEC Report, p. 12.

[49] *Id*.

[50] AMEC Report, p. 14.

[51] AMEC Report, p. 16.

trends of these species within larger reservoirs.[52] Despite these limitations, AMEC concluded that, compositionally, the fish community in the Lake of Egypt has remained similar.[53]

AMEC also points to the diversity in water temperatures existing both horizontally and vertically through the water column in Lake of Egypt, noting that such temperature diversity is advantageous for all fish species.[54] While water temperatures may be too warm or too cool for a particular species or life stage at a particular location, there are areas elsewhere in the lake where water temperatures will be closer to optimal. Fish spawning and recruitment differs between the upper and lower lake regions depending on temperature differences. For example, Heidinger *et al.* (2000) showed that spawning in the upper (unheated) zones of the lake lagged relative to the lower zones for a number of RIS species.[55] Use of these habitats as nursery areas is expected to reflect a similar temperature related time lag.

The studies conducted in Lake of Egypt provide evidence that fish in fact do behaviorally adapt to the warmest temperatures in the lake by avoiding them and seeking areas with cooler temperatures. In summary, the data show that the proposed temperatures promote survival, growth and development of early life stages for threadfin shad, and have not adversely affected game fish populations. No prior appreciable harm has been observed during the summer months in the past several years, even in those years with normal or warmer than expected temperatures.[56]

[52] *Id*. at 14.

[53] *Id*. at 20.

[54] AMEC Report, pp. 3, 51.

[55] AMEC Report, Section 6.2.4.

[56] AMEC Report, p. 56.

Moreover, the boiler replacement has had no adverse effect on the fishery and it may be reasonably assumed that a balanced, indigenous population will be maintained under the proposed alternate thermal standard since operating conditions are not expected to change in the future. Therefore, AMEC concluded not only that SIPC's discharges have not caused significant ecological damage to Lake of Egypt, but also that the lake's aquatic community actually benefits from the discharges.[57]

2. SIPC's Predictive Assessment Demonstrates the Proposed Thermal Limits Will Protect Shellfish, Fish, and Wildlife Even Under Worst-Case Conditions.

In addition to the retrospective assessment, AMEC also performed a predictive assessment. The report finds that Lake of Egypt is a site of low potential impact for five of the six biotic categories.[58] This is because the thermal plume comprises a relatively small percentage of Lake of Egypt and is not in an area of high biological value. Moreover, AMEC found a lack of any important spawning areas in the discharge zone. AMEC conducted more extensive studies on the remaining biotic category, fish.[59]

The predictive assessment incorporated existing data on the lake's thermal environment and the thermal requirements of its fish populations as reported in the literature. It assessed the thermal tolerances and requirements of the RIS – threadfin shad, gizzard shad, largemouth bass, bluegill, channel catfish, and black and white crappies – and compared them to the water temperatures that could exist under the proposed thermal standards and stressed environmental

[57] *Id*.

[58] The 1977 draft guidance describes low potential impact sites as "sites and proposed facilities which obviously pose little potential threat to the balanced indigenous population" and states applicants should be required to do less extensive aquatic studies for such sites. *Id*., pg. 63.

[59] AMEC Report, p. 15, 20.

conditions. The RIS are primary components of the recreational fishery of Lake of Egypt and their forage species. Based on its prospective assessment, AMEC found the fish species would find suitable habitat even under the modeled worst-case or "stressed" conditions by finding many areas and depths within the lake with suitable temperatures and DO concentrations.[60]

AMEC performed modeling to predict potential thermal conditions for both summer and winter worst-case or "stressed" conditions. A traditional plume type of model would not be able to model the overall lake configuration, including boundaries, and would not be appropriate to analyze far-field thermal conditions for Lake of Egypt. Instead, AMEC performed hydrothermal modeling using the Generalized Longitudinal Lateral Vertical Hydrodynamic Transport ("GLLVHT") model to predict lake temperatures during both summer and winter worst case conditions.[61] SIPC and AMEC spoke with USEPA regarding model selection prior to using the GLLVHT model. Both "stressed" scenarios reflect a set of weather and climactic conditions that are considered to be rarely exceeded.[62]

AMEC also ran the model using actual weather data from 2010. Since AMEC had collected lake temperature data in 2010, agreement between the model results and measured field temperatures provided confidence in the predictive modeling simulations. AMEC refers to this run as the "baseline" or "observed" scenario.

Finally, after discussions with IEPA, AMEC performed supplemental modeling of spring and fall conditions to support the recommendation of adjusted criteria for the transitional

[60] AMEC Report, pp .24-25.

[61] In *Illinois* Power *Co. v. IEPA*, PCB 92-153 (see petition filed Oct. 14, 1992), the petitioner also relied on the GLLVHT model in support of its petition.

[62] AMEC Report, p. 36.

months of April through May and October through November. The supplemental modeling was performed using additional recent plant data for these periods.[63]

The modeled scenarios demonstrated that even under warmer-than-normal meteorological conditions and maximum operating conditions, water temperatures decrease as distance from the discharge increases. According to the AMEC Report, there is available environment for fish species even when temperatures at the edge of the mixing zone would approach the proposed thermal standard under worst case conditions.[64]

Water temperature variation between the upper and lower portions of the lake ranges between 5°F to 10ºF in both the "normal" and "stressed" summer model scenarios.[65] Similarly, vertical profiling has demonstrated that under both scenarios temperatures at the edge of the mixing zone can be up to 5ºF cooler at depth than at the near-surface in the summer,[66] and 3 to 5ºF lower in the winter.[67] The difference in predicted summer temperatures between the baseline and "stressed" scenarios was an increase of approximately 6ºF in the lower lake. The predicted surface temperatures for the winter "stressed" scenario range from 23 to 25ºF warmer than the baseline scenario.[68]

[63] AMEC Report, p. 35.

[64] *See* AMEC Report, p. 45

[65] AMEC Report, Figures 5-10 – 5-13.

[66] AMEC Report, Figures 5-14, 5-15.

[67] *Id*., Figures 5-16, 5-17

[68] AMEC used a very conservative low equilibrium temperature value of 5ºF for the winter baseline condition. Use of a higher value typical of the end of the winter season such as 13ºF would make the difference smaller.

The hydrothermal modeling AMEC conducted to show lake temperatures under both normal and stressed conditions forms the basis for SIPC's requested alternate thermal limits.[69] AMEC used a 95% non-exceedance event for modeling summer and winter conditions. Modeling supporting the proposed temperatures during the fall and spring transition periods is provided in Appendix F. The thermal modeling included calibrating the model to available climate, water temperature, and other data and statistical analyses of recent historical climate data to quantify the probability, or risk, of climatic conditions that, in combination with the plant's heat load, dictate the water temperatures. Consequently, the proposed temperature limits are based on model predictions of water temperatures which are related to a quantified risk of exceedance balanced with ecological effects.

The AMEC Report also discusses why the impacts of SIPC's thermal discharges are sufficiently inconsequential in each of the six biotic categories and how the protection and propagation of a BIP will be assured. The AMEC Report and the data on which it relies demonstrate that Lake of Egypt is supporting a healthy fishery and will continue to do so during anticipated normal and worst-case operating conditions even with SIPC's requested relief.[70]

a. AMEC's Master Rationale Shows the Proposed Thermal Limits Will Continue to Protect and Propagate the BIP.

AMEC developed a master rationale that gives an overall picture of the ecosystem as projected by the six Biotic Category Rationales, the resource zones impacted, and a summary of why the data shows that the balanced, indigenous population ("BIP") will be protected. The master rationale of the demonstration should review the six biotic categories, summarize the key

[69] *See* AMEC Report, Tables 5-10 through 5-13.

[70] AMEC Report, pp. 55-56.

findings, and generally show how the BIP will be protected.[71] According to the AMEC Report, the proposed thermal limits, which reflect current thermal conditions, will continue to be protective of the BIP due to four observable patterns in Lake of Egypt.[72] First, AMEC observed temperatures outside of the mixing zone throughout the lake during normal summer conditions to be within the tolerance limits of the RIS even while the plant operated at full capacity.[73] Further, modeling showed that even under rarely expected extreme summer conditions, there would be extensive areas in the lake that fish could utilize as thermal refugia. Second, the proposed thermal limits will actually benefit the BIP. Under the proposed limits, Lake of Egypt will continue to sustain enhanced overwintering survival for threadfin shad which are an important subset of the forage base for largemouth bass and other predator species.[74] Third, the resident fish community has shown stable composition and abundance over the past 13 years, which is not expected to change due to thermal influence. Fourth, there is abundant habitat available at all times for the BIP, both horizontally throughout the lake and vertically in the water column.[75] This is evidenced by the fact that fish kills have not occurred historically in Lake of Egypt and are likewise not likely to occur in the future. These patterns show that Lake of Egypt has protected and will continue to protect a BIP.[76]

b. Lake of Egypt Is a Site of Low Potential Impact for Five of the Six Biotic Categories.

[71] *1977 Draft* USEPA *316(a) Technical* Guidance, p. 52.

[72] AMEC Report, p. 3.

[73] *Id*. at 3, 4.

[74] *Id.*

[75] *Id*.

[76] Id.

AMEC determined that Lake of Egypt meets the criteria set forth in USEPA guidance as a site of low potential impact for phytoplankton, zooplankton and meroplankton, habitat formers, shellfish and macroinvertebrates, and other wildlife. If a site is one of low potential impact for most biotic categories and other factors suggest a low potential for aquatic impact, then the evaluation can be less extensive.[77] Because SIPC constructed Lake of Egypt for the sole purpose of cooling discharges from the Marion Generating Station, the baseline lake conditions are manmade. Further, SIPC conducted a boiler replacement in 2003. Since 2003, the resident species in Lake of Egypt have developed under the same conditions that are expected in the future. Because there has been no indication of community impairment in these categories since 2003 (no prior appreciable harm), it follows that there will be no future community impairment. For all of these reasons, AMEC determined that the available information shows that impacts are sufficiently inconsequential that the protection and propagation of the BIP will be assured. [citation]

Illustrating this point with respect to the phytoplankton category, there have been no recent occurrences of algal blooms on the Lake of Egypt that suggest the aquatic ecosystem is prone to a shift to the predominance of nuisance populations of phytoplankton. Historical plankton blooms occurred prior to Goreville wastewater treatment plant improvements and homes surrounding Lake of Egypt converting from septic systems to a combined sewer system, suggesting the blooms were attributable to excess nutrient loading rather than to thermal influence.[78]

[77] *1977 Draft USEPA 316(a) Technical Guidance,* p. 64.

[78] AMEC Report, p. 16.

AMEC also determined the site is one of low potential impact because of the lake's size, depth, and shape. With respect to zooplankton and meroplankton, AMEC explained that the thermal plume does not constitute a lethal barrier to the free movement of species in these categories. The discharge is located at the far north end of the lake, thereby minimizing the potential negative effects of the thermal plume constituting a barrier or attractant to the free movement of these species throughout the lake.[79]

Likewise, AMEC explained that Lake of Egypt is a site of low potential impact to shellfish and macroinvertebrates because the area of thermal influence is very small in relation to the 2,300-acre lake.[80] Additionally, there is a deep, hypolimnetic area in the vicinity of the thermal discharge. Finally, studies show no commercially or recreationally important shellfish or macroinvertebrates present in Lake of Egypt and, therefore, no associated spawning or nursery sites.[81]

With respect to habitat formers, AMEC found that its field observations were comparable to historical reports evidencing a lack of deterioration of the habitat formers community. Wildlife such as Canada geese, red-tailed hawks, coyote, white-tailed deer, and rat snakes are common to the area.[82] AMEC determined that the observed use of Lake of Egypt by many species in the "Other Vertebrate Wildlife" category, coupled with the lack of negative

[79] AMEC Report, pp. 16-18.

[80] AMEC Report, p. 19.

[81] AMEC Report, pp. 18-19.

[82] *Crab Orchard National Wildlife Refuge: Comprehensive Conservation Plan*, U.S. Fish & Wildlife Service, pp. 25-31, 2007.

effects of plant operations on truly aquatic species, indicate that the proposed thermal standard will not cause appreciable harm for this category.[83]

The lack of any overall shift towards a nuisance species since the boiler replacement in 2003 and no algal blooms since water quality improvements in the system support the conclusion that Lake of Egypt is a site of low potential impact and indicate that there has been, and will be, no appreciable harm to the BIP for these biotic categories.[84]

c. A Detailed Assessment of the Fish Biotic Category Shows the Proposed Limits Will Assure the Protection and Propagation of a BIP.

Lake of Egypt exhibits several characteristics indicative of a low potential impact area for fish listed in USEPA's draft guidance.[85] First, the area of Lake of Egypt receiving SIPC's discharges is not a unique spawning or nursery area. As noted above, spawning may occur here during early spring when temperatures are not limiting. Second, due to the Lake of Egypt bathymetry, SIPC's discharges impact a small portion of the lake and, consequently, do not block or hinder fish migration even under stressed conditions. Third, because the discharges have a localized impact, fish will not be vulnerable to cold shock. Fourth, there is no evidence of threatened or endangered fish species in the lake. Nonetheless, because the occurrence of sport and commercial species of fish may be considered greater than marginal, AMEC performed a more in-depth study of fish, including selecting RIS, at both the species and community level.[86]

[83] AMEC Report, p. 20.

[84] AMEC Report, p. 40.

[85] *See 1977 Draft* USEPA *316(a)* Guidance *Manual*, p. 29.

[86] AMEC Report, pp. 6-14, 20-21.

According to AMEC, the fishery is the most important biotic category in terms of economic importance and sensitivity to alternations in the thermal conditions of the lake.[87] AMEC collected data that it used to characterize the indigenous fish community, develop the RIS concept, and identify habitat utilization. Species composition and abundance estimated by fish surveys from 2010 and earlier suggest that the populations are healthy and self-sustaining. Electrofishing surveys produced a total of 16 species and one hybrid. AMEC observed that the spatial patterns of the 2010 fish survey were comparable to those of previous studies demonstrating that the fish community in Lake of Egypt has remained stable over the past 12 to 13 years.[88]

Data and modeling also show that at all times Lake of Egypt provides adequate thermal refugia. A review of summer lake surface temperatures along with published thermal tolerance data shows that under normal conditions, the proposed thermal limit summer temperatures would be within the upper incipient lethal temperature tolerances for all the RIS throughout the Lake of Egypt.[89] While parts of the lake may be excluded for growth, development, and reproduction under "stressed" conditions, there would still be extensive areas of suitable habitat available to all of the RIS evaluated.[90]

In addition, the RIS are adaptable. According to AMEC, the literature-based temperature maxima derived from laboratory studies likely underestimate the tolerances of these species that have adapted and acclimated to the Lake of Egypt thermal regime over

[87] AMEC Report, p. 17.

[88] *Id*. at 19.

89 AMEC Report, p. 40.

[90] *Id*.

generations.[91] In fact, Heidinger's 2000 study found that mean internal body temperatures of largemouth bass in Lake of Egypt exceeded the preferred temperature in July and August 1998 and 1999. Maximum internal body temperatures exceeded the preference temperature in June through September 1998 and June through August 1999. This data suggests that largemouth bass are tolerating temperatures in Lake of Egypt that are actually higher than those found in the literature.[92] Even relying on literature-based temperature maxima, the AMEC Report determined that the proposed thermal effluent limits under normal late summer weather conditions would result in avoidance or adaptive behaviors only in localized areas within the lower lake, which is supported by the data AMEC collected.[93]

Moreover, the resident fish species will actually benefit from the heated discharge. AMEC refers to another study which has found that higher, stable water temperatures in winter and early spring likely promote earlier spawning, improved survival, and increased growth and development in the early life stages of several species, notably largemouth bass. According to this study, these conditions lead to greater overwinter survival. At the recommendation of Dr. Roy Hedinger, SIPC stocked Lake of Egypt with threadfin shad 1971 to provide a forage base for largemouth bass.[94] Threadfin shad are unable to overwinter under normal Illinois temperature regimes. However, since the stocking event, the Lake of Egypt thermal regime has allowed the threadfin shad population to sustain itself by minimizing winter mortality. [95]

[91] AMEC Report, p. 41.

[92] AMEC Report, Appendix C, p. 14-15.

[93] AMEC Report, p. 43.

[94] AMEC Report, Appendix E (Heidinger, 1990), p. 4.

[95] AMEC Report, p. 51.

AMEC's evaluation also concluded there is little to no potential for fish kills in Lake of Egypt due to thermal conditions resulting from the discharges from the Marion Generating Station. Fish kills can occur under conditions of elevated water temperatures combined with insufficient levels of DO saturation. These conditions do not occur in Lake of Egypt for the reasons discussed above. The elevated temperatures help the fish to overwinter and are not so high during warm summer months to cause fish kills. Moreover, there are always areas of the lake with sufficient levels of DO saturation available to the fish. There have been no past incidences of summer fish kills even during periods of highest lake temperatures, indicating that the fish community has adapted to warm-water conditions and move to refuge areas to avoid stressful conditions. Due to the absence of historical thermal-related fish kills, combined with no anticipated increase in thermal loadings, AMEC concludes that future fish kills are extremely unlikely.[96]

Plant outages are planned during the fall and spring transitional months during periods of lower demand. Sometimes unplanned outages do occur during the summer and winter months. The effect of an outage on thermal discharges varies depending on the cause of the outage. An extended winter outage would stress threadfin shad that typically seek the warmer waters near the plant discharge during winter months.[97] It is in the best interest of both the company and the lake to minimize the duration of the outage to regain generation and maintain a consistent lake environment. Based on AMEC's research and analysis, the fish community in Lake of Egypt shows an absence of prior appreciable harm and no likelihood of appreciable harm under future conditions.

[96] AMEC Report, p. 43.

[97] AMEC Report, p. 52.

d. AMEC Selected Seven Fish Species as RIS Appropriate for an Artificial Cooling Lake.

In a predictive 316(a) demonstration, the applicant selects a number of important species representative of the aquatic community and studies the effects of thermal discharges on those species in detail.[98] The RIS concept is based on several assumptions, including the following: (1) it is not possible to study every species at a particular site, and some smaller number must be chosen; (2) some species will be economically important because they may be, for example, commercially valuable, sport fish or nuisance species; and (3) other species will be particularly vulnerable or sensitive to power plant impact and, if protected, will assure the protection of other species at the site.[99] Pursuant to federal regulations, RIS means "species which are representative, in terms of their biological needs, of a balanced, indigenous community of shellfish, fish and wildlife in the body of water into which a discharge of heat is made."[100] The regulations further define "balanced, indigenous community" as synonymous with the term "balanced indigenous population" or "BIP," and:

> [A] biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications. Normally, however, such a community will not include species whose presence or abundance is attributable to the introduction of pollutants that will be eliminated by compliance by all sources with section 301(b)(2) of the Act; and may not include species whose

[98] 35 Ill. Adm. Code 106.1120 of the Board's procedural rules specifies that representative important species should be identified and included in the detailed plan of study.

[99] *1977 Draft USEPA 316(a) Technical Guidance,* p. 35.

[100] 40 C.F.R. §125.71(b).

> presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a).[101]

RIS can be selected from the biotic categories of fish, shellfish, or habitat formers.[102] Based on the assumptions in the RIS concept, the selection should consider any threatened or endangered species, thermally sensitive species, as well as commercially or recreationally valuable species.[103]

On SIPC's behalf, AMEC made a reasonable selection of RIS appropriate for a lake that has been stocked since its construction.[104] In its evaluation of Lake of Egypt, AMEC selected seven species of fish that have commercial and/or ecological importance and are considered representative of other species occupying the same trophic group. AMEC selected threadfin shad, gizzard shad, channel catfish, bluegill, white and black crappies, and largemouth bass as RIS. In Lake of Egypt, channel catfish, bluegill, and largemouth bass are recreationally important. In addition, these species have been collected and analyzed in previous studies on the Lake of Egypt fishery offering greater data for comparison.[105] Threadfin shad and gizzard shad are considered an important prey species for largemouth bass. White and black crappies are thermally sensitive species. While undocumented, AMEC speculates that the lake was stocked with four of the RIS – gizzard shad, channel catfish, bluegill, and largemouth bass – following its construction in 1963. SIUC reports refer to these species as species of fish

[101] 40 C.F.R. §125.71(c).

[102] *1977 Draft USEPA 316(a) Technical Guidance*, p. 36.

[103] *Id*. at 37-38.

[104] Illinois defines an "artificial cooling lake" as "any manmade lake, reservoir or other impoundment, constructed by damming the flow of a stream, which is used to cool the water discharged from the condensers of a steam-electric generating plant for recirculation in substantial part to the condensers." 35 Ill. Adm. Code 301.225.

[105] AMEC Report, p. 6.

"normally associated with southern Illinois reservoirs."[106] SIPC introduced threadfin shad in the 1970's to enhance the forage base for predators. Since that time, threadfin shad has maintained its own population through natural reproduction. In 2008, 2009, and 2010, SIPC has stocked Lake of Egypt with black crappies.

The AMEC Report also determined that while the thermal discharges from the Marion Generating Station result in earlier spawning in the heated portions of the lake, the discharges have not adversely affected recruitment of any of the RIS.[107] AMEC analyzed the effects of the Lake of Egypt thermal regime on the reproductive cycles of the RIS by examining published spawning temperatures and timing for RIS, reported literature from other Illinois artificial cooling lakes, and observed trends in larval fish abundance and recruitment in Lake of Egypt both before and after the 2003 boiler replacement. Similar to trends in other Illinois artificial cooling lakes, spawning in heated portions of Lake of Egypt occurs somewhat earlier than in unheated portions for all RIS.[108] A comparison of data collected before and after the boiler replacement shows that catch rates in 2010 were similar to those from 1998 and 1999.

IV. ADDITIONAL FACTORS SUPPORT SIPC'S REQUEST FOR AN ALTERNATE THERMAL LIMIT.

A. The Proposed Alternate Thermal Limits Will Have No Adverse Impact on Recreation in and on Lake of Egypt.

Granting SIPC's requested alternate thermal limit will have no impact on recreational use of the lake. SIPC owns the lake and the lake's primary purpose is to provide water for electricity generation. However, the majority of the lake is available for use by both private

[106] AMEC Report, p. 6.

[107] AMEC Report, p. 42-45.

[108] *Id.*

homeowners and the public. Shoreline property owners must agree with Lake of Egypt rules and regulations.[109] The rules and regulations specify that certain areas marked as "restricted" are not open for recreation. The restricted area is limited to the area near the CWIS and includes the mixing zone. Also, water skiing is limited to certain areas of the lake and is prohibited after sundown. Numerous fishing tournaments are held on the lake throughout the year, but tournaments must be registered. The Company has also placed number, length, and seasonal restrictions on certain fish species that may be caught in Lake of Egypt. The proposed alternate thermal limits will not impact any of these guidelines, rules, or regulations affecting use of the lake. The survival of fish and wildlife in and around Lake of Egypt provides a vibrant recreational resource for public use and the lake itself will continue to be a valuable public resource.

B. SIPC Employs Best Management Practices to Limit the Effect of Any Environmental Harm From Its Thermal Discharges.

SIPC also ensures minimal impacts to the environment from its thermal discharges by instituting good management practices at the Marion Generating Station. Storm water runoff from the plant property is collected through one of the many settling ponds utilized under the facility's NPDES permit. SIPC has a storm water pollution prevention plan which covers the settling ponds and controls pollutants from storm water discharges. The Company educates its employees on how the plan operates and about the procedures necessary to implement the plan. SIPC also monitors lake health, stocks fish periodically, and constantly monitors the lake for signs of stress to aquatic populations.

C. SIPC Has Not Been a Party to Any Prior Thermal Proceedings.

[109] See Exhibit B.

SIPC has not participated in any prior thermal proceeding before the Illinois Pollution Control Board. This is the Company's first petition for an alternate thermal limit. While SIPC has sought and received an adjusted boron water quality standard, the boron adjusted standard applies to SIPC's discharges via an outfall to Little Saline Creek, not to Lake of Egypt. [110]

D. Lake of Egypt Was Constructed to Cool SIPC's Thermal Discharges and Now Constitutes a Valuable Recreational Asset for Illinois.

The Marion Generating Station has been operating for more than 40 years and has maintained the current thermal regime for more than 10 years. Lake of Egypt supports abundant and diverse wildlife, including mallard ducks, bald eagles, Canada geese, coyote, and white-tailed deer.[111] It also supports a robust fishery comprised of approximately 30 species of fish and is well known as the home of numerous competitive sport-fishing tournaments. Representative game species include largemouth bass, bluegill, channel catfish, redear sunfish, black crappie and white crappie.[112] The lake fishery has continued to thrive under current operating conditions. The proposed alternate thermal limit – which reflect current operating conditions – will not adversely affect the fishery. Further, AMEC's assessment shows that abundant suitable habitat is always available and would even be available during worst-case "stressed" conditions. During these conditions, data shows that the fish in Lake of Egypt avoid unsuitable habitat.[113] The Board has granted alternate thermal limits on numerous occasions

[110] *In the matter of: Petition of Southern Illinois Power Cooperative (Marion Power Station) for an Adjusted Standard* from *302.208(e)*, AS 92-10 (Jul. 1, 1993).

[111] AMEC Report, p. 23.

[112] AMEC Report, p. 6, 51.

[113] AMEC Report, p. 51.

where data shows that behavioral avoidance leads those fish to environmentally acceptable waters.[114]

As discussed in more detail above, SIPC is fortunate to have lake data gathered over several decades which demonstrate a stable lake environment. This strengthens SIPC's demonstration that the lake temperatures have not caused prior appreciable harm to the BIP.

E. SIPC Has Considered the Interaction of Its Thermal Discharges with Other Pollutants.

SIPC found that IEPA's assessment of pollutants for which Lake of Egypt is impaired shows no evidence that SIPC's thermal discharge plays a role in IEPA's 2014 impairment listing (there are no other thermal sources in Lake of Egypt). The IEPA 2014 303(d) Report assessed Lake of Egypt as not supporting the designated use of fish consumption.[115] The 303 (d) Report identifies causes for the listing as mercury and PCBs due to air deposition and unknown causes.[116] The Report does not mention industrial point source discharges or thermal discharges as the cause of these listings.

These impairment listings appear to be consistent with conditions observed by IEPA across the state for inland lakes:

> The major potential causes of impairment based on number of lake acres affected are . . . mercury and polychlorinated biphenyls (PCBs) in fish tissue impairing *fish consumption* use (Tables C-39 and C-47). The major potential sources of

[114] *In the Matter of: 410(c) Petition for Dresden Nuclear Generating Station*, PCB 79-134, slip op. at 3 (Jul. 9, 1981); see also *In re: Aurora Energy, LLC*, 2004 WL 3214470, pg. 6 (Sept. 15, 2004) (rejecting review of a USEPA-issued permit pursuant to Section 316(a) where Region 10 explained fish will use behavioral means to avoid harmful temperatures and maintain optimal body temperatures and "optimal temperatures do not have to occur everywhere all the time.").

[115] *Illinois Integrated Water Quality Report and Section 303(d) List, 2014, Volume I: Surface Water ("IEPA 2014 303(d) Report")*, Illinois Environmental Protection Agency, Mar., 24, 2014, Appendix B-3 (Specific Assessment for Inland Lakes), p. 13.

[116] *Id*.

> impairment are crop production (crop land or dry land), littoral/shore area modifications (nonriverine), other recreational pollution sources, atmospheric deposition of toxics, runoff from forest/grassland/parkland, urban runoff/storm sewers, municipal point source discharges, animal feeding operations, contaminated sediments, and on-site treatment systems (septic systems and similar decentralized systems). [117]

In fact, 92.6% of the acres of Illinois freshwater lakes assessed for the 2014 303(d) Report were listed not supporting the fish consumption use.[118] Apart from the fish consumption use, Lake of Egypt is listed as fully supporting the aquatic life, public and food processing water supplies, and aesthetic quality uses. Moreover, thermal discharges (industrial point source discharges) are not listed as any of the causes of impairment for mercury or PCBs. Therefore, there is no evidence that IEPA's impairment listings for mercury and PCBs are in any way due to or related to SIPC's point source discharges, including thermal discharges.

F. SIPC's Proposed Alternate Thermal Limits Are Consistent with Federal Law.

The proposed thermal limits satisfy the requirements of the Clean Water Act and implementing regulations. Section 402 of the CWA, 33 U.S.C. §1342, requires that thermal discharges be permitted under the NPDES permit requirements. NPDES permit requirements include, pursuant to Section 301 of the CWA (33 U.S.C. §1311), any applicable state standard. At issue is an Illinois' temperature general use water quality standard included in Marion Generating Station's NPDES permit.

Section 316 of the CWA allows the State to establish alternative thermal effluent standards upon a demonstration by the owner or operator that the alternative standard will "assure the protection and propagation of a balanced, indigenous population of shellfish, fish

[117] *IEPA 2014 303(d) Report,* p. 3.

[118] *IEPA 2014 303(d) Report*, Table ES-2.

and wildlife in and on that body of water."[119] Section 304.141(c) of the Illinois effluent standards provides the Board authority to adopted alternate thermal limits under this standard. Finally, federal antidegradation regulations provide that "where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with section 316 of the Act."[120] Federal guidance explains that regulations developed under Section 316 take precedence over other requirements of the Act.[121]

V. REQUEST FOR HEARING

The Board's rule regarding alternate thermal limits requires an "opportunity for public hearing." 35 Ill. Adm. Code 304.141(c). SIPC therefore requests that the Board schedule a public hearing on this Petition.

VI. CONCLUSION

Based on the results of the AMEC Report, SIPC contends the thermal effluent limits applicable to SIPC's discharges to Lake of Egypt are more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on Lake of Egypt. SIPC has made its demonstration and met the Illinois requirements for an alternate thermal limit satisfying state and federal rules and federal guidance as to the substantive showing requirements. The AMEC Report makes the requisite showing in the form of a Section 316(a) demonstration, showing that SIPC's discharges under the requested thermal

[119] 33 U.S.C. §1326(a).

[120] 40 C.F.R. §131.12(a)(4).

[121] *Water Quality Standards Handbook: Second Edition*, USEPA EPA-823-B-12-002, Section 4.2 (Mar. 2012).

effluent limits will continue to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on Lake of Egypt.

WHEREFORE, for all the foregoing reasons Southern Illinois Power Cooperative ("SIPC") respectfully requests that the Illinois Pollution Control Board find SIPC has made the requisite showing and grant this Petition for an Alternate Thermal Limitation.

Respectfully submitted,

SOUTHERN ILLINOIS POWER COOPERATIVE

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EXHIBIT LIST

A. NPDES Permit No. IL0004316 – SIPC Marion Station.

B. *Evaluation of Site-Specific Thermal Standards at Marion Power Plant*, AMEC Environmental & Infrastructure, Inc., October 2013.

C. Map of Lake of Egypt and Official Lake of Egypt Rules and Regulations, July 2006.

D. Map of Shawnee National Forest, United States Forest Service.

E. April 15, 2014 letter from Scott Twait, IEPA Bureau of Water to Leonard Hopkins, SIPC.

AFFIDAVIT OF LEONARD HOPKINS ON BEHALF OF SOUTHERN ILLINOIS POWER COOPERATIVE

I, Leonard Hopkins, first being duly sworn on oath, depose and state as follows:

1. I am currently employed as the Environmental & Fuel Manager at Southern Illinois Power Cooperative ("SIPC") located south of Marion, Illinois, in Williamson County. I am responsible for environmental compliance and fuel procurement at the Marion Station. I have worked at SIPC for 20 years, with the last six years in my current position. I received a Bachelor's of Engineering from Southern Illinois University in 1977.

2. I participated in the preparation of the Petition for Alternate Thermal Standards ("Petition"), the 316(a) demonstration by AMEC, and the Sargent & Lundy report attached to the Petition.

3. I have read the Petition and, based on my personal knowledge and belief, the facts stated therein regarding the Marion Generating Station and its operation are true and correct.

FURTHER, Affiant sayeth not.

Leonard Hopkins

Subscribed and sworn to before me

this 8 day of May 2014.

Brenda K. Upchurch

OFFICIAL SEAL
BRENDA K. UPCHURCH
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 10-16-2014

CERTIFICATE OF SERVICE

I, the undersigned, certify that on this 13th day of May, 2014, I have electronically served the attached PETITION FOR ALTERNATE THERMAL EFFLUENT LIMITATIONS, and APPEARANCES OF GABRIEL RODRIGUEZ, RENEE CIPRIANO, AND AMY ANTONIOLLI, upon the following persons:

John Therriault, Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph, Suite 11-500
Chicago, Illinois 60601

and by first class mail, postage affixed, upon:

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