

Ameren therefore seeks an increase in thermal limits applicable during the calendar months of May and October.² Ameren has presented evidence and argument that the modification meets the standards of 35 Ill. Adm. Code 302.211(j)(5), and the intent of the Environmental Protection Act (Act) 415 ILCS 5/100 *et seq.*

On April 24, 2009, the Illinois Environmental Protection Agency (Agency) filed a recommendation (Rec.) that the Board deny Ameren's petition. The Agency argues that Ameren has failed to demonstrate that the proposed modification is environmentally acceptable and within the intent of the Act and has failed to demonstrate that the alternatives to the proposed modification to the thermal standard are technically infeasible and economically unreasonable. In particular, the Agency expressed concerns regarding (1) temperature and dissolved oxygen in Coffeen Lake, (2) total phosphorus and mercury levels in Coffeen Lake, and (3) lake habitat erosion³. Rec. at 1. The Agency did, however, suggest that the Board impose certain conditions if the Board were to grant the requested modification.

² The current, two-condition thermal discharge temperature limits applicable to the Station provide that discharges shall not result in a temperature, as measured at the outside edge of the mixing zone of Coffeen Lake, which

1) Exceeds 105 degrees F as a monthly average from June through September, and 112 degrees F as a maximum for more than 3 % of hours during that same period, and

2) Exceeds 89 degrees F as a monthly average from October through May, and 94 degrees F as a maximum for more than 2 % of hours during that same period.

Ameren proposes a three-condition limit as follows (note slight change in #2 from above, and new #3):

1) Exceeds 105 degrees F as a monthly average from June through September, and 112 degrees F as a maximum for more than 3 % of hours during that same period, and

2) Exceeds 89 degrees F as a monthly average from November through April, and 94 degrees F as a maximum for more than 2 % of hours during that same period.

3) Exceeds 96 degrees F as a monthly average, in each of the months of May and October, and 102 degrees F as a maximum for more than 2% of hours in each of those same months. Pet at. 5-6.

³ Eroded fish habitats or "habitat erosion" is a phenomenon described the 2007 SIUC Report as follows:

Water currents associated with power-cooling discharges cause the biota behavior to be more characteristic of slow-moving rivers than of reservoirs. As a result, fish movement increases over that of ambient reservoirs. The movement is, in large part, dictated by forage abundance and locality. In power-cooling

The Board held a hearing⁴ in Montgomery County on June 23, 2009. Ameren presented four expert witnesses in support of its petition. The Agency presented no witnesses. Two members of the public presented oral public comment at hearing, and followed their hearing presentations up with written comments. Two additional persons filed written comment, so that the Board considered four public comments. In addition to echoing the Agency's concerns, the public commenters expressed concerns, among others, about the effect on Coffeen Lake's watershed of planned longwall mining at Deer Run Mine, which includes a planned subsidence of the McDavid Branch of the East Fork of Shoal Creek. Tr. 249-253, PC 1-4.⁵

The record in this proceeding is extensive and rich in information, reflecting as it does studies conducted over three decades by various environmental consultants and eminent Illinois institutions documenting the effects of Coffeen's thermal discharges on the Coffeen Lake fish habitat. Ameren has provided additional information throughout this proceeding in response to questions posed by the Board, as well as concerns expressed by the Agency and commenters. Ameren's position as to agreeable conditions has evolved in response to the various questions and suggestions it has received.

Based on the record in this proceeding, the Board finds that Ameren has provided adequate proof to demonstrate that the proposed modification satisfies the requirements of the Act and Board rules. The Board finds that the site specific thermal standard for the discharge to the Coffeen Lake will be environmentally acceptable and within the intent of the Act. Even under the modified standards, the Board finds Lake Coffeen will continue to provide conditions capable of supporting shellfish, fish and wildlife, and recreational uses consistent with good management practices. The Board further finds that Ameren has invested \$26.7 million since 2000 to enhance thermal controls, and will control the thermal component of its effluent by technologically feasible and economically reasonable methods, including use of existing cooling towers and reduced power generation or "de-rating"⁶, when necessary. 35 Ill. Adm. Code 106.202(b)(1) and 302.211(j)(3).

reservoirs, forage species often inhabits water temperatures near their thermal maximums because the food supply is more abundant there. If a sudden pulse of lethally hot water is pulsed through and some fish happen to be located in a cove away from the main water flow, the fish can be forced to stay in the cove until the slug of hot water passes. If lethally hot water temperatures persist in the main channel long enough, water temperatures in the coves will increase until they are similar to those in the main channel. This phenomenon, described as eroded fish habitats, results in smaller but more frequent fish kills. .Ag. Exh. 1 at 10.

⁴ The transcript of the June 23, 2009 hearing is cited as "Tr."

⁵ The oral and written public comments are treated in more detail later in this opinion. See, *infra*, at 28-29, 42-43.

⁶ "De-rating" refers to adjusting an electrical generating unit down from full load and operating at less than full capacity. Tr. at 58-59.

The Board does not discount the depth of the concerns expressed by the public commenters who value Lake Coffeen for the fishing and other recreational opportunities this manmade lake offers. But, the Board believes that the record as a whole justifies the requested modification.

Accordingly, the Board grants Ameren's petition for modified site-specific thermal standards subject to conditions outlined in this opinion and order.

In this opinion, the Board first sets forth the legal framework within which the Board determines whether to issue site specific thermal standards pursuant to 35 Ill. Adm. Code 106.200 *et seq.* and 35 Ill. Adm. Code 302.211(j)(5). Next, the Board provides the procedural history, and the factual background of the case. The Board then describes the petitioners' requested relief. The Board then presents the parties' arguments, and responses to expressed concerns. This examination is followed by the Board's discussion of the regulatory criteria before reaching its conclusions on each of them.

LEGAL FRAMEWORK

Federal Requirements

The federal Clean Water Act (CWA) imposes requirements on state permitting authorities for control of thermal discharges. Section 301 of the CWA, 33 U.S.C. 1311, provides that permits issued under the National Pollutant Discharge Elimination System (NPDES) program must include any applicable state standard. Section 402 of the CWA, 33 U.S.C. 1342, requires thermal discharges to be permitted under the NPDES procedures.

Under Section 316(a) of the CWA, the Board can establish alternative thermal standards based on a demonstration that the alternative standard will "assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on that body of water." 33 U.S.C. 1326(a) provides

With respect to any point source otherwise subject to the provisions of section 301 or 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 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 sections for 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, indigenous population of shellfish, fish, and wildlife in and on that body of water. 33 U.S.C. 1326(a).

United States Environmental Protection Agency (USEPA) rules implementing Section 316 are codified at 40 CFR 125 Subpart H. 40 CFR Section 125.73 provides:

Thermal discharge effluent limitations or standards established in permits may be less stringent than those required by applicable standards and limitations if the discharger demonstrates to the satisfaction of the [permitting authority] that such effluent limitations are more stringent than necessary to 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. 40 CFR 125.73(a).

The current guidance provided by USEPA on CWA Section 316(a) demonstrations is the “Interagency 316(a) Technical Guidance Manual and Guide for Thermal Effects Sections of Nuclear Facilities Environmental Impact Statements (DRAFT)”, May 1, 1977, hereafter cited as “Section 316(a) Manual at ___.” The Section 316(a) Manual is available at: <http://www.epa.gov/npdespub/pubs/owm0001.pdf> The Section 316(a) Manual itself states that “The manual is intended to be used as a general guidance and as a starting point for discussions”, and that State Directors “are not rigidly bound by the contents of this document.” Section 316(a) Manual at 8-9, Pet. Br. at 2.

The Section 316(a) Manual indicates that “predictive studies” are appropriate for new sources, facilities discharging only for an evaluation period, facilities discharging into waters that were previously despoiled, and facilities making major operational changes. Section 316(a) Manual at 11.

The federal regulations at 40 CFR 122 provide for two possible types of predictive 316(a) demonstrations, Type II: Protection of Representative Important Species and Type III: Alternative Demonstrations. The Section 316(a) Manual states that a Type II Demonstration should fully develop three key biological components: completion of the Biotic Category Rationale (begun during early screening procedures), development of Representative Important Species (RIS) Rationale, and synthesize of all information into a Master Rationale. Section 316(a) Manual at 34.

Current Standards Applicable to Lake Coffeen

Section 13 of the Act authorizes the Board to adopt water quality and effluent standards, including thermal standards. 415 ILCS 5/13 (2008). The Board’s generally applicable water quality temperature standards are found at 302.211.⁷

⁷ 35 Ill. Adm. Code 302.211 provides:

- a) Temperature has STORET number (F^o) 00011 and (C^o) 00010.
- b) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.

As noted earlier, the current specific thermal standard applicable to Coffeen Lake was established by the Board in 1982 for Central Illinois Public Service Company (CIPS), the station's owner and operator at the time. Pet. at 2, referring to CIPS v. IEPA, PCB 77-158, PCB 78-100 (consolidated) (March 18, 1982). The current standard provides:

The thermal discharge to Coffeen Lake from the Central Illinois Public Service Company's Coffeen Power Station shall not result in a temperature, measured at the outside edge of the mixing zone in Coffeen Lake, which:

1. Exceeds 105 degrees Fahrenheit as a monthly average, from June through September, and 112 degrees Fahrenheit as a maximum for more than three percent of the hours during that same period.
2. Exceeds 89 degrees Fahrenheit as a monthly average, from October through May, and 94 degrees Fahrenheit as a maximum for more than two percent of the hours during that same period. Pet. at 2.

The language of the specific thermal standard for Coffeen Lake was incorporated into Ameren's current NPDES permit as Special Condition No. 5. Pet. at 2.

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- c) The normal daily and seasonal temperature fluctuations which existed before the addition of heat due to other than natural causes shall be maintained.
 - d) The maximum temperature rise above natural temperatures shall not exceed 2.8° C (5° F).
 - e) In addition, the water temperature at representative locations in the main river shall not exceed the maximum limits in the following table during more than one 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 by more than 1.7° C (3° F).

| | ° C | ° F | | ° C | ° F |
|------|-----|-----|-------|-----|-----|
| JAN. | 16 | 60 | JUL. | 32 | 90 |
| FEB. | 16 | 60 | AUG. | 32 | 90 |
| MAR. | 16 | 60 | SEPT. | 32 | 90 |
| APR. | 32 | 90 | OCT. | 32 | 90 |
| MAY | 32 | 90 | NOV. | 32 | 90 |
| JUNE | 32 | 90 | DEC. | 16 | 60 |

Requirements and Standard for Decision in Artificial Cooling Lake Demonstrations

The Board regulations at 35 Ill. Adm. Code 302.211 (j)(5) and (j)(3) set forth requirements for the adoption of site specific thermal standards for discharges to an “artificial cooling lake” (ACL)⁸, such as the Coffeen Lake. These are consistent with the requirements of Section 316(a) of the CWA.⁹

Section 302.211(j)(5) provides that “if an adequate showing as provided in subsection (j)(3) is found, the Board shall promulgate specific thermal standards to be applied to that discharge to that artificial cooling lake.” 35 Ill. Adm. Code 302.211(j)(5). The requirements for the ACL demonstration are set forth at 35 Ill. Adm. Code 302.211(j)(3), (j)(4), and (j)(5) as follows:

- 3) At an adjudicative hearing the discharger shall satisfactorily demonstrate to the Board that the artificial cooling lake receiving the heated effluent will be environmentally acceptable, and within the intent of the Act, including, but not limited to:
 - A) provision of conditions capable of supporting shellfish, fish and wildlife, and recreational uses consistent with good management practices, and
 - B) control of the thermal component of the discharger's effluent by a technologically feasible and economically reasonable method.
- 4) The required showing in subsection (j)(3) may take the form of an acceptable final environmental impact statement or pertinent provisions of environmental assessments used in the preparation of the final environmental impact statement, or may take the form of showing pursuant to Section 316(a) of the Clean Water Act (CWA) (33 U.S.C. 1251 et seq.), which addresses the requirements of subsection (j)(3).

⁸ By Board rule, an “artificial cooling lake” is defined 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.

⁹ Section 316(a) of the CWA and 40 CFR 125 Subpart H address alternate thermal limitations in terms of effluent standards. Although the Board’s rule for ACL demonstrations provides for the use of a Section 316(a) showing, the demonstration required under the Board’s Section 302.211(j)(3) is for water quality standards that apply at the outside edge of the mixing zone in the artificial cooling lake and not as effluent limits.

- 5) If an adequate showing as provided in subsection (j)(3) is found, the Board shall promulgate specific thermal standards to be applied to the discharge to that artificial cooling Lake. 35 Ill. Adm. Code 106.202(b).

Additionally, the Board has adopted procedural rules pertaining to ACL demonstration required under Section 302.211(j)(3) at 35 Ill. Adm. Code 106.200 *et seq.* These rules set forth requirements for the petition content, Agency recommendation, and burden of proof. The burden of proof in thermal demonstration proceedings is on the petitioner. 35 Ill. Adm. Code 206.210.

PROCEDURAL BACKGROUND

On December 15, 2008, Ameren filed this petition for the modification of site specific thermal standard applicable to discharges to Coffeen Lake. The petition was accompanied by Exhibits 1-16, a motion for expedited review, and a waiver of hearing.

On March 5, 2009, the Board accepted the petition for hearing, and denied Ameren's motion for expedited review. While Ameren waived hearing, the Board found that hearing is required under the terms of 35 Ill. Adm. Code 302.211(j)(3). Also on March 5, 2009, the Board's Hearing Officer Carol Webb directed Ameren to address prehearing questions posed by Board staff.

On April 7, 2009, the Agency filed a motion for extension of time to file the recommendation. On April 8, 2009, the Hearing Officer granted the motion for extension subject to Ameren's request that the recommendation be filed by April 17, 2009. On April 27, 2009, the Agency filed its recommendation that the Board deny Ameren's requested relief and a motion for leave to file *instanter*, which is hereby granted.

On May 6, 2009, the Hearing Officer granted Ameren until May 12, 2009 to respond to the Agency's recommendation as requested by the petitioner. On May 12, 2009, Ameren filed its response to the Agency's recommendation (Pet. Resp. to Rec.), answers to the Hearing Officer's prehearing questions (Pet. Resp. to HOO), and the prefiled testimony of Ann B. Shortelle, Ph.D., James R. McLaren, Ph.D., and James L. Williams, Jr.

Pursuant to notice duly given¹⁰, on June 23, 2009, Hearing Officer Carol Webb conducted a hearing in this matter at the City Hall Council Chambers, 120 East Ryder Street, Litchfield, Montgomery County. Four witnesses testified at hearing on behalf of Ameren: James B. McLaren, Ph.D with ASA Analysis & Communication, Inc. (ASA), Anne Shortelle, Ph.D. with MACTEC Engineering & Consulting, Inc. (MACTEC), James L. Williams, Jr. with Ameren, and Michael Smallwood with Ameren. Hearing Officer Webb found all four witnesses credible. The Agency did not present any witnesses, although it did introduce one exhibit.

¹⁰ The Board published newspaper notice of hearing notice of the hearing in the *Litchfield News-Herald* on May 20, 2009.

On July 10, Ameren filed a response to information requested during the hearing. (Pet. Resp. to Hearing).

On July 13, the Agency filed a motion to supplement the record with SIUC Reports from 2000 to 2005. This motion was granted by the Hearing Officer on August 5, 2009.

On July 16, 2009, Ameren filed a supplemental response to its earlier response to information requested during the hearing. (Pet. Supp. Resp. to Hearing)

On July 22, 2009, the Agency filed a motion to correct the transcript of the June 23, 2009 hearing. Ameren did not object. The Hearing Officer granted the Agency's motion to correct the transcript on August 5, 2009.

On August 13, 2009, Ameren filed its Post Hearing Brief. (Pet. Br.) On September 16, 2009, the Agency filed its Post Hearing Brief. (Ag. Br.) On September 28, 2009, Ameren filed a Post Hearing Reply Brief. (Pet. Reply Br.)

Finally, the Board received four Public Comments: Mary Bates (PC #1), Prairie Rivers Network (PC #2), Joyce Blumenshine (PC #3), and Mary Ellen DeClue (PC #4).

FACTUAL BACKGROUND

The Facility

Ameren operates the Coffeen Power Station (Coffeen or Station), which is a two-unit 950 megawatt (MW) coal-fired electrical generating station employing 400 people. The Station is located on 3200 acres approximately two miles southwest of Coffeen, Montgomery County. Approximately 1100 acres of the property is dedicated to the Station's artificial cooling lake, Coffeen Lake. Pet. at 6.

From an historical perspective, planning for the Coffeen Power Station began in 1958 and construction began in 1962 after the Illinois Commerce Commission granted Central Illinois Power Service (CIPS) a Certificate of Public Convenience and Necessity. In 1963, Coffeen Lake was created as an artificial impoundment to provide a source for the Station's once-through cooling water. Pet. at 7. Unit No. 1 went into service in 1965 and Unit No. 2 in 1972, providing 360 MW and 590 MW of electrical generating capacity, respectively. Pet. at 7. On May 1, 2000, CIPS transferred the ownership of its coal-fired generating stations, including the Coffeen Power Station to Ameren.¹¹ Pet. at 1.

Coffeen Lake as a Cooling Water Resource

¹¹ In March 2000, Ameren Energy Generating Company was incorporated in Illinois in conjunction with the Illinois Electric Service Customer Choice and Rate Relief Law of 1997. CIPS continues to own and operate electric and gas distribution utility services in central Illinois. Both CIPS and Ameren are subsidiaries of Ameren Corporation. Pet. at 1.

Coffeen Lake was created in 1963 as an artificial impoundment to provide a source for the Station's once-through cooling water. Pet. at 7. Ameren explains that Coffeen Lake was formed by damming the McDavid Branch of the East Fork of Shoal Creek approximately two miles directly south of the Village of Coffeen. With a watershed area of approximately 18 square miles, the lake discharges over a spillway to the East Fork of Shoal Creek. According to Ameren, Coffeen Lake experiences extended periods of low water levels. Ameren states that , "[s]everal months often lapse without a discharge over the spillway. Prior to an overflow on April 11, 2008, the lake had not discharged to the East Fork of Shoal Creek since May 2005." Pet. Exh. 10 at 2.

The Station obtains cooling water from the western arm of the lake. The cooling water passes through condensers to dissipate waste heat from both Units 1 and 2 at the Station and is then discharged back into the eastern arm of Coffeen Lake. Pet. at 11-12. Ameren indicates the path of cooling water from discharge to intake is 4.1 miles, taking 7 to 10 days to complete, depending on the number of pumps operating and the lake level. Pet. at 12.

Coffeen Lake as a Recreational Resource

Ameren states that although Coffeen Lake was created to provide cooling water to the Station, the lake has also become a resource for recreational fishing, boating, camping, hunting, and trapping. Pet. at 7. In 1986, Ameren recounts that CIPS and the Illinois Department of Conservation (now known as the Illinois Department of Natural Resources (IDNR)) entered into a Lease Agreement allowing for conservation and public recreation in certain portions of Coffeen Lake and the surrounding property. Under the Lease Agreement, the parties recognized the need to restrict and regulate public use to avoid conflict with the then current and future operation of the Station. At the time, CIPS and the Department of Conservation developed a "Site Development Management Plan" that set aside certain recreational areas for public fishing and boating. *Id.* Since September 1999, Ameren states that hunting and trapping have also been allowed. Also in 1986, a Sublease Agreement between CIPS and the Department of Conservation and the Indian Grove Campground allowed additional public recreation on the west side property of Coffeen Lake. Pet. at 8.

Thermal Control Equipment In Use

As previously stated, Ameren's discharges are governed by NPDES Permit IL 0000108, which includes the current thermal standards as Special Condition No. 5. Pet. at 2, Pet. Exh.1.

Since 2000, Ameren has undertaken capital projects to enhance cooling capacity. In 2000, Ameren developed a 70-acre supplemental cooling basin at a cost of \$20,734,000. In 2002, Ameren installed a 48-cell helper cooling tower structure at a cost of \$6,833,000. Pet. at 12. Ameren states that both the supplemental basin and cooling tower structure are used to condition the circulating water temperature to meet the mixing zone limits. *Id.* In 2007, Ameren experimented with solar-powered aerators ("solar bees") to stimulate circulation of water from lower depths to the surface. Pet. at 27. These aerators, which are still in operation today, were installed at a capital cost of \$120,000. *Id.*

Other Environmental Projects at the Station

The Station has the ability to utilize both Illinois basin coal and western Powder River Basin (PRB) coal. In order to burn Illinois coal, Ameren states that significant environmental projects are planned for construction at the station over the next three years.

Ameren recently installed selective catalytic reduction (SCR) on both units at the Station to remove NO_x (nitrogen oxides), investing approximately \$100 million in capital costs. Currently, Ameren is installing flue gas desulphurization (FGD) systems to remove SO₂ (sulfur dioxide) with an investment of over \$600 million in capital. Tr. at 18. Ameren states that SO₂ scrubbers will be in place by the end of 2009, which will operate throughout the year to also reduce mercury emissions. Pet. Br. at 31.

History of Thermal Standards at Coffeen Lake

In 1978 and 1982, the Board granted alternative thermal standards for the Coffeen artificial cooling lake when it was under the ownership of CIPS in PCB 77-158, PCB 78-100 (cons.). Later in 1997, CIPS identified the need for a variance (PCB 97-131) when Coffeen adjusted its maintenance schedule to reduce costs. Historically, CIPS was able to meet the applicable thermal standards during May and October because either one or the other of the units at Coffeen were scheduled for extended annual maintenance outages during either May or October.

In the 1980s, CIPS converted from a twelve- to an eighteen-month maintenance schedule to reduce costs. The change to the maintenance schedule no longer provided a reduction in heat loading for the months of May and October. PCB 97-131, slip op. at 2 (June 5, 1997). The Board granted CIPS the 5-year thermal variance for the months of May and October, allowing higher temperatures than requested in the instant petition. CIPS expected to return to the Board 3 years later for permanent relief, however, the variance was suspended after 2 years when a fish kill occurred during July 1999. At that time, the thermal standards for May and October reverted to the previous limits under PCB 77-158/PCB 78-100, and Coffeen has relied on operational constraints and additional cooling capacity to reduce effluent temperatures since then. Pet. Exh. 11 at 1-2.

Continuing Compliance Issues at Lake Coffeen

Ameren states that to meet the current standards during times of hot, dry weather conditions and low lake levels, Ameren has scheduled planned outages and extended forced outages. Pet. at 4. Despite the enhancements that were made to the cooling system since 2000 (70-acre supplemental cooling basin and helper cooling towers), Ameren contends that the Station continues to experience loss in generation capacity during high station power output and hot weather, specifically in May and October. Pet. Exh. 15 at 5. Ameren states that at times of unseasonal warm temperatures and lack of rain, the lake level has been down by 8-10 feet. Tr. at 15, Pet. Exh.10 at 2. In order to comply with the current standards, Ameren has resorted to de-rating the Coffeen Power station in past years, resulting in a financial loss of over \$5 million since 1999. Ameren is forecasting an increase in generation within the next few years from 950

MW to 1026 MW. Ameren estimates capital costs for additional cooling capacity would range from \$13,053,000 to \$18,266,000. Exh. 15 at 13. Ameren seeks to modify its current thermal standards for the months of May and October only.

AMEREN'S PROPOSED THERMAL STANDARDS

In the original petition, Ameren proposed the following alternative thermal standards for adoption by the Board based on the limits derived by Sargent & Lundy. Sargent and Lundy was commissioned by Ameren to assess engineering alternatives to meet the current thermal limits based on both current Station capacity as well as forecasted increases in future capacity. Pet. at 6, Exh. 15 at 12.

The thermal discharge to Coffeen Lake from Ameren's Coffeen Power Station shall not result in a temperature, measured at the outside edge of the mixing zone in Coffeen lake, which:

1. Exceeds 105 degrees Fahrenheit as a monthly average, from June through September, and 112 degrees Fahrenheit as a maximum for more than three percent of the hours during that same period.
2. Exceeds 89 degrees Fahrenheit as a monthly average, from November through April, and 94 degrees Fahrenheit as a maximum for more than two percent of the hours during that same period.
3. Exceeds 96 degrees Fahrenheit as a monthly average, in each of the months of May and October, and 102 degrees Fahrenheit as a maximum for more than two percent of the hours in each of those same months. Pet. at 6.

In Ameren's post hearing brief, Ameren modified the above language to incorporate an agreement between Ameren and the Illinois Department of Natural Resources. Ameren clarifies that the proposed thermal limits apply to the near-surface temperatures at the boundary of the 26-acre mixing zone, as follows: Pet. Br. at 15.

- (A) The thermal discharge to Coffeen Lake from Ameren Energy Generating Company's Coffeen Power Station shall not result in a temperature, measured at the outside edge of the mixing zone in Coffeen Lake, which:
1. Exceeds 105 degrees Fahrenheit as a monthly average, from June through September, and 112 degrees Fahrenheit as a maximum for more than three percent of the hours during that same period.
 2. Exceeds 89 degrees Fahrenheit as a monthly average, from November through April, and 94 degrees Fahrenheit as a maximum for more than two percent of the hours during that same period.

3. Exceeds 96 degrees Fahrenheit as a monthly average, in each of the months of May and October, and 102 degrees Fahrenheit as a maximum for more than two percent of the hours in each of those same months.
- (B) Ameren and IDNR will monitor Coffeen Lake during the period May through October for fish mortality. In the event excessive fish mortality occurs during these months, Ameren shall implement appropriate mitigation measures including the following:
1. Immediately notify the IDNR;
 2. Maximize operation of the cooling basin and existing cooling towers to reduce thermal temperatures;
 3. Make operation revisions to the station's typical dispatch order (e.g. "last on and first off");
 4. Reduce nighttime capacity factors;
 5. Monitor intake and discharge temperatures and visually inspect intake and discharge areas; and
 6. No later than November 15 of each year, document mitigation measures employed during periods of excessive fish mortality.

Pet. Br. at 37-38.

In addition, Ameren stated if the requested relief is granted, Ameren and IDNR have agreed to a draft Memorandum of Understanding (MOU) to conduct additional studies on Coffeen Lake and the fishery. Resp. to Hearing at 5. The draft MOU includes provisions for: (1) Fish Population and Behavior Status Monitoring Studies, (2) Fish Stocking Pilot Study, (3) Annual Summary Data Report, (4) Corrective Action – Fish Mortality. Pet. Resp. to Hearing, Exh. C.

While the Agency's recommends that the Board deny Ameren's petition, the Agency suggests that if relief is granted to Ameren, conditions should include requirements to demonstrate that the relief will not result in violations of other water quality standards as required by 302.211(j)(2). In particular, the Agency states that Ameren has not been required to monitor discharges *from* Coffeen Lake. Ag. Br. at 7-8.

AMEREN'S PRESENTATION IN SUPPORT OF ITS ACL DEMONSTRATION

Provision of Conditions Capable of Supporting Shellfish, Fish and Wildlife, and Recreational Uses Consistent With Good Management Practices **(35 Ill. Adm. Code 106.202(b)(1)(A) & 302.211(j)(3)(A))**

Thermal Environment of Coffeen Lake

Ameren states that water temperatures and dissolved oxygen concentrations have been monitored by SIUC since 1997 at various depths and locations within Coffeen Lake. Pet. at 13. According to SIUC, average daily temperatures at the edge of the mixing zone in May and October have been typically 80 to 90°F, exceeding the 96°F limit on occasion, while maximum daily temperatures have not exceeded the 102°F limit during May or October. During July and August, water temperatures at the edge of the mixing zone have occasionally exceeded 100°F following seasonal weather patterns. Temperatures at the plant intake tend to be 10 to 15 degrees cooler than temperatures at the edge of the mixing zone during the period of May through October. Pet. at 13. The SIUC data also show that both temperature and dissolved oxygen in the lake is vertically stratified during the summer months, especially in the deeper parts of the lake. Pet. at 13-14.

Ameren states that Coffeen Lake is capable of supporting shellfish, fish, and wildlife, and recreational uses consistent with good management practices as required by Sections 106.202(b)(1)(A) and 302.211(j)(3)(A). Pet. at 20. Over the past 40 years since the Station has been operating, water temperatures have repeatedly occurred at or above the proposed thermal limits (96°F and 102°F). Despite the occurrence of higher temperatures, Ameren states

Coffeen Lake supports abundant and diverse wildlife, including muskrat, turtles, heron and mussels. It also supports a robust fishery, comprised of 22 species of fish, and is well known as the home of numerous competitive sport-fishing tournaments. *Id.*

ASA Report Generally

Ameren relies on the report by ASA (Pet. Exh. 11) to demonstrate the capability of Coffeen Lake to support shellfish, fish, and wildlife, and recreational uses. Ameren commissioned ASA to evaluate the potential ecological impacts from proposed modifications to the current site specific thermal standards in Coffeen Lake. ASA produced the report entitled, “Evaluation of Potential Adverse Impacts from Revised Site-Specific Thermal Standards in May and October for Coffeen Lake” (ASA Report) dated March 2008. The ASA Report is based on extensive studies of the thermal impacts of the Coffeen Power Station on the biota of Coffeen Lake. *See* Pet. Exh. 11 at 6-1 to 6-6. The ASA Report provides “an overview of the evidence supporting the conclusion that raising the thermal limits for the months of May and October presents minimal additional risk to fish populations in the lake.” Pet. Exh. 11 at 1-1.

Dr. McLaren of ASA conducted an exhaustive examination of data collected by SIUC, IDNR, INHS, and Ameren. Pet. Br. at 8. As the most recent source of information, the ASA Report relied on the 1997-2006 studies conducted by SIUC. Pet. Resp. to HOO at 3, Pet. Exh. 11 at 3-1. The SIUC studies were conducted to comply with the conditions of the 5-year variance granted in 1997 in PCB 97-131. *Id.* The SIUC data was supplemented by data collected by IDNR during the same years. Tr. at 27. Dr. McLaren commented that having this amount of long-term data collected is unusual and very fortunate in assessing the effects of the thermal regime on the fish. Tr. at 28.

ASA explains that in an assessment, the general practice is to select only certain species for detailed analysis, which are referred to as “representative important species” (RIS)¹². RIS are chosen because they “(1) are important because of their societal or ecological value, and (2) can adequately represent other species not studied to the same extent.” Pet. Exh. 11 at 3-1. Following the extensive studies conducted during 1978-1981 (Tranquilli and Larimore 1981)¹³ and 1997-1999 (Heidinger et al. 2000)¹⁴, SIUC selected three fish species as RIS to be monitored on an annual basis thereafter for compliance with the 1997 thermal variance: Largemouth Bass, Bluegill, and Channel Catfish. Pet. Exh. 11 at 3-1. IDNR concurred with the selection of the three RIS while approving the studies in 1997. Resp. to HOO at 3-4.

The ASA Report focused on the three RIS selected by SIUC. Pet. at 21-22. Dr. McLaren of ASA explains that these three are appropriate RIS, “because IDNR manages these species and because they are recreationally important species, self-reproducing, and predatory species that reflect the status of lower trophic levels.”¹⁵ Tr. at 158, Pet. Exh. 3. Since SIUC focused on these same three species in its multi-year studies, the collective body of research represents a long-term database from which to assess the thermal effects of these species of fish. Pet. Br. at 9.

Although Ameren lists white crappie among the game species present in Coffeen Lake, white crappie was not selected as a RIS because only a couple were caught during the study. In addition, while the other three RIS populations are sustained entirely by natural reproduction, the white crappie has typically only been stocked. Pet. Resp. to HOO at 4.

The ASA Report notes that the effects of the proposed thermal standards on fish populations in Coffeen Lake were evaluated using two types of assessments: (1) a “retrospective” assessment that examines past studies on Coffeen Lake, and (2) a “prospective” assessment that predicts how the lake’s thermal environment might be altered under the proposed revised standards and how the fish might adapt. Pet. Exh. 11 at 1-2. These assessments are described below.

¹² Representative, Important Species (RIS) is defined in the USEPA “Interagency 316(a) Technical Guidance Manual and Guide for Thermal Effects Sections of Nuclear Facilities Environmental Impact Statements” (May 1, 1977) at page 78-79.

¹³ Tranquilli, J.A. and R.W. Larimore (eds). 1981. Final report to Central Illinois Public Service Company. Part I: Environmental studies of Coffeen Lake, a thermally-altered reservoir. INHS, Urbana, Illinois. July 1981.

¹⁴ Heidinger, R., R. Sheehan, and R. Brooks (eds.). 2000. Ameren/CIPS Newton and Coffeen Lakes Research and Monitoring Project Status Report. Fisheries & Illinois Aquaculture Center, Southern Illinois University at Carbondale. November 2000.

¹⁵ Trophic Level: “A feeding stratum in a food chain of an ecosystem characterized by organisms that occupy a similar functional position in the ecosystem.” The American Heritage Dictionary. Second College Edition. 1982.

ASA's Retrospective Assessment

In the “Retrospective Assessment”, ASA examined data collected from 1997 to 2006 by IDNR, SIUC, and Coffeen Station. ASA explains the retrospective assessment is presented “to evaluate how the populations have adapted to the recent thermal environment in the lake.” Pet. Exh. 11 at 1-3. In many respects,

A retrospective assessment provides the strongest evidence of the long-term effects of periodically higher water temperatures in that it integrates all aspects of the thermal environment on the life cycle for the fish species and the lower trophic levels in the lake, such as phytoplankton, epiphyton, macrophytes, zooplankton, and benthos. *Id.* at 3-1.

At hearing, Dr. McLaren further explained,

We found that the survival and growth of the early life stages, the eggs and the larvae, particularly for largemouth bass, apparently are improved by the stable warmer temperatures that occur in the late winter and early spring, and are improved by the prolonged growth season that results from the thermal discharge to the lake.” Tr. at 30.

Largemouth Bass. For largemouth bass, the ASA Report states, “the fishery for it is considered to be exceptional.” Pet. Exh. 11 at 3-2. The ASA Report cites to evidence that spawning of largemouth bass occurs earlier in Coffeen Lake than in other regional lakes. In terms of recruitment, the ASA report states, “Earlier spawning can impart benefits that last throughout the first year of life.” Pet. Exh. 11 at 3-3. Based on several historical studies, ASA concludes, “it is apparent that elevated water temperatures in Coffeen Lake should benefit the largemouth bass population overall in terms of reproduction, growth, and survival.” Pet. Exh. 11 at 3-4.

Bluegill. The ASA Report observed a prolonged spawning season in Coffeen Lake for bluegill, from April to October in the eastern arm of the lake and May to October in the western arm. Pet. Exh. 11 at 3-6, 3-7. However, the ASA Report states, “The influence of water temperatures on bluegill growth in Coffeen Lake is unclear.” Pet. Exh. 11 at 3-7. During the five-year period from 1999-2003, within the range of temperatures experienced in Coffeen Lake, “the thermal environment appeared to have no effect on the first year growth rates.” Pet. Exh. 11 at 3-7. The ASA Report goes on to state, “There is evidence that competition for food is limiting growth of bluegills in Coffeen Lake, resulting in a stunted population.” Pet. Exh. 11 at 3-7. This competition appears to be related to the increasing survival of other small fish (sunfish, gizzard shad, and threadfin shad). The ASA Report attributes the increasing survival to the abundance of submerged macrophytes¹⁶ in Coffeen Lake that provides refuge from predation for these smaller fish. *Id.*

¹⁶ Macrophyte: “A macroscopic plant in an aquatic environment.” The American Heritage Dictionary. Second College Edition. 1982.

Channel catfish. ASA Report notes that the 2001 creel survey by the INHS indicated that channel catfish is the most frequently harvested fish species in Coffeen Lake. As to the effect of temperature, the ASA Report concluded that the “annual changes in the thermal environment had no effect on the condition of channel catfish in Coffeen Lake.” Pet. Exh. 11 at 3-8. The ASA Report observes, “The length at age for channel catfish in Coffeen Lake falls within the range of values for other channel catfish populations studied in rivers, lakes, and other reservoirs in the Midwest or South...” Pet. Exh. 11 at 3-8.

ASA’s Prospective (Predictive) Assessment

The ASA Report (Exh. 11) also contains a “Prospective Assessment” where ASA predicts how the proposed standards might alter the thermal environment of the lake during the months of May and October. Pet. Exh. 11 at ES-1. ASA assessed the thermal tolerances and requirements of the three RIS (largemouth bass, bluegill, and channel catfish) in relation to the proposed thermal standards for May and October. Pet. at 24. ASA points out that the proposed thermal limits would apply to near-surface water temperatures at the edge of the mixing zone. These temperatures represent the warmest temperatures to which fish and other organisms would be exposed outside the mixing zone. Even when temperatures approach the thermal limits of 96°F and 102°F, ASA observes that at other locations in the lake and at greater depths, the water temperatures would be in the 80s (°F) or lower, “well within the range of temperatures tolerated by RIS life stages...” Pet. Exh. 11 at 4-1, Pet. Br. at 16. Dr. McLaren testified, “Diversity in water temperatures exist in the eastern and western arms of Coffeen Lake, and at depth, providing adequate refuge; such temperature diversity would be advantageous to all fish species.” Hearing Exh. 2 at 10. Further, the ASA report states that the results of electrofishing conducted in August 1995 indicate that juvenile and adult fish will avoid the highest temperatures in or near the thermal plume in the eastern arm of the lake and move away from the discharge areas. Pet. Exh. 11 at 4-1 - 4-2.

ASA also used the results of the thermal modeling conducted by Sargent & Lundy, LLC to show that warmer May temperatures do not necessarily result in a carryover effect in later months. Pet. at 25, Pet. Exh. 11 at 5-1. ASA used the concept of “degree days”¹⁷ to “reflect longer term, cumulative effects of temperatures.” Pet. at 14, Exh. 11 at 2-4. Based on the ASA Report, Ameren states, “[T]he SIUC data indicate that raising water temperature in the mixing zone during May via higher thermal limits will not necessarily result in warmer temperatures throughout the remainder of the summer.” Pet. at 14. ASA found, “the meteorological conditions are the controlling factors of the temperature... The lake dissipates heat through

¹⁷ The ASA Report explained:

Monthly and seasonal degree-days were determined by computing the difference between mean daily temperatures and 60°F (15.6°C) and summing these differences over the desired period of time, i.e., individual month or season (*e.g.*, May-October). A threshold temperature of 60°F was chosen because it represents the minimum temperature for largemouth bass spawning (Heidinger 1975) and a reasonable, if not conservative, lower limit for growth.” Pet. Exh. 11 at 2-4.

surface exchange with the atmosphere. That's influenced by ambient air temperatures, relative humidity, wind and wave reaction and solar radiation.” Tr. at 32.

In summary, the ASA Report states that the proposed standards for the transition months of May and October “would more realistically reflect a natural thermal environment, where temperatures increases or decreases occur more gradually than the abrupt change inherent in the existing site-specific standards.” Pet. Exh. 11 at 5-1. With the current thermal standards, Dr. McLaren explained, “There can be a very rapid increase in the water temperature at the end of May when you transition from the non-summer to the summer limits. And this can be a very stressful thing, and it certainly is not a natural situation.” Tr. at 37. Dr. McLaren added that a more gradual shift in temperature provides more opportunity for fish to acclimate and move to areas with more suitable temperatures. Tr. at 196-197, Pet. Br. at 15.

ASA maintains that the warmer temperatures during May and October also tend to promote fish survival and growth. ASA cites to the exceptional largemouth bass fishery which has resulted from the earlier spawning and a prolonged growing season. ASA suggests the proposed thermal standards “would easily be tolerated” by largemouth bass. Pet. Exh. 11 at 5-1. For bluegills, ASA observes that spawning success at these temperatures is demonstrated by the abundance of small bluegill in Coffeen Lake. *Id.* For channel catfish, ASA finds that the warmer water temperatures during the spring months also contribute to a prolonged growing season, leaving juvenile fish which are less temperature sensitive. *Id.* at 5-2. Dr. McLaren testified that Ameren’s proposal “lengthens the growing season for the fish. It gives them a better ability to bulk up for the winter [and] probably better over[-]winter survival to attain larger growths.” Tr. at 168, Pet. Br. at 11.

The ASA Report concludes, “Since the range of temperatures occurring in the summer have not influenced recruitment, growth, or relative weight for these three species annually, it is even less likely that the detrimental effects could result from temperatures that would be experienced in May and October under the revised standards.” Pet. Exh. 11 at 5-2. In addition, ASA finds that the food supply supported by the lower trophic levels in the lake (i.e. phytoplankton, epiphyton, and macrophytes, zooplankton, benthos, and phytomacro-benthos) are also adapted to the thermal environment and should not be affected by the proposed thermal standards. Pet. Exh. 11 at 5-2. ASA cites to the intensive monitoring of the fish populations in Coffeen Lake by SIUC and IDNR to demonstrate “that the fish populations have adapted and thrived in the thermal environment of the lake.” Pet. Exh. 11 at 5-2.

Finally, ASA states that fish kills are unlikely to result from the proposed thermal standards. The conditions contributing to the previous fish kills (warmest temperatures, lake stratification, and depleted dissolved oxygen) would not be expected to occur during either May or October even under the proposed thermal standards. Pet. Exh. 11 at 5-3. Ameren adds that even if such conditions did occur, Ameren would be required to de-rate to comply with the proposed limits for these months. Pet. Br. at 12.

**Control of the Thermal Component of the Discharger's Effluent
by a Technologically Feasible and Economically Reasonable Method**
(35 Ill. Adm. Code 106.202(b)(1)(B) & 302.211(j)(3)(A))

Current Methods of Control

Currently, Ameren uses good management through scheduled maintenance, de-rating, and various cooling system enhancements to maintain compliance with the thermal limits. Pet. at 25-26. Since 2000, Ameren has invested in several cooling system enhancements. In 2000, Ameren constructed a 70-acre cooling basin at a capital cost of \$20,734,000. In 2002, Ameren constructed a 48-cell cooling tower with a flow capacity of 200,000 gallons per minute (gpm) at a capital cost of \$6,833,000 million. In 2007, Ameren experimented with solar-powered aerators ("solar bees"), which are still in operation today, at a capital cost of \$120,000. Pet. at 27, Resp. to Hearing at 1. The total capital cost of the cooling system enhancements amounts to \$27,687,000 to date. Pet. at 27.

With these enhancements, Ameren states that the only challenge remaining is meeting the thermal limits in the months of May and October when summer transitional temperatures are coupled with high energy consumption. Pet. at 27-28. To maintain compliance with the current thermal limits, Ameren uses a variety of operational practices at Coffeen Station in combination with the cooling system. Ameren has historically scheduled planned outages during May and October to reduce the heat loading to Coffeen Lake during those months. Ameren has also de-rated the units at the Station during evening hours and lowered the load over the weekends. Since 1999, Ameren has resorted to de-rating 64 times, resulting in costs totaling \$5,584,477.17 and substantial financial hardship. Pet. at 28, Pet. Exh. 14. Without the requested relief, Ameren argues that as demand on the system increases in the future, the Station will be required to shut down or de-rate on a regular basis in order to comply with the monthly average requirements of the thermal limits in the NPDES permit. Pet. at 28. The cost of de-rating averages \$2.4 million per year under forecasted operation. Pet. Exh. 15 at 8-10.

Alternatives for Compliance

As previously stated, Ameren commissioned Sargent & Lundy, LLC to assess engineering alternatives to meet the current thermal limits based on both current Station capacity as well as forecasted increases in future capacity. Pet. at 29, Pet. Exh. 15. The current maximum plant gross electrical output is 950 MW, running with an average 82% capacity factor, which is the ratio of the actual output of a power plant over a period of time and its output if it had operated at full nameplate capacity (*i.e.* manufacturer's recommended capacity) for the entire time. Electrical output is forecasted to increase to 1,026 MW with a 90% capacity factor. Pet. Exh. 15 at 5. The Sargent & Lundy Report points out that Coffeen Lake was originally designed to provide cooling capacity equivalent for operation of a 1,000 MW station with a 70% capacity factor. Pet. Exh. 15 at 5. Despite the enhancements that were made to the cooling system (70-acre supplemental cooling basin and helper cooling towers), the Station continues to experience loss in generation capacity during high station power output and hot weather, specifically in May and October. Pet. Exh. 15 at 5.

Thermal Lake Modeling: Sargent & Lundy used its own thermal lake modeling software program to evaluate the thermal performance of the Coffeen cooling system. The model was benchmarked with actual plant operating data and historic weather conditions and run to predict the response of the cooling system to the forecasted increases in capacity. Sargent & Lundy explains that when there is insufficient capacity in the cooling system to adequately pre-cool that water, the Station's generation is reduced. Exh. 15 at 6. The evaluation of the model showed a gradual increase in lost capacity factor over time, from 12% in 1980 to 21% in 2007, averaging 16% per year with a corresponding loss of \$2,334,000 per year (based on 2007 dollars). *Id.* at 7. Ameren states that this is a trend that is not economically reasonable for Ameren to sustain. Based on the weather conditions experienced in 2007 that resulted in the majority of recent de-ratings, the model shows that the Station would experience a 34% loss in capacity factor under the forecasted increase in capacity, resulting in a theoretical loss of \$5 million in revenue. Pet. at 29, Pet. Exh. 15 at 7, Pet. Exh. 14, Pet. Br. at 27.

Identified Compliance Alternatives: Sargent & Lundy evaluated several alternatives to improve the performance of the cooling system to meet the current thermal limits without resorting to de-rates.

1. Utilize existing system as-is with continued de-ratings
 2. Install additional cooling towers
 3. Add cooling basin capacity
 4. Modify the Station to utilize a closed-cycle cooling tower
 5. Modify the Station to utilize an air-cooled condenser on one or both units
 6. Utilize the entire length of Coffeen Lake
- Pet. Exh. 15 at 7.

Based on the evaluation, Sargent & Lundy concluded that only Options 1 and 2, above, to be technically feasible. Pet. at 30-31, Pet. Exh. 15 at 8-10. Although Option 1 is technically feasible, this option involves continued de-rating of units, which Ameren has stated imposes a substantial financial hardship. The cost to Ameren to de-rate 64 times during the period from January 1999 through September 2007 was \$5.584 million, and costs to do so in future will only increase, averaging some \$2.3 million per year under forecasted operations. Pet. at 28 and Exh. 15 at 8-10.

As for Option 2, the corresponding capital costs for the installation of additional cooling towers range from \$13,053,000 for a 100,000 gpm cooling tower to \$18,266,000 for 175,000 gpm. However, the least cost cooling tower option would still result in lost generation through de-rates. Pet. Exh. 15 at 13. Ameren states that even the scaled-down cooling towers at \$13 million would be prohibitively expensive and would not obviate the need to de-rate in May and October. Pet. at 32. Considering capital and operating and maintenance costs, Ameren's initial prediction was that it would not recover its costs from installation of the cooling towers for 9 to 11½ years. Pet. at 33, Pet. Exh. 5 at 3. After rerunning the cost analysis with more recent data, Ameren shows that the 11½ year cost recovery time for this option would actually outlast the operating life of the cooling tower itself. Pet. Resp. to Rec. at 16. The updated analysis indicates that revenues and energy margins from the projected increase in power generation

capacity will never recover the high up-front cost for this option. *Id.* at 17, Pet. Resp. to Hearing at 1-4.

Given the minimal reduction in temperature achieved by the alternative options, including de-rating, Ameren asserts that none of them are technically feasible and economically reasonable. Pet. at 33. Ameren states that relief from the current thermal limits is critical to maintain compliance and operating capacity. Ameren emphasizes that Ameren has already invested over \$27.6 million in capital costs to enhance the cooling system just since 2000. *Id.* Ameren states, “Given the minimal environmental impact the requested relief would have on Coffeen Lake, the modified limit Ameren requests for May and October is the only economically reasonable alternative available.” Pet. Br. at 2-3.

Economic Impact on Retail Customers

Ameren notes that in 1997, the Illinois electric markets and electric industry were restructured under the Illinois Electric Service Customer Choice and Rate Relief Law of 1997, 220 ILCS5/16-101–16-130 (2008). Pet. at 14. Ameren now competes to sell energy as well as capacity in the wholesale electricity markets. Ameren explains that functional control of the transmission facilities and wholesale markets is under the Midwest Independent System Operator (MISO), which covers all or parts of 11 states in the upper Midwest. As Ameren states, “MISO selects the lowest bid prices consistent with the need to have generators operating throughout the region to maintain reliability of the grid.” Pet. at 15.

Because of the new market structure, Ameren explains that Coffeen’s capacity and ability to deliver energy to the market directly impacts the market prices for electricity in Illinois. Pet. at 15. Ameren states that Coffeen is a baseload plant and currently among the most inexpensive power available in Illinois. If Coffeen’s generating capability is reduced, Ameren asserts that the market must rely on higher-cost generating resources to serve the electricity demand, increasing the wholesale market price of electricity for the region. Retail customers will also feel these impacts in the daily and hourly market prices as well as in the longer term. Pet. at 16.

In addition, Ameren speaks to Coffeen’s role in meeting growing demand for electricity. During 2002 through 2006, Coffeen operated with an average annual net generation of 66 percent of its 950 megawatts per hour (MWh) capacity. Pet. at 17. Anticipating a continuing demand for growth, Ameren is planning to increase the capacity utilization of Coffeen toward 90 percent by 2011. *Id.* At the same time, Ameren notes that the energy demands of new air pollution control equipment (such as selective catalytic reduction) and flue gas desulfurization) would reduce Coffeen’s net output by an estimated 22.6 MWh. *Id.*

Ameren states, “In summary, maximizing the availability of Coffeen Station to supply capacity and electricity to the wholesale electricity market in Illinois and the Midwest will insure to the benefit of retail electricity consumers in Illinois.” Pet. at 17.

**All Discharges from the Artificial Cooling Lake to Other Waters of the State
Comply with the Applicable Provisions of Subsections (b) through (e)**
(35 Ill. Adm. Code 302.211(j)(1))

As for the requirements under 302.211(j)(1), Ameren states, “Ameren will ensure that such discharges comply with the applicable provisions of Section 302.211(b)-(e). Pet. at 35. As noted later, based on a suggestion by the Agency, Ameren states that it would not object to including a condition consistent with this requirement in the relief if granted. Pet. Reply Br. at 8.

**The Heated Effluent Discharged to the Artificial Cooling Lake Complies with All Other
Applicable Provisions of this Section, except Subsections (b) through (e)**
(35 Ill. Adm. Code 302.211(j)(2))

As for the provisions of 302.211(j)(2), Ameren simply states, “Ameren will ensure that such discharges comply with all other water quality criteria, except the provisions of Section 302.211(b)-(e), by relying on the results of monitoring required by its NPDES permit.” Pet. at 35.

Consistency with Federal Law

Ameren states that Section 402 of the Clean Water Act (CWA), 33 U.S.C. 1342, requires thermal discharges to be permitted under the NPDES requirements. Pursuant to Section 301 of the CWA (33 U.S.C. 1311), the NPDES permit requirements include any applicable state standard. The state standard at issue here is the thermal standard adopted in PCB 77-158 that was included in Coffeen Station’s NPDES permit as Special Condition No. 5. Pet. at 36.

Ameren goes on to state that under Section 316(a) of the CWA, the Board can establish alternative thermal standards based on a demonstration that the alternative standard will “assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on that body of water.” [33 U.S.C. 1326(a)] Ameren states that this standard is consistent with the Board’s rules at 302.211(j)(3)(A). Pet. at 36.

AGENCY RECOMMENDATION TO DENY AND CONCERNS

On April 27, 2009, the Agency filed its recommendation that the Board deny Ameren’s request for modification of the site specific thermal standards. Rec. at 1. The Agency states that Ameren has not demonstrated that the proposed thermal limits would provide conditions capable of supporting shellfish, fish and wildlife. Rec. at 9. Specifically, the Agency believes the petition fails to address the impacts of the proposed thermal standards on: (1) temperature and dissolved oxygen in Coffeen Lake, (2) total phosphorus and mercury levels in Coffeen Lake, and (3) lake habitat. Rec. at 1. The Agency also contends that Ameren has not demonstrated that alternatives to the proposed thermal limits are technically infeasible and economically unreasonable. Rec. at 20.

Conditions Capable of Supporting Shellfish, Fish and Wildlife, and Recreational Uses
(35 Ill. Adm. Code 106.202(b)(1)(A) & 302.211(j)(3)(A))

Temperature and Dissolved Oxygen

The Agency states that Ameren has failed to demonstrate that the proposed thermal limits will provide conditions “capable of supporting shellfish, fish and wildlife” as required by 106.202(b)(1) and 302.211(j)(3)(A). Rec. at 9-10. The Agency reviewed the ASA Report in combination with the SIUC studies and does not agree with Ameren’s interpretation of the results and conclusions. Rec. at 10. The Agency cites to the SIUC Report (March 2007) which documents fish kills in 1999, 2001, 2002 and 2005 and attributes the cause to (1) ambient conditions such as hot air temperatures combined with high discharge water temperatures and low dissolved oxygen, and (2) habitat erosion wherein small fish were trapped in a thermal refuge area that was eroded by prolonged periods of heated discharge. Rec. at 10, Ag. Exh. 1.

The Agency cites to the 2007 SIUC Report that describes the conditions contributing to the fish kills. Rec. at 10-11, citing Ag. Exh. 1 at 9-13:

The 1999 fish kills were likely induced by a combination of elevated discharge water temperatures, prolonged periods of relatively hot air temperatures (which reduced the cooling capacity of the lakes and increased water temperatures at most depths throughout the lakes) and low levels of dissolved oxygen due to atmospheric conditions (which also induced fish kills in local ambient lakes).

* * *

Fish kills of smaller magnitudes also occurred in the two reservoirs [Coffeen Lake and Newton Lake] during the study. Those kills were likely more directly associated with water mixing zone temperatures....This phenomenon, described as eroded fish habitats, results in smaller but more frequent fish kills such as occurred in 2001, 2002, and perhaps in Coffeen Lake in August 2005. 2007 SIUC Report at 9-10.

Referring to the 2004 SIUC Report, the Agency points out that SIUC concluded that extremely warm water temperatures during June through September may be lethal to fish species. Rec. at 11, referring to Ag. Exh. 2 at 3. The Agency states that during periods of high ambient temperatures, Coffeen Lake is heated to depths where dissolved oxygen is too low to support aquatic life leading to fish kills. Rec. at 11.

The Agency relied on the temperature data from the 2007 SIUC Report to evaluate the lake conditions during the 1999 fish kill. The Agency notes that during the time period of the 1999 fish kill, the hourly surface temperatures at the outer edge of the mixing zone exceeded 112°F during 83 hours in 1999, with most exceedances occurring over the 9-day period between July 23 and 31. Rec. at 11. Again referring to the SIUC Report, the Agency notes that the fish kill involved the larger of the larger fish, amounting to 242 largemouth bass and 6 channel catfish. *Id.*

In July 2001, a fish kill involved 546 channel catfish, 513 *Lepomis spp.*, and 65 largemouth bass. Ag. Exh. 1 at 10. SIUC associated the fish kill with mixing zone temperatures and eroded cove habitat in the mixing zone. Minimum water temperatures increased to nearly 100°F for a prolonged period of time, and mean water temperatures were high to a depth of 3 meters. Below this depth where temperatures were cooler, dissolved oxygen was limiting at the time. *Id.*

As for dissolved oxygen, the Agency suggests the proposed thermal limits may contribute to violations of the dissolved oxygen water quality standards at Section 302.206. Ag. Br. at 7. The Agency cites to testimony by Dr. Shortelle who estimated that under the proposed limits, the number of anoxic days would increase from 18 to 23 in segment 1 of the lake and from 17 to 25 in segment 2 in May, and from 1 to 13 in segment 1 and from 1 to 11 in segment 2 in October. Ag. Br. at 7, citing to Tr. at 228-229.

The Agency points out that Dr. McLaren testified that the lethal temperature end points for largemouth bass, bluegill, and channel catfish would be exceeded by the proposed thermal limits for May and October, and that the three RIS studied are heat tolerant species. Ag. Br. at 5 citing Tr. at 154. The Agency asks, “So what does that mean for other species of fish that exist in Coffeen Lake?” Ag. Br. at 5.

The Agency finds shortcomings in the ASA Report, comparing SIUC’s evaluation of temperature and dissolved oxygen related to depth and ASA’s evaluation of cumulative temperature expressed as degree days. Rec. at 14. SIUC monitored water temperatures, dissolved oxygen, and water depth profiles, estimating the volume of lake that was available for fish habitat as a percentage of the water depth at temperatures between 87 and 96°F and dissolved oxygen concentrations of 1 to 4 parts per million (ppm). The Agency notes that the SIUC estimation indicated “that potentially critical periods for fish existed in the lake between June and mid-September.” Rec. at 15 citing Agency Exh. 1 at 5-6. Just 4 days before the July 1999 fish kill, SIUC estimated the fish habitat available at or below 94°F with at least 4 ppm dissolved oxygen was 5-10 percent. Rec. at 15-16, citing Ag. Exh. 3. SIUC stated that the dissolved oxygen/temperature profiles indicated that certain areas of Coffeen Lake could serve as refuges, “[h]owever, during extremely critical periods, even those areas would likely have critically low quality habitat.” Rec. at 16, Ag. Exh. 1 at 14.

In contrast, the Agency finds the ASA Report’s prospective assessment only reflects surface temperatures and considers conditions during May and October in isolation, failing to address how higher temperatures in May could exacerbate conditions leading to a fish kill. Rec. at 14. The Agency reiterates the testimony of Dr. McLaren. When asked whether other states use degree days to set water quality standards, Dr. McLaren responded “that would be a misapplication of degree days.” Ag. Br. At 4 quoting Tr. at 135.

The Agency asserts that Ameren’s proposed higher temperatures in May will increase the heat load to Coffeen Lake earlier in the summer, resulting in higher temperatures throughout the remainder of the season. Rec. at 14. The Agency states that Ameren does not demonstrate that higher temperatures in May will not exacerbate conditions during the summer that cause fish

kills. Pet. at 19. The Agency states that Ameren has not demonstrated that the proposed higher temperature limits in May and October will not prolong the period of stratification and corresponding lower dissolved oxygen levels for fish. Rec. at 14. The Agency also states Ameren has failed to address the varying temperatures and levels of dissolved oxygen at different depths throughout the lake and the resulting impacts on fish. Rec. at 15.

Total Phosphorus and Mercury Levels

The Agency raises the issue of the impact of the proposed thermal limits on total phosphorus and mercury levels in Coffeen Lake. In the Illinois EPA's 2008 Integrated Water Quality Report, Coffeen Lake is listed as fully supporting aquatic life uses, but not supporting fish consumption and aesthetic quality uses. The cause of impairment for fish consumption was mercury. The causes of impairment for aesthetic quality are attributed to aquatic plants, total phosphorus, and total suspended solids. Pet. at 16.

Regarding phosphorus, the Agency states that allowing increased water temperatures may increase the phosphorus levels in the lake. Since increased temperatures in October prolong stratification of the lake, the Agency asserts anoxic conditions may persist, allowing more phosphorus to be released from the sediment into the overlying water. The Agency explains that this internal loading of phosphorus contributes to algal growth. Rec. at 16. The Agency cites to the testimony of Ameren's expert witness, Dr. Shortelle, who estimated the proposed standards would result in an increased internal phosphorus loading of 48 to 96 kilograms per year. Ag. Br. at 6, citing Tr. at 225. The Agency approved a Total Maximum Daily Load (TMDL) for phosphorous in Coffeen Lake in 2007. The TMDL determined that a 64 percent reduction in phosphorus loading from tributary and internal sources would be necessary to meet the water quality standard of 0.05 mg/L. The calculation of loading capacity was based on increasing the level of the lake by 3 feet. The Agency indicates Ameren had plans at one point to raise the dam to increase the level of the lake to meet increasing production needs. Rec. at 17. The Agency asserts that Ameren has not addressed the impact of the proposed thermal limits on phosphorus levels in the lake that are already a cause of impairment. Rec. at 17-18.

The Agency is also concerned about the impact of the proposed thermal limits on mercury levels in the lake. As discussed above, the Agency states that higher temperatures in May and October prolong stratification and low dissolved oxygen levels in the lake. According to the Agency, such conditions also contribute to increased production of methylmercury. Methylmercury bioaccumulates so that it is typically found in predatory fish. Rec. at 18. The Agency states that if temperatures are allowed to increase in May and October, the levels of mercury in the fish might also increase. Rec. at 18. The Agency cites to testimony of Dr. Shortelle that increasing lake temperatures may also increase methylation. Ag. Br. at 6.

Lake Habitat

The Agency argues that Ameren's petition does not adequately address impacts on lake habitat, citing to the 2007 SIUC Report attributing causes of fish kills to habitat erosion. Rec. at 10, Ag. Exh. 1 at 10 (see *infra*, p. 2 at n. 3).

The Agency points to the link in the SIUC Reports between habitat erosion resulting from high mean water temperatures and fish kills. The Agency cites to the 2007 SIUC Report describing a fish kill in another cooling lake, Newton Lake, which stated, “The prolonged high temperatures most likely caused fish mortality in a relatively small cove where the fish’s thermal refuge was broken down.” Rec. at 12, quoting Ag. Exh. 1 at 11. SIUC indicated that fish kills in June/July 2002 and August 2005 in Coffeen Lake “were likely a result of eroding habitat.” Rec. at 12. The fish kills involved 42 largemouth bass, 64 striped bass, and small amounts of other species in 2002 and 19 channel catfish in 2005. The 2007 SIUC Report states the Coffeen Lake has cove habitats in the discharge area “where fish could easily congregate during less severe discharge temperatures and get trapped during a sudden increase of temperatures.” Ag. Exh. 1 at 11.

**Technologically Feasible and Economically Reasonable Methods
for Achieving Compliance**
(35 Ill. Adm. Code 302.211(j)(3)(A))

In its recommendation, the Agency states that Ameren has not demonstrated that the alternatives are not technically feasible and economically reasonable. Rec. at 20. The Agency asserts that both de-rating and cooling towers are currently used as a means for compliance and could be expanded. Ag. Br. at 8. The Agency refers to the Sargent & Lundy Report, stating that the 175,000 gpm helper tower would allow Ameren to maintain compliance with the current thermal limits without de-rating. The Agency notes the cost for this option was estimated at \$18 million with a 1½ year cost recovery. Rec. at 12. The Agency notes that at the hearing, Ameren stated that it reran the economic analysis during its annual review and determined that such an investment would actually result in a negative \$2.7 million, making the investment “not economically viable.” Ag. Br. at 11.

The Agency argues that Ameren’s definition of economic reasonableness appears to hinge on whether an investment will result in profit, particularly whether installing supplemental cooling will allow increased power generation to realize a net profit. The Agency points out, “It will be a very rare case where environmental controls result in a profit to the regulated entity.” Ag. Br. at 9. The Agency continues to argue that de-rating and supplemental cooling are both technically feasible and economically reasonable alternatives for meeting compliance. Ag. Br. at 11.

Consistency with Federal Law

The Agency points out that any relief granted to Ameren must be treated as a “water quality standard change” and will require federal approval under Section 303(c) of the Clean Water Act. Ag. Br. at 12, 15. The Agency notes that the Board regulations requiring that the showing take the form of a Section 316(a) demonstration was designed to make the Artificial Cooling Lake demonstration approvable by USEPA, thereby satisfying the conditions necessary to issue an NPDES permit. Ag. Br. at 15. The Agency states that a water quality standard change in this case could be either a site specific thermal limit or a change in use designation. Ag. Br. at 14. The Agency suggests that unless Ameren shows the site specific thermal limits will be protective of aquatic life as designated by the general use standard, then Ameren must

request a change in the use designation instead. The Agency argues that the requested relief will not be protective of aquatic life, and Ameren has not suggested a change in use designation. Ag. Br. at 15. Therefore, the Agency believes, “Ameren has not made a sufficient showing to gain federal approval of the relief requested as a water quality standard change.” Ag. Br. at 15.

Agency-Suggested Conditions of Relief

The Agency suggests that if relief is granted to Ameren, conditions should include requirements to demonstrate that the relief will not result in violations of other water quality standards. In particular, the Agency cites to 302.211(j)(1)

- j) All effluents to an artificial cooling lake must comply with the applicable provisions of the thermal water quality standards as set forth in this Section and 35 Ill. Adm. Code 303, except when all of the following requirements are met:
 - 1) All discharges from the artificial cooling lake to other waters of the State comply with the applicable provisions of subsections (b) through (e).

The Agency states that overflows from Coffeen Lake must comply with the conditions that

- b) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.
- c) The normal daily and seasonal temperature fluctuations which existed before the addition of heat due to other than natural causes shall be maintained.
- d) The maximum temperature rise above natural temperatures shall not exceed 2.8o C (5o F).
- e) In addition, the water temperature at representative locations in the main river shall not exceed the maximum limits in the following table during more than one 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 by more than 1.7o C (3o F).

| | o C | o F | | o C | o F |
|------|-----|-----|-------|-----|-----|
| JAN. | 16 | 60 | JUL. | 32 | 90 |
| FEB. | 16 | 60 | AUG. | 32 | 90 |
| MAR. | 16 | 60 | SEPT. | 32 | 90 |
| APR. | 32 | 90 | OCT. | 32 | 90 |
| MAY | 32 | 90 | NOV. | 32 | 90 |
| JUNE | 32 | 90 | DEC. | 16 | 60 |

Specifically, the Agency states that Ameren has not been required to monitor discharges from Coffeen Lake. Ag. Br. at 7-8.

CONCERNS EXPRESSED IN PUBLIC COMMENT

The Board heard public comment at the hearing from two individuals and subsequently received four written public comments. Tr. at 249-253, PC #1-4.

Mary A. Bates expressed concerns with Ameren's proposal and the absence of any discussion regarding a planned longwall mining process which may affect the viability of the watershed feeding into Coffeen Lake. Ms. Bates explains that the Deer Run Mine is scheduled to longwall mine. The longwall mining includes a planned subsidence in the area under the McDavid Branch. PC #1 at 1. The Board notes that Coffeen Lake was formed by damming the McDavid Branch of the East Fork of Shoal Creek and has a watershed area of approximately 18 square miles. Pet. at 8.

Ms. Bates points out that if the McDavid Branch is subsided during the longwall mining process and is unable to flow into Coffeen Lake, the water feeding Coffeen Lake may be greatly diminished or eliminated altogether. PC #1 at 1. Ms. Bates stated, "The mine will subside the area above the lake watershed with the stated average in the permit application of 5.7 feet." Tr. at 249. Ms. Bates adds that the Office of Surface Mining has indicated that subsidence is not considered a mining activity, so reclamation related to the subsidence of McDavid Branch would not be required. PC #1 at 1.

Mary Ellen McClue expressed concern regarding the dissolved oxygen and mercury levels in the lake and suggested aeration and alternative energy sources be considered to protect the fishery. Tr. at 250-253, PC #4. Ms. McClue reiterated the concerns of Ms. Bate regarding the longwall mining and the potential impact on the watershed draining into Coffeen Lake. PC #4.

Prairie Rivers Network (PRN) filed a public comment echoing the concerns of the Agency with regard to phosphorus and mercury levels in the lake and the economic reasonableness of the compliance alternatives. PC #2. As to the economic reasonableness of compliance options, PRN suggests that Ameren supply a more detailed cost analysis to show that the \$18 million cooling tower option is actually economically infeasible. PC 2 at 3. In addition, PRN points out that Coffeen Lake lies within the Shoal Creek watershed which contains some of the State's Biologically Significant Stream reaches. PRN quotes IDNR stating, "Stream segments identified as biologically significant are unique resources in the state and we believe that the biological communities present must be protected at the stream reach, *as well as upstream of the reach.*" PC #2, quoting "Integrating Multiple Taxa in Biological Stream Rating System" by IDNR¹⁸ (emphasis added in PC.) PRN states that deterioration of the high quality aquatic community present in Shoal Creek watershed must be prevented. PC #2 at 3.

¹⁸ www.dnr.state.il.us/orc/biostrmratings/images/BiologicalStreamRatingReportSept2008.pdf

In addition, PRN also raises the issue of increasing the lake level by 3 feet as a way to address the thermal discharge as well as decrease phosphorus and mercury concentrations. PC #2 at 3-4. PRN concludes by stating that the additional thermal loading must comply with the State's antidegradation regulations at 302.105, and that Ameren has failed to show that existing uses will be protected and that the increased heat loading is necessary to accommodate important social or economic development. PC # 2 at 4-5.

Joyce Blumenshine also filed public comment, stating Ameren should be required to conduct additional studies of Coffeen Lake watershed before any regulatory modifications are made. Ms. Blumenshine expresses further concern regarding the longwall mining plans and the potential effect on the water levels in Coffeen Lake. As to the relative cost of installing improvements to the cooling system, Ms. Blumenshine states that Ameren's electric division realized a revenue of \$6.37 billion for 2008 out of a total revenue for the company of \$7.84 billion. Ms. Blumenshine asks why such large companies should not be required to come up with better solutions. PC #3 at 1-2.

AMEREN'S RESPONSE TO AGENCY'S AND OTHERS' CONCERNS

Fish Kills

Ameren asserts that the Agency's selective citations to the SIUC reports suggesting that fish kills occur frequently do not fairly represent the overall findings of the decade-long SIUC studies. Resp. to Rec. at 4, 6. Ameren states that SIUC identified three, possibly four, fish kills that were linked to thermal conditions during the 10-year study. According to SIUC, of these instances, there were two (2001 and 2002), possibly three (2005), that occurred where sudden changes in water temperature resulted in entrapment of fish in coves near the discharge point (habitat erosion). Resp. to Rec. at 6. SIUC linked the other thermally-induced fish kill in July 1999 to abnormal meteorological conditions coupled with unusually warm water temperatures. Ameren points out that SIUC investigators noted that at the time, similar fish kills were reported at other southern Illinois lakes, including at least one ambient lake. Resp. to Rec. at 7.

To put the significance of the fish kills in perspective, Ameren cites to the 2006 SIUC Report which stated that the most significant fish kill in 1999 was "relatively insignificant to the sportfish populations." Resp. to Rec. Att. 1 at 10, Pet. Br. at 13. In relative terms, SIUC stated the number of largemouth bass that died from the 1999 fish kill represented only 1% of the bass population, whereas the average total annual mortality rate for largemouth bass in Coffeen Lake from 1997-2004 is approximately 42%. Resp. to Rec. Att. 1 at 9, Pet. Br. at 13.

Ameren emphasizes that since the last of the enhancements were made to the cooling system in 2002, SIUC reported no cases of thermally-induced fish kills other than the possible 2005 event, and none of those years involved entrapment. Resp. to Rec. at 7.

Temperature and Dissolved Oxygen

In response to the Agency's concern that higher thermal limits in May and October would have carryover effect that would exacerbate summer conditions, Ameren points to the findings in the ASA and Sargent & Lundy Reports. Resp. to Rec. at 10. The ASA Report examined the data from the SIUC studies conducted during 1997-2006 and found no statistically significant relationship between higher water temperatures in May and warmer water temperatures during the remainder of the season. Resp. to Rec. at 10, referring to Pet. Exh. 11 at 2-4. ASA used the concept of degree-days to assess the cumulative thermal impact, taking into account the annual variation in heat loading and meteorological conditions. ASA relied on degree-days measured at the edge of the mixing zone to represent a near worst-case assessment of whether a carryover effect would result. Resp. to Rec. at 10-12.

Although the Agency suggests that the use of degree-days does not account for the variability of temperature and dissolved oxygen by depth, Ameren argues that ASA's use of degree-days was actually overly-conservative given the near worst-case parameters used in the assessment. Resp. to Rec. at 11. The Sargent & Lundy Report used thermal lake modeling to evaluate the impacts of the proposed thermal limits under near worst-case conditions and increased Station power output. The modeling showed that the mean daily lake temperatures in June through September would be unaffected by loadings in May. Resp. to Rec. at 11.

As to the Agency's concern regarding the effect of the proposed thermal limits on dissolved oxygen, Ameren refers to the ASA Report and testimony by Dr. McLaren. ASA analyzed the SIUC data to determine whether thermal loading resulted in a carry-over effect on dissolved oxygen levels as the summer months progress. ASA plotted data from SIUC for the depth at which the 5 mg/L dissolved oxygen was first encountered each week during the summer months of 2000 through 2006. While the depth at which the 5 mg/L dissolved oxygen level varied from week to week throughout the summer, ASA indicates that the data plots show no discernable pattern that dissolved oxygen depletion increases as the summer progresses. Resp. to Rec. at 13, Hearing Exh. 2 at 6. Dr. McLaren testified that the epilimnion¹⁹ remains oxygenated with dissolved oxygen concentrations usually well in excess of 5 mg/L. Tr. at 29, Pet. Br. at 9.

Responding to the Agency's concerns regarding temperature, dissolved oxygen, and habitat erosion, Dr. McLaren states that he found Coffeen Lake provides a diverse habitat where thermal refuge is available at any time in various parts of the lake. Tr. at 29, Pet. Br. at 9. Dr.

¹⁹ As to epilimnion and hypolimnion, Dr. McLaren explains,

In stratified lakes, because of the difference in the density of the water, usually because of the temperature, you have layers called epilimnion, which is above a layer called a metalimnion where there's a thermocline. There's a rapid decrease in temperature. And then the densest water remains at the bottom in a layer that's called hypolimnion. So the epilimnion is the region where fish and possibly the metalimnion where fish would generally remain during periods of stratification within the lake. Tr. at 29.

McLaren testified, “Accordingly, there should be no adverse effect on the fishery by the proposed increase in the thermal standard for May and October.” Hearing Exh. 2 at 6.

The Agency cites to the IDNR 2007 Lake Management Status Report (Pet. Exh. 12) listing the relative weight index (WR) and numbers (catch per unit effort, CPUE) of species in Coffeen Lake from 2000 - 2006. Based on the data, the Agency concludes that, the relative weight and numbers of all species in Coffeen Lake have declined. Rec. at 20, referring to Pet. Exh. 12 at 3, Resp. to Rec. at 9. Ameren responds stating that Dr. McLaren has not found that these numbers conclusively demonstrate thermal stress. Dr. McLaren testified that the numbers in the 2007 Lake Management Status Report more likely reflect competition with other species for food, angling pressure, increasing predator base, or the cyclical nature of a particular species. Tr. at 173-185, Pet. Br. at 10.

Ameren again notes that the Agency did not introduce its own expert testimony on any of the issues the Agency raised. Pet. Br. at 18.

Total Phosphorus and Mercury Levels

Ameren responds to the Agency’s concerns regarding the effect of prolonged stratification and anoxic conditions on the total phosphorous and methylmercury levels in Coffeen Lake. To address the Agency’s concerns, Ameren commissioned Dr. Anne B. Shortelle of MACTEC to quantify potential for additional phosphorus and mercury release related to the proposed thermal limits. Resp. to Rec. at 14. MACTEC’s report is entitled, “Evaluation of Effects of Revised Thermal Standards on Phosphorus and Mercury Cycling in Coffeen Lake” (MACTEC Report). Resp. to Rec. at 14, Hearing Exh. 3 Attachment 1.

The MACTEC Report addressed the potential for the proposed thermal limits to impact the internal phosphorus loading and contribute to the Agency’s concern regarding algal growth. Dr. Shortelle looked at seasonal trends with regard to phosphorus and Chlorophyll-*a*. Chlorophyll-*a* is an indicator of algal growth and grows better with more nutrients such as phosphorus. Hearing Exh. 3 Att. 2 at 2-2, Tr. at 44, Pet. Br. at 19. The MACTEC Report shows that any phosphorus released from the sediment would not be expected to reach the epilimnion where Chlorophyll-*a* is produced. Therefore, any additional phosphorus loading would not be available for biological production within Coffeen Lake to contribute to algal growth.

Dr. Shortelle’s analysis continues that even if phosphorus were released from the hypolimnion (at depth) up into the epilimnion, this internal loading would be unobservable compared to the loading from external sources. Dr. Shortelle explained that if significant phosphorus were released from the sediment, it would be observed in the Chlorophyll-*a* after a fall turnover when the stratified levels in the lake mix. Dr. Shortelle testified, “This is not seen in Coffeen Lake.” Tr. at 46. Dr. Shortelle compared seasonal water quality data and found no evidence that internal phosphorus loading from sediment was an important component of total phosphorus loading in Coffeen Lake. Resp. to Rec. at 14. Dr. Shortelle predicted that the increase in internal phosphorus loading attributable to the proposed thermal limits would be no more than 1.5%. Hearing Exh. 3 Att. 2 at 2-25. Dr. Shortelle concluded,

Future modifications to thermal discharge limits from the Ameren Power Generating Plant are unlikely to present additional phosphorus loads from sediment release in the future, and therefore are not a threat to the existing water quality of Coffeen Lake. Resp. to Rec. at 14-15, Hearing Exh. 3 Att. 2.

Dr. Shortelle found that the source of phosphorus in Coffeen Lake is primarily external loading due to runoff from agriculture in the watershed. Tr. at 47, Hearing Exh. 3 Att. 2 at 2-7. Dr. Shortelle testified,

We know that this is occurring because we can see in the areas of the lake that are closest and out of the influence of the cooling water loop, we see that phosphorus and Chlorophyll-*a* are highest there. And we see that that area of the lake is filling in with sediments, soils that are sediments, soils that are washing in from the watershed.” Tr. at 47.

Ameren adds that the CWA Section 303(d) listing for Coffeen Lake does indeed list “crop production” as a source of the phosphorus impairment. Pet. Br. at 20, referring to the Illinois Integrated water Quality Report and Section 303(d) List – 2008, App. B-3.

Although the 2007 TMDL document placed an emphasis on the contribution from internal loading of phosphorus, Dr. Shortelle testified that this is not supported by the data and stems from an error in the TMDL modeling. Tr. at 47-48. Ameren introduced information regarding a 2009 Addendum to the 2007 TMDL which came about from an Agency request regarding a project Ameren is planning for the East Fork Shoal Creek. Tr. at 221. Although the report was only recently finalized and has not yet been approved by USEPA, Dr. Shortelle indicated the emphasis on internal loading of phosphorus “was lessened somewhat, partially corrected in the 2009 addendum.” Tr. at 48.

In the 2007 TMDL, the Agency indicated the calculation of phosphorus loading capacity depended on increasing the level of the lake by 3 feet based on plans Ameren had to raise the dam. Rec. at 17. Ameren states that the current proposal is to transfer water from the East Fork Shoal Creek to Coffeen Lake to provide the additional water supply needed for new air pollution control equipment being installed, the FGD and SO₂ scrubbers. Pet. Br. at 32, Tr. at 83. When asked by the Board’s technical staff at hearing whether raising the dam by 3 feet posed other environmental impacts by changing the contour of the lake, Dr. Shortelle replied, “Absolutely.” Tr. at 236.

As to mercury, the MACTEC Report also considered the Agency’s concern that the proposed thermal limits might prolong thermal stratification and low dissolved oxygen levels in the lake leading to an increase of methylmercury in fish. Dr. Shortelle explained that mercury methylation is affected by multiple parameters, not solely thermal stratification, and the suite of parameters should be evaluated as a whole before making any predictions. Based on the available data for Coffeen Lake, Dr. Shortelle found that mercury concentrations are low and that conditions do not appear favorable for methylation. Although thermal stratification might be prolonged under the proposed limits, Dr. Shortelle states that this would not substantially change lake conditions.

This change is minor, and does not represent a change that could or would significantly increase hypolimnetic mercury methylation rates. It is anticipated that the change, if any, would be so small, that it would not result in increased mercury in the biota. Hearing Exh. 3 at 4-2.

Dr. Shortelle commented that in general, mercury levels in fish are expected to decline as a result of mercury load reductions across the region. Hearing Exh. 3 at 4-2. Ameren adds that Illinois recently adopted regulation aimed at reducing the levels of atmospheric deposition of mercury from electric generating utilities. Ameren cites the Illinois mercury rulemaking proceedings where the Agency testified that the reductions in atmospheric deposition were expected to correlate to lower mercury levels in fish within a period of a few years. Resp. to Rec. at 16, citing to In the Matter of: Proposed New 35 Ill. Adm. Code 225 Control of Emissions From Large Combustion Sources (Mercury), R06-25, Testimony of Marcia Willhite, at 162-172 (June 14, 2006).

To comply with the new regulations, Ameren has and continues to install pollution control equipment to reduce mercury emissions from its facilities. Ameren states, “In fact, pollution controls that Ameren will initiate in a matter of months will likely have an overriding beneficial impact to Coffeen Lake by actually reducing mercury loading due to air deposition.” Pet. Br. at 22. Ameren states that SO₂ scrubbers will be in place by the end of 2009, which will operate throughout the year to also reduce mercury emissions. Pet. Br. at 31.

Alternatives for Achieving Compliance

Ameren reiterates that the option supported by the Agency of installing a 175,000 gpm cooling tower at a capital cost of \$18 million is economically prohibitive. In preparing for the hearing in this case, Ameren refined and updated the financial analysis done by Sargent & Lundy using May 2009 capacity and energy prices as well as future market prices for power and the likelihood of additional compliance costs or CO₂ tax. Based on Ameren’s Economic Value Added Model or Economic Viability Analysis (EVA), the more recent analysis shows that the 11½ year cost recovery time for this option would actually outlast the operating life of the cooling tower itself. Resp. to Rec. at 16. The updated analysis indicates that revenues and energy margins from the projected increase in power generation capacity will never recover the high up-front cost for this option. Resp. to Rec. at 17, Resp. to Hearing at 1-4.

Ameren states that given the minimal environmental impact of the requested relief, the proposed thermal limits for May and October represent the only economically reasonable alternative available. Pet. Br. at 2-3.

Environmental Impact

Ameren states, “Coffeen Lake supports abundant and diverse wildlife, including muskrat, turtles, heron and mussels. It also supports a robust fishery, comprised of 22 species of fish, and is well known as the home of numerous competitive sport-fishing tournaments.” Pet. at 20.

Nonetheless, Ameren states that the regulations do not require that there necessarily be a fishery or recreational uses, only that the artificial cooling lake provide “conditions capable of supporting shellfish, fish and wildlife, and recreational uses consistent with good management practices...” 35 Ill. Adm. Code 302.211(j)(3)(A). Moreover, Ameren states, “Coffeen Lake clearly need not support an *optimal* fishery, but simply *conditions capable* of supporting a fishery.” Pet. Br. at 6. Ameren cites to the Board’s opinion in the original R75-2 rulemaking:

[U]nder subsection (cc) (1) [now section 302.211(j)], it is not absolutely required that there be a fishery, or that an artificial cooling lake provide recreational or any other uses except that for which it was designed . . . [b]ut it is nonetheless felt that by requiring such conditions in a lake we will have taken a significant step in protecting water quality. Water Quality and Effluent Standards Amendments, Cooling Lakes, R75-2, slip op. at 40 (Sept. 29, 1975) (emphasis in original).

Ameren cites to the relief granted to Illinois Power in PCB 92-142 stating, “the Board found that minimal impacts to reproduction, growth and survival of some species did not constitute a significant ecological impact as long as the adjusted thermal limit would not inhibit the propagation of fish or other aquatic biota.” Pet. Br. at 7, referring to Petition of Illinois Power Co. for Hearing Pursuant to 35 Ill. Adm. Code 302.211(j) to Determine Specific Thermal Standards, PCB 92-142, slip op. at 7 (August 26, 1993).

Conditions of Relief

Ameren responds to the Agency’s suggestion that any relief granted to Ameren contain a condition requiring discharges from Coffeen Lake to meet the standards of 35 Ill. Adm. Code 302.211(b)-(e). Ameren notes that the discharge from Coffeen Lake to the East Fork Shoal Creek is so infrequent, that Ameren has had almost no opportunities to collect data to make a demonstration. Ameren states that making a demonstration is not necessarily a prerequisite to the Board granting relief. However, Ameren recognizes that pursuant to Section 106.200(a)(2)(C)(i)

A Board order providing alternate thermal standards...will include...the following conditions...(i) all discharges from the artificial cooling lake to other waters of the State must comply with the applicable provisions of 35 Ill. Adm. Code 302.211(b) through (e).” Pet. Reply Br. at 7-8.

Ameren indicated it would not object to a condition consistent with 35 Ill. Adm. Code 106.200(a)(2)(c)(i) as part of the requested relief. Pet. Reply Br. at 8.

Dr. McLaren indicated that if Ameren’s request for relief is granted, further studies of the fish are planned. This is in response to IDNR’s desire to see the long-term database continue to develop. Tr. at 213. One study Ameren and IDNR plan to develop would be a study to investigate the ability of fish to avoid exposure to stress by seeking preferred temperatures within the Lake’s environment. The study would be designed to complement IDNR data. In another study, Ameren has already committed to implement a 3-year fish stocking pilot study at the Lake in conjunction with IDNR. Ameren has agreed “to financially support a three-year pilot stocking

program to introduce suitable species, such as the blue catfish, to help IDNR better assess the long term nature of maintaining a viable, recreational resource.” Hearing Exh. 2 at 12.

At hearing, Ameren indicated that these studies are not being proposed as conditions to the requested relief. Tr. at 212. However, Ameren did revise its proposed language to include an agreement with IDNR to respond in the event of excessive fish mortality during the months of May and October and implement appropriate mitigation measures. Pet. Br. at 15.

Response to Public Comments

Ameren responded to each of the oral public comments made at hearing as well as the four written public comments filed.

With regard to concerns voiced by Ms. Bates (PC #1, Tr. at 249), Ms. Blumenshine (PC #3), and Ms. DeClue (PC #4, Tr. at 20-253) about the effect on lake levels from the Deer Run Mine in combination with Ameren’s proposal (PC #1, Tr. at 249-250), Ameren states that it is not familiar with the mining project. Ameren does not believe that the activities associated with the longwall mining are germane to the relief requested here. Nonetheless, Ameren notes that under the proposed thermal limits, Ameren will actually draw less water from Coffeen Lake than if it were to install additional cooling towers. Ameren explains that cooling towers are extremely water consumptive since they use evaporation. Pet. Br. at 30.

In response to concerns raised by Prairie Rivers Network (PRN) (PC #2), Ameren reiterates the work done by Dr. Shortelle to support the conclusions regarding phosphorus and mercury as well as the economic analysis performed by Ameren to demonstrate the economic reasonableness of the alternatives. Although PRN disputes the use of the 2009 Addendum to the TMDL, Ameren makes it clear that Dr. Shortelle relied on her own analysis to estimate the internal phosphorus loading, not the 2009 Addendum. Pet. Br. at 30-31.

Ameren also responds to PRN’s concern that Biologically Significant Stream Reaches have been identified in the Shoal Creek watershed that might be affected by discharges from Coffeen Lake. Ameren notes that discharges from Coffeen Lake are relatively rare. Even so, Ameren believe that such discharges result in an improvement to the East Fork Shoal Creek since the phosphorus concentration is actually much lower in Coffeen Lake than in the creek. Pet. Br. at 31-32, referring to Illinois EPA, 2009a, Coffeen Lake and East Fork Shoal Creek TMDL Addendum, Hanson Prof. Serv., Apr. 2009.

In its petition, Ameren indicated the East Fork of Shoal Creek is a general use water body and rated as a “B” stream under the Agency’s Biological Stream Characterization system. Pet. at 8. Ameren states that the creek is not listed in the INHS’s publication of “Biologically Significant Illinois Streams”. Pet. at 8. As to PRN’s inquiry behind Ameren’s decision not to pursue raising the dam level by three feet, Ameren states that the current proposal is to transfer water from the East Fork Shoal Creek to Coffeen Lake and that permits are pending. Ameren indicates the additional water supply is needed for new air pollution control equipment being installed. Pet. Br. at 32.

In response to the inquiry from Ms. Blumenshine (PC #3) when she asked why such large companies should not be required to come up with better solutions, Ameren replies, “the requested relief will not allow Ameren to realize a profit at the cost of the environment.” Pet. Br. at 33. The proposal would only allow Ameren to avoid de-rating during May and October and the corresponding economic losses. In addition, the requested relief would help to mitigate losses in net generating capacity resulting from the operation of the new air pollution control equipment being installed. Pet. Br. at 34.

Ameren also responded to the oral and written comments of Mary Ellen DeClue (PC #4, Tr. at 250-253). At hearing Ms. DeClue inquired about the use of aeration to improve oxygen levels in the lake. Tr. at 251. Ameren noted that solar-powered aerators, dubbed “solar bees”, have been used on an experimental basis since 2007 to mix and cool the lake water. Ameren plans to continue using the solar bees to enhance cooling. Pet. Br. at 34.

DISCUSSION

The Board first observes that, in 1982, when the alternative thermal standards were first granted for Coffeen Lake, the criteria of the previous Rule 203(i)(5) required “a one-time showing by a power station that it has not caused nor can reasonably be expected to cause significant ecological harm to its cooling lake.” PCB 77-158, PCB 78-100, slip op at 1 (March 19, 1982.) (citing Rule 203(i)(5)). That particular language is no longer present in the Board’s current rules, and the current rules require the Board to revisit thermal issues despite the fact that, as Ameren states, Coffeen Station is not a new facility nor is it changing any design parameters of its generating equipment that would affect its thermal effluent discharged into Coffeen Lake. Resp. to HOO at 2, Tr. at 124.

In summary, Ameren seeks to modify the existing site specific thermal standards to increase the thermal limits applicable to heated effluent discharge from Ameren’s Coffeen Power Station to Coffeen Lake. Ameren asserts that the modification of the thermal standards is needed to meet its NPDES permit limits without de-rating. Ameren believes the modified thermal limits will allow Ameren to meet increase power output to meet market demands, and mitigate the loss in net generating capacity from operation of new air pollution control equipment. Ameren has submitted extensive studies and data to demonstrate that the modified thermal limits are environmentally acceptable.

For all of the reasons set for below, the Board finds that Ameren has justified the grant of modified thermal discharge limits in compliance with the standards set in Sections 106.202(b)(1)(A) and 302.211(j)(3)(A). The Board finds that Ameren has provided information and argument to meet the question and concerns raised both by the Agency and the public commenters. Neither the Agency nor any members of the public presented expert testimony or exhibits which dispute the information which Ameren presented, and which was subject to cross-examination. Again, the only exhibits the Agency filed consisted of the 2000-2005 series of reports by SIUC.

The Board grants the requested modification effective today, subject to the conditions in the Board’s order.

Supporting Documentation for Initial Coffeen Lake Thermal Demonstrations

In reviewing the record in this PCB 09-38 proceeding, the Board has revisited the record in the prior Lake Coffeen proceedings. In PCB 77-158/PCB 78-100, CIPS supported its Thermal Demonstration with, among other studies and data, a 3-year series of reports from 1979 to 1981 completed by the INHS.

For the sake of ease for public access to pertinent historical documents, the Board's Clerk's Office scanned in portions of the microfiche file from PCB 77-158 to the Clerk's Office Online (COOL), including the 1981 Tranquilli and Larimore report: Petitioner's Group Exhibit 1a: "Part I: Environmental Studies of Coffeen Lake, A Thermally-Altered Reservoir, Part II: Ecological Investigations of Shoal Creek, Final Report to Central Illinois Public Service Company", INHS, Urbana, Illinois, July 1981, John A. Tranquilli and R. Weldon Larimore, Principal Investigators; Lance G. Perry, Project Coordinator. This report is 470 pages long, not including the appendices. Also scanned in is a report entitled "Lake Coffeen – Biological and Chemical Findings", Sept. 14, 1977.

The microfiche file for PCB 77-158 also contains the extensive studies leading up to the 1981 Tranquilli and Larimore report that were performed by the INHS (1979, 1980, 1981) that appear as three separate documents: First Annual Report (1979), Second Annual Report (1980), and Final Report (1981). The combined studies apparently stacked 8-inches high. The introduction to the final report states:

"In July 1978, at the request of Central Illinois Public Service Company (CIPS), the Illinois Natural history survey began a 3-year investigation of the environmental effects of CIPS Coffeen Power Station on Coffeen lake and its receiving stream, Shoal Creek. The overall objective of this study was to provide diagnostic data for use in determining whether Coffeen Lake and Shoal Creek were environmentally acceptable in terms of supporting shellfish, fish, wildlife, and recreational uses consistent with good management practices." Final Report to Central Illinois Public Service Company by INHS, July 1981, page 1.1.

When CIPS petitioned the Board for a variance in PCB 97-131, CIPS intended to return to the Board for permanent relief after three years in the form of a site-specific rule. When the Board granted the 5-year PCB 97-131 variance in 1997, the Board included, as a condition of the variance, that CIPS continue to study the thermal effects on the fishery in Coffeen Lake. The Board also indicated the record needed more economic information to quantify the hardship. (See CIPS, PCB 97-131, slip op. at 5-6 (June 5, 1997). During the period of the variance, lake temperature data for May and October were to be closely monitored and compared to historical data, and the annual fish surveys were to be reviewed by the IDNR to verify that there was no significant impact. *Id.* at 3, 5.

To comply with the 1997 variance, CIPS (now Ameren) retained SIUC to continue studying Coffeen Lake, producing the 1997-2006 SIUC studies referenced in Ameren's current proposal. Subsequently, Ameren commissioned ASA to prepare a report presenting "an

overview of the evidence supporting the conclusion that raising the thermal limits for the months of May and October presents minimal additional risk to fish populations in the lake.” Pet. Exh. 11 at 1-1. Ameren also provided more economic information to quantify the hardship through the Sargent & Lundy Report (Pet. Exh. 12) and Ameren’s updated Economic Value Added model or Economic Viability Analysis (EVA). Tr. at 15-20, 72-74, Resp. to Hearing at 1-4.

Ameren’s Current Artificial Cooling Lake Demonstration

Ameren’s artificial cooling lake demonstration embodied in the ASA Report draws from a long history of studies from INHS (1978-1981, 2002), IDNR (2007, covering 2000-2006), SIUC (1997-2007) as well as Ameren’s consultants from Sargent & Lundy (2008) and an extensive literature review. (Pet. Exh. 11.) In response to particular Agency concerns, Ameren also supplements its thermal demonstration with the MACTEC Report (2009). Hearing Exh. 3 Att. 2.

The ASA Report includes as part of its basis the Tranquilli and Larimore 1981 Final Report by the INHS that was completed under the previous thermal demonstration for Coffeen Lake in PCB 77-158/PCB 78 covering a three-year study period from 1978-1980. The Tranquilli and Larimore (1981) report addressed several components of the aquatic community, including algae, zooplankton, benthos, and fish. Whereas the entire fish community was addressed in the report, the three species most frequently chosen for detailed study were largemouth bass, bluegill, and channel catfish. Resp. to HOO at 5.

When SIUC was retained to conduct the study under the 1997 variance, the same three species were selected as the target species, RIS, for the study. The proposed study underwent review and comment by IEPA and IDNR as well as the public. IDNR approved of the study and the selection of the three RIS to be monitored on an annual basis to comply with the variance PCB 97-131: largemouth bass, bluegill, and channel catfish. Exh. 11 at 3-1. The three RIS are also considered to represent the lower trophic levels as well. Resp. to HOO at 9. In addition, Ameren addresses consideration that was given to threatened and endangered species, nuisance species, unique and rare habitat, and other vertebrate wildlife. Resp. to HOO at 5-6, 9-10.

The ASA Report follows an approach similar to the USEPA’s Ecological Risk Assessment (ERA) framework. Ameren indicates that other recent 316(a) demonstrations have shown that the decision criteria from 1977 USEPA 316(a) Manual “is congruent with this more recently developed guidance for evaluating the adversity of effects from a wide variety of ecological stressors.” Resp. to HOO at 7-8. ASA’s use of the ERA approach relied on multiple lines of evidence for both a retrospective assessment and a prospective (predictive) assessment of the potential risks for increasing the thermal standards in May and October in Coffeen Lake. Resp. to HOO at 8. ASA considers the studies arising from the 1997 variance as “an incremental step in compliance with the NPDES permit conditions for the Station rather than a Section 316(a) demonstration.” Resp. to HOO at 8. Nevertheless, ASA provides a summary of the conclusions from their investigation similar to a 316(a) Master Rationale. Resp. to HOO at 8.

Ameren Has Justified that Modified Thermal Limits Are Environmentally Acceptable

The Board's rules do not explicitly require artificial cooling lake demonstrations take the form of a CWA Section 316(a) showing, but they do explicitly allow it. As discussed below, the Board finds that Ameren makes a convincing demonstration pursuant to 301.211(j)(3) and (4) and satisfies the Board's rules. The Board agrees with ASA that the amount of long-term data that has been produced in connection with Coffeen Lake is "unusual and fortunate" in assessing the effects of the thermal regime on the fish, and the Board notes that Ameren is committed to further study of the lake through agreements with IDNR.

As previously discussed, the federal regulations at 40 CFR 122 provide for two possible types of predictive CWA Section 316(a) demonstrations, Type II: Protection of Representative Important Species and Type III: Alternative Demonstrations. Based on the manner in which the studies were conducted to support Ameren's petition, the Board will consider Ameren's demonstration similar to a Type II demonstration. The Section 316(a) Manual states that a Type II Demonstration should fully develop three key biological components: completion of the Biotic Category Rationale (begun during early screening procedures), development of RIS Rationale, and synthesis of all information into a Master Rationale. Section 316(a) Manual at 34.

The Board finds that Ameren's retrospective assessment demonstrated that no appreciable harm from the thermal discharge from Coffeen Station to the three RIS: largemouth bass, channel catfish, or bluegill. As Ameren stated,

In fact, all three RIS exhibit characteristics such as survival, growth, body condition, population size, and recruitment of young that are comparable to or exceed those for populations in other regional and national water bodies. Resp. to HOO at 8.

The Board concludes that the condition of these populations attests to the accuracy of ASA's conclusion that "Coffeen Lake's thermal regime is also suitable for lower trophic levels that provide forage for these top consumers." Resp. to HOO at 9. The record amply demonstrates the exceptional fishery and the recreational value of Coffeen Lake.

The Board finds that ASA's conclusions are consistent with the Board findings in the original rulemaking for thermal standards in cooling lakes:

It would appear that, within limits . . . the addition of heat from a steam-electric generating plant actually aids in the growth and development of gamefish in artificial cooling lakes . . . While the continued growth of fish and other aquatic organisms during winter is unquestionably not in the natural order of things for Illinois lakes; it would appear that this phenomena nonetheless contributes to the recreational value of an artificial cooling lake. Further, it would appear that the presence of such a fishery as is evidently produced by the thermal effluent may also be a good indication of the general environmental quality and acceptability of an artificial cool lake . . . Apparently, then, the existence of this type of recreational use is compatible with the preservation of our environment. Water

Quality and Effluent Standards Amendments, Cooling Lakes, R75-2, slip op. at 22 (Sept. 29, 1975).

In PCB 77-158/PCB 78-100, when establishing the initial site specific standards for Lake Coffeen, the Board found conditions very similar to the conditions presented for the current proposal:

The evidence indicates that Coffeen Lake supports a diverse fishery consisting of a total of twenty-two species and which is comparable to other central Illinois reservoirs. Coffeen Lake supports an abundance of fish second only to Lake Shelbyville in a group of 200 Midwestern and Mid-southern reservoirs studied. The Coffeen Lake fishery appears to be in good condition with the exception of the stunted condition of blue gills, a condition common to reservoirs and probably caused by too great a population for the existing food supply.

The lack of significant fish kills over the years at Coffeen Lake indicates that adequate mode-rate temperature refuge areas exist to enable the fish population to survive the short-term, high-temperature conditions that exist during late summer months. CIPS, PCB 77-158/PCB 78-100, slip op. at 2-3 (March 19, 1982.)

The record here thoroughly discusses the documented fish kills since then. Of the documented fish kills in 1999, 2001, 2002, and 2005; SIUC concluded the most significant fish kill in 1999 was “relatively insignificant to the sportfish populations”, involving 1% of the largemouth bass population, whereas the average annual mortality rate is 42%. Resp. to Rec. Att. 1 at 9-10, Pet. Br. at 13. ASA concluded that fish kills are unlikely to result from the proposed thermal standards since conditions contributing to the previous fish kills (warmest temperatures, lake stratification, and depleted dissolved oxygen) would not be expected to occur during either May or October. Pet. Exh. 11 at 5-3. Ameren provides the assurance that even if such conditions did occur, Ameren would be required to de-rate to comply with the proposed limits for these months. Pet. Br. at 12.

ASA concluded that “raising the thermal limits for the months of May and October presents minimal additional risk to fish populations in the lake.” Pet. Exh. 11 at 1-1. In response to the Agency’s concerns, ASA demonstrated that proposed thermal limits for May will not necessarily result in a carryover of warmer temperatures throughout the remainder of the summer. Pet. Exh. 11 at 2-4. ASA also demonstrated that dissolved oxygen does not exhibit a pattern of depletion throughout the summer, and that the epilimnion remains oxygenated with dissolved oxygen concentrations usually well in excess of 5 mg/L. Tr. at 29, Pet. Br. at 9. ASA found that Coffeen Lake provides a diverse habitat where thermal refuge is available at any time in various parts of the lake. Tr. at 29, Pet. Br. at 9. Based on MACTEC’s analysis of phosphorus and mercury, the proposed standards are also not expected to contribute to a significant increase in internal phosphorus loading or mercury methylation. Hearing Exh. 3 Att. 2.

The Board notes that CWA Section 316(a) of the CWA contains language for alternative thermal effluent standards to “assure the protection and propagation of a balanced, indigenous

population of shellfish, fish and wildlife in and on that body of water.” 33 U.S.C. 1326(a). In comparison, the Board’s rules at Sections 106.202(b)(1) and 302.211(j)(3)(A) require a demonstration that the cooling lake “will be environmentally acceptable, and within the intent of the Act, including, but not limited to... provision of conditions capable of supporting shellfish, fish and wildlife, and recreational uses consistent with good management practices.” 35 Ill. Adm. Code 106.202(b)(1), 302.211(j)(3)(A). Although the Board’s rules for alternative thermal water quality standards are somewhat different, Ameren responds to the Agency’s question of whether the concept of thriving fishery is the same as a balanced indigenous community. Dr. McLaren testified

Fisheries are managed, and this is a particularly well-managed fishery. They're managed for particular sport fish, more often than not. So you would look at it in terms of the importance of a particular game species that are being fished for and exploited, but also for the overall community composition. So the fish themselves that are being managed are only a component of the overall balanced community. And in all probability, you wouldn't have a strong recreational fishery if you didn't have a balanced community. Tr. at 126-127.

For all of the foregoing reasons, the Board finds that under the proposed modified standards for May and October, Coffeen Lake will continue to be capable of supporting shellfish, fish, and wildlife, and recreational uses consistent with good management practices as required by Sections 106.202(b)(1)(A) and 302.211(j)(3)(A).

Ameren Has Demonstrated that Existing Means for Control of the Thermal Component of Its Discharge are Economically Reasonable and Technically Feasible

For all of the reasons set forth below, the Board finds that Ameren’s control of the thermal component of its effluent using the existing cooling system is by a technologically feasible and economically reasonable method. The Board recognizes that Ameren is committed to de-rate if necessary to comply with the proposed limits. Pet. Br. at 12. Based on this record, the Board does not believe that to require further environmental controls will provide any net benefit to Coffeen Lake. On the other hand, the costs to Ameren and its ratepayers of installing an additional cooling tower, or of continued de-rating to meet the existing standards, are clear.

As to Ameren’s control of the thermal component of its discharge, it is uncontested that, since 2000, Ameren has invested some \$26.7 million dollars to enhance cooling capabilities. Even so, it has had to de-rate some 64 times since 1999, at a cost of over \$5.5 million dollars. The costs of de-rating are expected to increase overtime, averaging \$2.3 million per year (2007 dollars) under the forecasted operations. Pet. at 28, Exh. 14. Costs of continued de-rating will likely be passed through to ratepayers.

It is also undisputed that the cost of the technically feasible additional enhancements available to Ameren range from \$13,053,000 to \$18,266,000, and that the least expensive of these options did not completely mitigate Ameren’s need to de-rate. Exh. 15 at 13. Ameren’s EVA indicated the cost recovery time for the \$18 million option would outlast the operating life of the cooling tower itself, and Ameren would never recover the high up-front costs. Resp. to Rec. at 16-17, Resp. to Hearing at 1-4.

The Agency argues that Ameren could continue to de-rate as a means of compliance, arguing that, “It will be a very rare case where environmental controls result in a profit to the regulated entity.” Ag. Br. at 9. While the Board does not disagree with the Agency, the Agency’s comment neglects the fact that the uncontroverted expert testimony here supports the finding that no significant environmental impact is expected to occur as a result of Ameren’s proposal. Additionally, this does not take into consideration Ameren’s need to mitigate losses in net generating capacity due to operation of new air pollution control equipment or the financial losses in revenue.

Conditions

The Agency suggests that if relief is granted to Ameren, conditions should include requirements that Ameren demonstrate that the relief will not result in violations of other water quality standards. In particular, the Agency cites to 35 Ill. Adm. Code 302.211(j)(1), requiring that overflows from Coffeen Lake must comply with 302.211(b)-(e). The Agency reports that Ameren has not been required to monitor discharges from Coffeen Lake. Ag. Br. at 7-8.

In response to the Agency’s suggestion, Ameren indicated it would not object to a condition consistent with 35 Ill. Adm. Code 106.200(a)(2)(C)(i) as part of the requested relief. Pet. Reply Br. at 8. Although the Agency appears to suggest that Ameren should be subject to monitoring, Ameren replies that discharges from Coffeen Lake to the East Fork Shoal Creek are so rare that Ameren has had almost no opportunity to collect such data. Pet. Reply Br. at 7. In its original petition, Ameren states, “[s]everal months often lapse without a discharge over the spillway. Prior to an overflow on April 11, 2008, the lake had not discharged to the East Fork of Shoal Creek since May 2005.” Pet. at 8.

The Board agrees with Ameren that the regulations at 35 Ill. Adm. Code 106.200(a)(2)(C)(i) do not specifically require monitoring to make its modification demonstration. As for 35 Ill. Adm. Code 106.200(a)(2)(C)(ii) (which has parallel language at 35 Ill. Adm. Code 302.211(j)(2)), Ameren states “Ameren will ensure that such discharges comply with all other water quality criteria, except the provisions of Section 302.211(b)-(e), by relying on the results of monitoring required by its NPDES permit.” Pet. at 35. Therefore, the conditions set forth by the Board in the following Order include those as stated in 35 Ill. Adm. Code 106.200(a)(2)(C)(i) – (ii).

The Board notes Ameren has also made a commitment for additional fish kills studies, and provided a draft MOU with IDNR. Ameren stated if the requested relief is granted, Ameren and IDNR have agreed to a draft MOU to conduct additional studies on Coffeen Lake and the fishery. Resp. to Hearing at 5. Ameren states, “If investigation shows that a fish kill has resulted from the requested relief, Ameren agrees to replenish or replace the impacted resource pursuant to the terms and conditions of a Fish Stocking Plan to be developed in consultation with IDNR.” Pet. Resp. to Hearing at 6, Exh. C.

Paragraph 2 in the Board’s Order below reflects Ameren’s commitment. But, as IDNR is not a party to this proceeding, IDNR is not named as a party to be bound by the Board’s order.

Public Comments

The Board wishes to acknowledge the thoughtful public comments it has received in this proceeding, and to address a couple of them briefly. The Board does not now have authority or ability to address any potential subsidence or other effects on Lake Coffeen from any proposed longwall mining at Deer Run Mine. The Board echoes Ameren's comments to the effect that Ameren must take all steps necessary to ensure that its discharges into Coffeen Lake meet the conditions of the modification granted today, no matter what conditions may result at Coffeen Lake due to actions of others.

Ameren's experts have adequately addressed the issues of phosphorus and mercury loading, and habitat erosion. Ameren's current, and promised future, use of solar-powered aerators, to some extent addresses the query about use of aeration to improve oxygen demand. The Board does not discount the concern that major corporations should be asked to "do better", but reminds that Ameren is also being required to expend resources to meet stricter air pollution control standards, and that ratepayers typically must shoulder some of these costs.

CONCLUSION

Based on the record before it, the Board finds that Ameren has provided adequate proof that the Coffeen Lake artificial cooling lake receiving the heated effluent from Coffeen Power Station will be environmentally acceptable and within the intent of the Act, including: (A) provision of conditions capable of supporting shellfish, fish and wildlife, and recreational uses consistent with good management practices; and (B) control of the thermal component of the discharger's effluent by a technologically feasible and economically reasonable method. 35 Ill. Adm. Code 106.202(b)(1), 302.211(j)(3). The Board grants Ameren's requested relief subject to conditions outlined in this order, effective today.

This opinion constitutes the Board's findings of fact and conclusions of law.

ORDER

1. The thermal discharge to Coffeen Lake from Ameren Energy Generating Company's Coffeen Power Station, located in Montgomery County, shall not result in a temperature, measured at the outside edge of the mixing zone in Coffeen Lake, which:
 - A. Exceeds 105 degrees Fahrenheit as a monthly average, from June through September, and a 112 degrees Fahrenheit as a maximum for more than three percent of the hours during that same period.
 - B. Exceeds 89 degrees Fahrenheit as a monthly average, from November through April, and 94 degrees Fahrenheit as a maximum for more than two percent of the hours during that same period.

- C. Exceeds 96 degrees Fahrenheit as a monthly average, in each of the months of May and October, and 102 degrees Fahrenheit as a maximum for more than two percent of the hours in each of those same months.
2. Ameren must monitor Coffeen Lake during the period May through October for fish mortality. In the event excessive fish mortality occurs during these months, Ameren shall implement appropriate mitigation measures including the following:
 - A.. Notify the Illinois Department of Natural Resources (IDNR) immediately;
 - B. Maximize operation of the cooling basin and existing cooling towers to reduce thermal temperatures;
 - C. Make operation revisions to the station's typical dispatch order (*e.g.* "last on and first off");
 - D. Reduce nighttime capacity factors;
 - E. Monitor intake and discharge temperatures and visually inspect intake and discharge areas; and
 - R. No later than November 15 of each year, document mitigation measures employed during periods of excessive fish mortality.
 3. Pursuant to 35 Ill. Adm. Code 302.211(j)(1), all discharges from Coffeen Lake to other waters of the State must comply with the applicable provisions of 35 Ill. Adm. Code 302.211(b) through (e).
 4. Pursuant to 35 Ill. Adm. Code 302.211(j)(2), the heated effluent discharged to Lake Coffeen must comply with all applicable provisions of 35 Ill. Adm. Code Subtitle C, Chapter I, except 35 Ill. Adm. Code 302.211(b) through (e).
 5. The Agency must expeditiously modify Ameren's NPDES permit consistent with the foregoing opinion and order.

IT IS SO ORDERED.

Member C.K. Zalewski abstained.

Section 41(a) of the Environmental Protection Act provides that final Board orders may be appealed directly to the Illinois Appellate Court within 35 days after the Board serves the order. 415 ILCS 5/41(a) (2008); *see also* 35 Ill. Adm. Code 101.300(d)(2), 101.906, 102.706. Illinois Supreme Court Rule 335 establishes filing requirements that apply when the Illinois Appellate Court, by statute, directly reviews administrative orders. 172 Ill. 2d R. 335. The Board's procedural rules provide that motions for the Board to reconsider or modify its final

orders may be filed with the Board within 35 days after the order is received. 35 Ill. Adm. Code 101.520; *see also* 35 Ill. Adm. Code 101.902, 102.700, 102.702.

I, John T. Therriault, Assistant Clerk of the Illinois Pollution Control Board, certify that the Board adopted the above opinion and order on March 18, 2010, by a vote of 4-0, Member Zalewski abstained.

A handwritten signature in black ink that reads "John T. Therriault". The signature is written in a cursive style with a long horizontal flourish at the end.

John T. Therriault, Assistant Clerk
Illinois Pollution Control Board