BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

MIDWEST GENERATION, LLC	)	
	)	
Petitioner,	)	PCB _____
	)	(Thermal Demonstration)
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY	)	
	)	
	)	
Respondent.	)	

NOTICE OF FILING

To:

Don Brown, Clerk of the Board Illinois Pollution Control Board James R. Thompson Center, Suite 11-500 100 W. Randolph Street Chicago, IL 60601 don.brown@illinois.gov	Division of Legal Counsel Illinois Environmental Protection Agency 1021 N. Grand Avenue East P.O. Box 19276 Springfield, IL 62794 epa.dlc@illinois.gov
Office of Legal Services Illinois Department of Natural Resources One Natural Resources Way Springfield, IL 62702-1271	

PLEASE TAKE NOTICE that I have today electronically filed with the Office of the Clerk of the Pollution Control Board the Appearance of Susan M. Franzetti , the Appearance of Vincent R. Angermeier, and Midwest Generation, LLC's Petition to Approve Alternative Thermal Effluent Limitations for the Joliet 29 Generating Station with Exhibits (Demonstration Report and other exhibits hand delivered to IPCB), copies of which are herewith served upon you.

Dated: December 30, 2019

MIDWEST GENERATION, LLC

By: __/s/Susan M. Franzetti_____

Susan M. Franzetti
Vincent R. Angermeier
NIJMAN FRANZETTI LLP
10 South LaSalle Street Suite 3600
Chicago, IL 60603
(312) 251-5590

CERTIFICATE OF SERVICE

The undersigned, an attorney, certifies that a true copy of the foregoing Notice of Filing, Appearance of Susan M. Franzetti, Appearance of Vincent R. Angermeier, and Midwest Generation, LLC's Petition to Approve Alternative Thermal Effluent Limitations for the Joliet 29 Generating Station (Demonstration Report and other exhibits hand delivered to IPCB) was electronically filed on December 30, 2019 with the following:

Don Brown, Clerk of the Board
Illinois Pollution Control Board
James R. Thompson Center, Suite 11-500
100 W. Randolph Street
Chicago, IL 60601
don.brown@illinois.gov

and that copies were mailed via U.S. Postal Service on December 30, 2019 to the parties listed above.

Dated: December 30, 2019 /s/Susan M. Franzetti

Susan M. Franzetti
Vincent R. Angermeier
Nijman Franzetti LLP
10 S. LaSalle Street, Suite 3600
Chicago, IL 60603
(312) 251-5590

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

MIDWEST GENERATION, LLC Petitioner,	)	
	)	PCB _____
v.	)	
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY Respondent.	)	

ENTRY OF APPEARANCE OF SUSAN M. FRANZETTI

NOW COMES Susan M. Franzetti, of Midwest Generation, LLC, and hereby enters her appearance as counsel in this matter on behalf of Midwest Generation, LLC. This appearance shall also serve as consent to service via email.

Respectfully submitted,

__/s/Susan M. Franzetti_____

Susan M. Franzetti
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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

MIDWEST GENERATION, LLC Petitioner,	)	
v.	)	PCB _____
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY Respondent.	)	

ENTRY OF APPEARANCE OF VINCENT R. ANGERMEIER

NOW COMES Vincent R. Angermeier, of Midwest Generation, LLC, and hereby enters his appearance as counsel in this matter on behalf of Midwest Generation, LLC. This appearance shall also serve as consent to service via email.

Respectfully submitted,

_/s/Vincent R. Angermeier_____

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

MIDWEST GENERATION, LLC	)	
Petitioner,	)	
v.	)	PCB _____
ILLINOIS ENVIRONMENTAL	)	(Thermal Demonstration)
PROTECTION AGENCY	)	
Respondent.	)	

PETITION TO APPROVE ALTERNATIVE THERMAL EFFLUENT LIMITATIONS FOR THE JOLIET 29 GENERATING STATION

Pursuant to 35 Ill. Adm. Code Section 304.141(c), 35 Ill. Adm. Code Part 106, Subpart K, and Section 316(a) of the Clean Water Act ("CWA"), Midwest Generation, LLC ("MWGen") requests that the Illinois Pollution Control Board ("Board") determine that the alternative thermal effluent limitations proposed in this Petition should apply to discharges from Joliet 9 Generating Station ("Joliet Station 9") and Joliet 29 Generating Station ("Joliet Station 29"), and collectively the "Joliet Stations" or "Stations") in lieu of those imposed by 35 Ill. Adm. Code 302.408(c) through (f), and (i), (collectively, the "2018 Thermal Standards").

I. INTRODUCTION

Pursuant to their respective National Pollution Discharge Elimination System ("NPDES") permits, the Joliet Stations discharge treated wastewater, including condenser cooling water, to the Upper Dresden Island Pool ("UDIP"). Although the UDIP ends at the I-55 Bridge, the Stations' thermal influence can sometimes extend beyond the bridge, into a downstream portion of the Lower Des Plaines River ("LDPR") commonly referred to as the "Five-Mile Stretch."[1]

As the result of the Board's decision in R08-09, Subdocket D (the "CAWS UAA Rulemaking"), a new set of thermal water quality standards for the UDIP became applicable

[1] The UDIP and Five-Mile Stretch comprise most of the LDPR. However, the Brandon Pool upstream from the Brandon Road Lock and Dam is also within the LDPR, but would not be subject to the relief requested in this Petition.

on July 1, 2018. During the Board's deliberations in the CAWS UAA Rulemaking, MWGen noted that the 2018 Thermal Standards were more stringent than necessary to protect a balanced, indigenous, community of aquatic life ("BIC") in UDIP/Five-Mile Stretch,[2] and that the Joliet Stations cannot consistently meet the numerical and narrative provisions of the 2018 Thermal Standards. The Stations could only avoid violations by shutting down or derating, and this would be especially likely during summer and winter weather extremes when public power demands are at their greatest levels. In 2015, the Board delayed for three years the applicability of the 2018 Thermal Standards to allow adversely affected thermal dischargers, like MWGen's Joliet Stations, time to conduct the necessary additional demonstration studies pursuant to 35 Ill. Adm. Code Part 106, Subpart K (the "Subpart K regulations") and CWA § 316(a) to support a request for alternative thermal effluent limitations. MWGen has conducted those studies. Based on two study plans (one for each station) reviewed and approved by the Illinois Environmental Protection Agency ("IEPA" or "the Agency"), the data collected and findings of those studies support this Petition's request for alternative thermal effluent limitations.

The 2018 Thermal Standards are based on existing Illinois General Use thermal water quality standards used to protect waters that meet or have the capability of meeting CWA aquatic life goals. But the UDIP, per the Board, is compromised by non-thermal impairments to the point that it "may not fully attain the CWA aquatic use goal . . . ."[3] This is why the Board designated it as the "Upper Dresden Island Pool Aquatic Life Use Waters" rather than a General Use water. *See* 35 Ill. Adm. Code 303.240.

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[2] In reference to aquatic life in the UDIP and Five-Mile Stretch, this Petition uses the terms "balanced, indigenous, population" (or "BIP") and "balanced, indigenous, community" (or "BIC"). These terms are used interchangeably, as both terms appear in state and federal regulations, and the Board's regulations specify that they share the same meaning. *See* 35 Ill. Admin. Code 106.1110.

Also, although Board's regulations assign different Designated Uses to the UDIP and Five-Mile Stretch, there is little meaningful ecological difference between these adjacent waterbodies. Accordingly, this Petition and attached Demonstration Report analyze and discuss a single biological community inhabiting both portions, the "UDIP/Five-Mile Stretch BIC".

[3] *See in the Matter of: Water Quality Standards and Effluent Limitations for the Chicago Area Waterway System and Lower Des Plaines River: Proposed Amendments to 35 Ill. Adm. Code 301, 302, 303, and 304,* PCB R08-9(D), slip op. at 22 (June 18, 2015).

The UDIP is a natural waterway that, in the early 20th Century, was heavily modified and channelized to accommodate barge traffic.[4] Flows in the UDIP are greatly influenced by the operation of a series of locks and dams that create artificial flow patterns in the waterway. The majority of this flow enters the UDIP from the Chicago Sanitary & Ship Canal (CSSC), a man-made waterway whose base flow is dominated by the treated and partially treated effluents from several Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) wastewater reclamation plants and by 408 combined sewer overflow (CSO) points located throughout the metropolitan area that discharge into the Chicago Area Waterway System (CAWS) and ultimately the LDPR.

The Five-Mile Stretch is outside the scope of the 2018 Thermal Standards, and was not evaluated during the CAWS UAA Rulemaking.[5] The Board last studied these waters in 1996, when it found "adequate proof" that the impact of the Joliet Stations on water temperatures past the I-55 Bridge did not cause nor could be reasonably expected to cause significant ecological damage to the waters of the Five-Mile Stretch. See Opinion and Order of the Board in AS 96-10, at 7 (Oct. 3, 1996) (amended March 16, 2000 to reflect ownership change). Based on that finding, the Board granted an "adjusted standard" for the waterway pursuant to Section 28.1 of the Illinois Environmental Protection Act (the Act). The Board also asserted that this action was taken in compliance with CWA § 316(a). Based on this 1996 adjusted standard relief, "Adjusted Thermal Standards", commonly referred to as the "AS 96-10 Standards," have been incorporated as far-field temperature limits in all NPDES permits for the Joliet Stations issued since 1996.

The adjusted standards provisions of Section 28.1 apply to all Illinois environmental regulations of general applicability, not just water regulations. But recently the Board adopted, for the first time, specific regulations for creating alternate thermal standards for water discharges: The Subpart K regulations. Now that MWGen has access to this more specific option

[4] Section 303.230(a) defines the UDIP as the "Lower Des Plaines River from the Brandon Road Lock and Dam to the Interstate 55 bridge . . . ."

[5] The "Five-Mile Stretch" is not formally defined in the Board's regulations. This stretch of the LDPR runs from the I-55 Bridge (River Mile 277.9) to the head of the Illinois River (formed by the confluence of the Des Plaines River and the Kankakee River), at River Mile 273.0. The Five-Mile Stretch straddles the border between Grundy County and Will County. The UDIP is entirely within Will County.

for relief, and because much of the evidence collected in support of alternate thermal limitations for the UDIP would also support alternate thermal limitations for the Five-Mile Stretch, this Petition seeks to obtain Subpart K relief for the Five-Mile Stretch. The relief sought would result in temperature standards for the Joliet Stations that are as stringent as the AS 96-10 Standards that currently govern the waterway.[6]

Pursuant to Subpart K, MWGen is proposing alternative thermal effluent limits for the UDIP and Five-Mile Stretch that will assure the protection and propagation of the BIC of the UDIP/Five-Mile Stretch in the area affected by the Joliet Stations' thermal discharges as required by applicable law and regulations. Exhibit A to this Petition, the *Joliet Generating Stations 9 and 29 §316(a) Demonstration Report* ("Joliet Stations Demonstration Report" or "Report"), was prepared pursuant to the requirements of the Subpart K regulations and CWA § 316(a). The Report contains studies, data and information establishing the appropriateness of the relief requested for the Joliet Stations' thermal discharges. It demonstrates that the requested, less stringent, alternative thermal effluent limitations are capable of supporting the BIC of aquatic life in the UDIP and Five-Mile Stretch. These proposed limitations would be stricter than currently enforced standards in the UDIP and equally stringent to those currently enforced in the Five-Mile Stretch.

MWGen has diligently pursued the steps necessary to prepare this Petition since the creation of the 2018 Thermal Standards in 2015. Within six months of their adoption, MWGen completed both the "Early Screening" requirements of Subpart K Section 106.1115 and the preparation and submittal to IEPA and the Illinois Department of Natural Resources (IDNR) of two Section 106.1120 Detailed Plans of Study (the "DSPs")—one for each of the two Joliet Stations. The IEPA approved the DSPs by letter dated March 3, 2016. (See Ex. B.) IDNR's questions regarding certain aspects of the DSPs were satisfactorily addressed and the IDNR also approved them by email dated June 7, 2016. (See Ex. C.)

The Joliet DSPs called for sampling to be conducted in the Stations' receiving waters during the calendar years of 2016, 2017, and 2018. Each DSP cautioned that the sampling period might need to be extended if unusual meteorological conditions and/or atypical station operations interfered with the collection of useful data. They further cautioned that the 2016 data, some of it

[6] As shown in Section E.2 below, the proposed standards for the Five-Mile Stretch would be more stringent than the AS 96-10 Standards on 45 days every year.

collected prior to the start of the Joliet Stations' new mode of peaker operations, might not be representative of the UDIP's thermal regime once the Stations were operating in "peaker" mode. (Ex. D & E, at p. 25).

The change in operations at the Joliet Stations is the primary reason why the Joliet DSP has extended out over a longer period than similar studies in the CSSC that MWGen initiated around the same time. The Joliet Stations were out of operation for several months during the first half of 2016, as they converted their fuel source from coal to natural gas. This project was not completed until June 2016. After conversion to natural gas, the Stations would begin operating as "peakers," generally generating only during periods of high system electrical demand. The collection of the needed two-years of study data under the Joliet DSP needed to await operations under the new "peaker" mode. And, once implemented, the "peaker" operations made the collection of useful study data difficult, as MWGen usually could not predict when periods when the Stations would be put into operation for a sufficient amount of time to collect representative study data.

When MWGen's technical consultant—EA Engineering, Science, and Technology, Inc., PBC—attempted to collect data in December 2016, it was soon discovered that the data would not be practically useful, primarily because the Joliet Stations did not run for a long enough period of time to create "mature" thermal plume data. (Typically, a run of three days is needed.) MWGen notified IEPA of this issue, and the IEPA supported MWGen's proposal to delay the winter work until January/February 2017. But, because of the relatively mild 2017 winter, electrical demand remained low through much of this period, and the Joliet Stations were not run at all during January 2017. Eventually, to avoid further postponement of the winter DSP work, MWGen planned to put the Joliet Stations into operation so that representative instream conditions could be created to allow two rounds of sampling in February (15th to 17th and 22nd-23rd). These operations were conducted at a significant loss ($810,882.27) to MWGen, due to the low compensation that PJM Interconnection (the regional transmission organization for Illinois and several other states) was offering to generators on those particular days. The second, and final, winter thermal plume survey and the second winter fish survey were completed at the Joliet Stations on December 14, 2017.

A copy of the revised Demonstration Report also was recently submitted to the U.S. EPA for its review and comment. As of the filing of this Petition, the U.S. EPA has not yet provided any comments or questions on the Demonstration Report.

II. LEGAL STANDARDS APPLICABLE TO RELIEF

Although heat is regarded as a "pollutant" under the CWA, 33 U.S.C. § 1362(6), Congress made a policy choice to offer regulatory relief to thermal dischargers that other kinds of dischargers cannot receive. Section 316(a) of the CWA allows for a point source with thermal discharge to obtain relief—called an alternative effluent limit, or "AEL"—from otherwise applicable thermal effluent limits:

> With respect to any point source otherwise subject to the provisions of section 1311 of this title or section 1316 of this title, 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 projection 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.

CWA § 316(a) (codified at 33 U.S.C. § 1326(a)).

Section 304.141(c) of the Illinois Water Pollution Regulations authorizes the Board to determine that different thermal effluent standards should apply to a particular discharger instead of those imposed by the generally applicable thermal water quality standards. Section 304.141(c) provides:

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

Section 304.141(c) references the Subpart K regulations, which are procedures for applying for AELs that the Board recently promulgated in 2014. Dischargers petitioning for an AEL first go through an early screening process with the Agency, where they provide basic information about the nature of their discharge and a broad outline of how they intend to demonstrate that a proposed AEL will protect the local aquatic community. 35 Ill. Adm. Code 106.1115. The discharger then submits a "Detailed Plan of Study" to the Agency, for its review and approval, which puts the planned demonstration into sharper focus so that the Agency has the opportunity to recommend potential improvements. *Id.* at 106.1120. Upon the Agency's approval, or after 90 days have passed with no Agency response, the discharger implements the Detailed Plan of Study. *Id.* at 106.1120 (f) and (g).

Once the study is complete, the discharger initiates the AEL proceeding by formally petitioning the Board for an AEL. *Id.* at 106.1125. In evaluating the merits of the petition, the Board applies standards that mirror those in CWA § 316(a). Although predictive studies are typically a necessary part of a thermal demonstration for new dischargers, existing dischargers are allowed to forego those studies if they can otherwise demonstrate using retrospective studies of the waterway that the AEL will assure the protection and propagation of the BIC. *Id.* at 106.1160(d). Nothing, however, prevents existing dischargers from relying on both retrospective *and* predictive studies.

The petitioner has the burden of proof to demonstrate that the generally applicable thermal water quality standard is more stringent than necessary to assure the protection and propagation of a balanced and indigenous community of shellfish, fish, and wildlife in and on the receiving water. *See* 35 Ill. Adm. Code 106.1160(a)-(b). The petitioner must also demonstrate that the requested alternative thermal effluent limitation assures the protection and propagation of a balanced and indigenous community of shellfish, fish, and wildlife in the receiving water. *See id.* at 106.1160(c).

Ultimately, the Board must decide whether the thermal demonstration submitted by the petitioner provides a "reasonable assurance" of the protection and propagation of a BIC in the receiving waterbody. The U.S. EPA's 1974 draft guidance manual on Section 316(a) demonstrations, notes that "[m]athematical certainty" is not required, and suggests that the risks to the environment from AELs (even if one assumes some kind of error rate) are low—the AELs must be renewed during the permitting cycle, and additional protections can be added at that

time, if needed. U.S. EPA. *Draft 316(a) Technical Guidance—Thermal Discharges*, at 8 (Sept. 30, 1974) ("Draft 316(a) Guidance Manual"); 35 Ill. Adm. Code 106.1180.

III. REQUIRED CONTENTS OF PETITION

Pursuant to the requirements of 35 Ill. Adm. Code 106.1130(a)-(c), MWGen provides the following information regarding the Joliet Stations and a description of the Joliet Stations Demonstration Report included with and incorporated as part of this Petition.

A. General Plant Description (Section 106.1130(a))

1. Generating Capacity and Type of Fuel Used (Section 106.1130(a)(1)-(2))

i. Joliet Station 9

Joliet Station 9 (Unit 6) is a single-unit gas-fired steam electric generating facility located on the UDIP portion of the LDPR in Joliet, Illinois at RM 284.9. Unit 6 started commercial service in 1965 as a coal-fired station and was converted to natural gas in early 2016. The Station has an original design output (on coal) of 341 megawatts (MW). The conversion to natural gas did not change the design output.

ii. Joliet Station 29

Joliet Station 29 (Units 7&8) is a two-unit gas-fired steam electric generating facility located on the UDIP portion of the LDPR in Joliet, Illinois at RM 284.6. Unit 7 started commercial service in 1965, while Unit 8 began commercial service in 1966. Both units were originally designed and built for coal-fired operation but were converted to gas at the same time as Joliet Unit 6 (2016). The Station has an original design output (on coal) of 1,150 MW [Unit 7: 572 MW, Unit 8 578 MW]. The conversion to natural gas did not change the design output.

2. Operating Characteristics of the Condenser Cooling System (Section 106.1130(a)(3))

See Section III.B, below.

3. Load Factors (Gross) for Past 5 and Next 5 Years (Section 106.1130(a)(4)-(5))

The history of the Joliet Stations load factor for the past 5 years is as follows:

	2015	2016	2017	2018	2019[7]
Joliet 9 Load Factor (Unit 6)	49%	8.4%	1.7%	0.2%	0.1%
Joliet 29 Load Factor (Unit 7)	58%	22%	4.3%	6.4%	16%
Joliet 29 Load Factor (Unit 8)	58%	12%	2.5%	6.8%	16%

The projected load factors for the Joliet Stations for the next 5 years are as follows:

Year	2020	2021	2022	2023	2024
Joliet 9 Load Factor (Unit 6)	5.5%	2.9%	1.3%	0.5%	0.2%
Joliet 29 Load Factor (Unit 7)	20%	16%	10%	5%	5%
Joliet 29 Load Factor (Unit 8)	19%	13%	6%	3%	3%

The Joliet Stations are also subject to significant operational limits that are required to comply with their Illinois air permit. Permit I.D. No. 197809AAO (Exhibit F, p. 6)[8]. The permit restricts the three generating units at the Joliet Stations to about 70 million MMBtu/year. The three units have the capacity to produce around 140 million MMBtu/year, thus MWGen must run them on a capacity factor of 50% or below to comply with the permit.

[7] Not including December 2019.

[8] Page 6 of the permit identifies that the three generating units at the Joliet Stations have the capacities to run at 3,543 mmBtu/hr, 6,034 mmBtu/hr, and 6,386 mmBtu/hr. When these numbers are expressed as an annual capacity (multiplying by 8,760 hours/year) this produces the 140,000,000 mmBtu/yr figure.

4. Estimated Retirement Dates (Section 106.1130(a)(6))

i. Joliet 9

The estimated retirement date for the Joliet 9 is 2030.

ii. Joliet 29

MWGen does not own the generating units (Unit 7 and Unit 8) at Joliet 29. Rather, it leases them from another company. That lease expires in 2030, and MWGen is unable to speculate whether the units would be in operation beyond that date.

5. Plant Shutdowns (Section 106.1130(a)(7)-(9))

i. History of Plant Shutdowns for Past 5 Years (Planned & Emergency)

The planned and emergency shutdowns of Joliet Stations Units 6, 7, and 8 are listed in Exhibit G. During the last five years, the three units have had a combined 760 outage days. This total does not include days where the generation units were available to operate, but did not operate due to market conditions.

ii. Planned and Projected of Plant Shutdowns for Next 5 Years

Exhibit H is a chart showing planned or projected shutdowns. The Units 6, 7, and 8 will be shut down for a collective 442 days. This total does not include days where the generation units will be available to operate, but will not operate due to market conditions.

B. Description of Method for Heat Dissipation (Section 106.1130(b))

1. Type of Cooling System and Operating Characteristics of the Condenser Cooling System

i. Joliet 9

Joliet Station 9 operates in an open-cycle cooling mode. Under its current single-unit operation, cooling water is withdrawn from the UDIP through a single intake structure (oriented flush with the descending left bank at RM 284.9) at a design rate of approximately 375 million gallons per day (MGD). The cooling water is withdrawn by two circulating water pumps and two low pressure service water pumps. There is a partially submerged sunken barge located at the face of the Station's cooling water intake structure. The purpose of this barge is to protect the intake from potential blockage by barge tows waiting to traverse the upstream Brandon Road Lock and Dam, as well as to prevent debris entry, which can be considerable during high-flow events in the upstream CAWS.

Circulating water used to cool and condense steam from the generating process is discharged to the UDIP through a short discharge canal that is oriented in a downstream position parallel to the existing shoreline. Joliet Station 9 does not have any supplemental cooling systems. The Station condenser tubes are maintained through dehumidification, an environmentally benign process that involves isolating and drying individual intake water boxes with residual heat. No chemicals are used in this process.

Joliet Station 9 discharges wastewater in accordance with NPDES Permit No. IL0002216, which was issued by IEPA on 30 September 2014. (Ex. I) A permit renewal application was submitted to IEPA in April 2019. The thermal discharge from Joliet 9 is designated in the NPDES Permit as Outfall 001. The discharge canal for Joliet 9 enters at River Mile 284.9.

ii. Joliet 29 (Units 7 & 8)

Joliet Station 29 operates in an open-cycle cooling mode. Under its two-unit operation, cooling water is withdrawn through a single intake structure positioned at the head of an approximately 0.5 mile long intake canal, oriented parallel to the shoreline. The mouth of the intake canal is equipped with a fixed boom structure to deflect large floating debris. The combined design flow rate for both Joliet 29 units is 1,325 MGD, based on the operation of four circulating water pumps and four service water pumps. Under typical two-unit station operation, only three of the four circulating water pumps are in use. The cooling water passes through the station's heat exchangers and discharges directly back into the UDIP through a long discharge canal that is oriented downstream and discharges at RM 284.2.

Joliet Station 29 is equipped with 24 supplemental cooling towers, which were installed in 1999. The 48 tower pumps (two per tower fan) withdraw a portion of the water from along the station's 2,000 ft discharge canal and cools it before returning it to a common flume that empties back into the discharge canal prior to entry into the UDIP. These towers are therefore considered to be "helper" towers and not a closed-cycle cooling system; they are designed to cool approximately one-third of Joliet Station 29's total design discharge flow. These "helper towers" are not designed for long-term, continuous use, nor are they equipped for winter operation. The purpose of the helper towers is to minimize potential thermal impacts to the river ecosystem and maintain compliance with the current/prior existing thermal water quality standards, while optimizing MWGen's ability to produce needed power during critical

warm weather conditions. Since they were installed, the towers have been used primarily to maintain compliance with existing far-field AS 96-10 Standards. As a consequence of their use to meet the far-field thermal limits, the cooling towers also assist the station in remaining in compliance with the near-field thermal standards during critical weather conditions and corresponding low flow periods that commonly occur in the UDIP. Helper towers are used on an as-needed basis during the summer months and at times of unseasonably warm or dry spring and fall weather when the station has historically operated at higher levels.

Circulating water used to cool and condense steam from the generating process is discharged to the UDIP. The Station discharges wastewater in accordance with NPDES Permit No. IL000064254, which was issued by IEPA 30 September 2014. (Ex. J) A permit renewal application was submitted to IEPA in April 2019. The thermal discharge from Joliet 29 is designated in the NPDES Permit as Outfall 001.

2. Summary Information on Temperature of Discharge to Receiving Waters in Narrative Form

To assess the actual effects of the Joliet Stations' thermal discharges, Appendix D of the Demonstration Report reviews thermal intake and discharge data covering the period from 2012-2017.

i. Joliet Station 9

Per the summer discharge data for Joliet Station 9, the mean summer discharge temperatures for the 2012-2017 period of record were all below 90°F, with the highest monthly means occurring in July (84.4°F) and August (84.5°F). The highest summer discharge temperatures were encountered during July, with a median (50th percentile) temperature of 84.6°F and upper 10th percentile temperatures at or above 92.9°F. The maximum measured July discharge temperature was 100°F. The upper 10th percentile August discharge temperatures were at or above 92.7°F, with a maximum measured temperature of 98.1°F. In June and September, the upper 10th percentile temperatures were at or above 86.4°F and 90.0°F, respectively, with measured maximums of 96.2°F and 97.8°F, respectively.

The mean winter discharge temperatures at Joliet Station 9 for the 2012-2017 period of record were all below 60°F. The highest monthly means occurred in February (50.8°F) and March (53.6°F). The highest intake and discharge temperatures during the 2012-2017 period were typically encountered in either December or March. Intake temperatures were greater than

60°F for up to 5% of the time. Discharge temperatures during the months of December and March exceeded 60°F for more than 10% of the time, with measured maximums of 80.8°F and 70.0°F, respectively. Even during the consistently colder months of January and February, discharge temperatures exceeded 60°F for up to 5% of the time, with a maximum of 68.2°F in February. This range of Joliet Station 9 winter discharge temperatures is reflective of a combination of non-seasonal weather conditions, low LDPR flow, and higher winter power demand.

ii. Joliet Station 29 [9]

Per the summer discharge temperature data for Joliet Station 29, the highest summer discharge temperatures were encountered during July with a median (50th percentile) temperature of 86.6°F and upper 10th percentile temperatures at or above 97.4°F. The upper 10th percentile August discharge temperatures were at or above 93.9°F. The maximum measured temperatures (measured at the end-of-pipe and not at the edge of the mixing zone point of compliance) for both months were 105.5°F and 105.0°F, respectively. In June and September, the upper 10th percentile temperatures were at or above 90.2°F and 91.7°F, respectively, with maximum measured temperatures of 102.3°F and 103.5°F, respectively. The mean summer discharge temperatures for the 2012-2017 period of record were all below 90°F, with the highest monthly means occurring during the months of July (86.9°F) and August (85.6°F).

The mean winter Joliet Station 29 discharge temperatures for the 2012-2017 period of record were all below 60°F, with the highest monthly means occurring in December (51.1°F) and March (54.1°F). The highest Joliet Station 29 intake and discharge temperatures during the winter 2012-2017 period were typically encountered in either December or March. Intake temperatures during the months of December and March exceeded 60°F for up to 5% of the time, with measured maximums 66.3°F and 69.5°F, respectively. Discharge temperatures

[9] This narrative description of discharge temperature does not account for any supplemental cooling tower use. All referenced Joliet 29 data represent measured end-of-pipe temperatures and therefore provide conservative estimates of compliance point temperatures under most conditions. However, mechanical issues and/or adverse dew point conditions can negatively affect cooling tower performance during critical periods, so it is not excessively conservative to look at end-of-pipe temperatures as a valid means of assessing potential thermal impact under unfavorable conditions. What's more, the cooling towers cannot be used during winter conditions, and so they can have no impact on winter discharge temperatures that would need to be accounted for.

for December and March were above 60°F up to 15% of the time and reached measured maximums of 80.5°F and 69.1°F, respectively. Even during the consistently colder months of January and February, discharge temperatures exceeded 60°F for up to 1% of the time, with maximum measured values of 67.5°F and 64.6°F, respectively. This range of Joliet Station 29 winter discharge temperatures is reflective of a combination of non-seasonal weather conditions, low UDIP flow, and higher winter power demand.

C. Summary of Compliance or Non-Compliance with Thermal Requirements at the Joliet Stations in the Last 5 years. (Section 106.1130(c).)

For thermal discharges, based on the existing thermal water quality standards and IEPA's approval of an allowed mixing zone for thermal discharges, each Station's NPDES Permit provides that at the edge of the allowed 26-acre mixing zone, temperatures shall not exceed 93°F (34°C) more than 5% of the time, or 100°F (37.8°C) at any time. (Ex. I at p.12 & Ex. J at p. 11) For compliance-monitoring purposes, MWGen uses an IEPA-approved Near-Field Thermal Model to determine the temperature of the UDIP at the boundary of each Station's 26-acre mixing zone.[10] (Id.) The Near-Field Thermal Model utilizes real-time station operating data and 24-hour average antecedent flow to calculate fully mixed temperatures in the main body of the waterway. (See Ex. A, at Appendix D, Exhibit D-1a.) The results produced by the Near-Field Thermal Model have been demonstrated to be equivalent to the approximate edge of the allowed 26-acre mixing zone for each of the Joliet Stations.

Under Special Conditions 4.B and 4.C of each Station's NPDES Permit, the thermal discharge is also subject to the far-field alternate temperature limitations that are applicable in the main channel of the Lower Des Plaines River at the I-55 Bridge, where the General Use designation for these downstream waters begins. (Ex. I, at p. 12 & Ex. J, at p. 11)

Each of the Joliet Stations has complied with the existing thermal discharge limitations and conditions in their respective NPDES Permits for the last five years (2015-2019).

[10] The Joliet Station Near-Field Thermal Model was patterned after IEPA's Illinois Point Source Strategy for Waste Load Allocation document dated January 17, 1991. Both Joliet Stations' NPDES permits contain a "Special Condition 4.D.1" requiring the use of the station-specific models for the prediction of downstream river temperatures at the edge of the mixing zone and for monitoring of the use of excursion hours.

D. Detailed Plan of Study Submitted to the Agency under Section 106.1120(a) and the Agency's Written Response under Section 106.1120(f).

As stated above, DSPs in support of thermal demonstrations for the Joliet Stations were developed and submitted to both the IEPA and the IDNR on December 4, 2015. The Agency approved the DSPs in written correspondence dated March 6, 2016. (Ex. B) IDNR raised questions regarding the plan in an email dated March 7, 2015. On April 19, 2016, representatives from MWGen and IDNR participated in a conference call to discuss IDNR's comments. MWGen addressed those questions to IDNR's satisfaction, resulting in IDNR approval, by email dated June 8, 2016. This email chain is attached as Exhibit C, and the attachment referenced in those emails is Exhibit C.1.

E. The Results of the Studies Conducted under the Detailed Plans of Study. (Section 106.1120(e).)

The Joliet Thermal Demonstration Report included with this Petition as Exhibit A is a voluminous report that presents the detailed information, data and findings supporting the requested thermal AEL. It is based on over 40 years of monitoring and analyses of the fauna and ecosystems associated with the UDIP and Five-Mile Stretch. The Demonstration Report presents both prospective (Appendix B) and retrospective (Appendix C) analyses which show that the proposed thermal AELs will assure the protection and propagation of a BIC. It provides the required demonstration, meeting the requirements of the Subpart K regulations and the § 316(a) criteria, as outlined in the U.S. EPA's *Interagency 316(a) Technical Guidance Manual and Guide for Thermal Effects Section of Nuclear Facilities Environmental Impact Statements* (Draft; May 1, 1977), that considering the impact of the Joliet Stations' thermal discharges, both individually and cumulatively with all other significant impacts on the species affected:

> (a) the generally applicable thermal water quality standard is more stringent than necessary to assure the protection and propagation of a balanced and indigenous community of shellfish, fish, and wildlife in and on the receiving water; and
>
> (b) the requested alternative thermal effluent limitation assures the protection and propagation of a balanced and indigenous population of shellfish, fish, and wildlife in the receiving water.

The Demonstration Report begins with a summary of all the information presented. Appendix A describes the UDIP and Five-Mile Stretch in detail, while Appendices B and C respectively provide the above-described prospective and retrospective assessments. Appendix D details both the historical and current operations at the Joliet Stations and recent hydrothermal modeling analysis of the two station discharges, including thermal plume studies performed in the summer and winter of 2017. Appendix E reviews the various Joliet Stations 9 and 29 data collection programs which are referenced throughout this Demonstration. Appendices F, G, and H present the most recent annual fisheries monitoring reports covering the UDIP and Five-Mile Stretch from 2016, 2017, and 2018, respectively. These reports contain a comprehensive assessment of the LDPR fish community over time. Appendix I includes the prior thermal plume studies performed at the Joliet Stations in 2002 and 2012, along with related documentation. Appendix J provides a detailed summary of the fisheries data collected in the UDIP near the Joliet Stations in 2017 and 2018, post Joliet Stations 9 and 29 gas conversion during both summer and winter periods. Appendix K presents the results of the habitat and submerged aquatic vegetation (SAV) surveys performed during the years 2016-2018. Appendix L contains the results of benthic macroinvertebrate surveys that were conducted in the UDIP in 2017 and 2018.

As required by Subsections 106.1120(e)(1)-(4) of the Subpart K Regulations, the results of the studies conducted under the DSPs are presented below. Additionally, a draft of the Joliet Station Demonstration Report was provided to IEPA for review on October 3, 2019. All comments received from the Agency were addressed and have been incorporated into the final document included with this Petition.

1. Background on Proposed Thermal Standards for the UDIP

The UDIP, which is the receiving stream for the Joliet Stations' thermal discharge, was formerly designated as a Secondary Contact and Indigenous Aquatic Life Water ("Secondary Contact Waters") under the Illinois use designation system in 35 Ill. Adm. Code Part 303. Due to the inherent limitations of the CAWS, of which the UDIP forms a part, these Secondary Contact Waters were regulated by a set of water quality limitations that were less stringent than the General Use water quality standards that applied to most waters of the state. The waterway is heavily influenced by hydromodification, channelization, alterations in flow, wastewater

discharges, and other factors that limit the kinds of aquatic life that can be maintained there. (Ex. A, Appendix A.)

Since the adoption of the Secondary Contact Waters designation in the 1970s, water quality improved over the years as the result of point source discharge controls, including wastewater control technology advances by publicly owned treatment works. These improvements generated interest in revising the applicable designated uses and standards. In 2007, the Agency presented two use attainability analyses (UAAs) to the Board and submitted that these studies indicated that the UDIP and other portions of the CAWS had attained, or had the potential to attain, higher designated recreational and aquatic life uses under the Clean Water Act than those provided by the Secondary Contact Waters designation. (The Five-Mile Stretch was not one of the waters considered as part of this process because it already was designated as a General Use water.)

The ensuing Board rulemaking, initiated on October 26, 2007, lasted several years. Ultimately, the Board redesignated the UDIP from a Secondary Contact Water to an "Upper Dresden Island Pool Use" or "UDIP Use" water. This designation is defined in the regulations as follows:

> Lower Des Plaines River from the Brandon Road Lock and Dam to the Interstate 55 bridge is designated as the Upper Dresden Island Pool Aquatic Life Use. These waters are capable of maintaining, and shall have quality sufficient to protect, aquatic-life populations consisting of individuals of tolerant, intermediately tolerant, and intolerant types that are adaptive to the unique flow conditions necessary to maintain navigational use and upstream flood control functions of the waterway system. Such aquatic life may include, but is not limited to, largemouth bass, bluntnose minnow, channel catfish, orangespotted sunfish, smallmouth bass, shorthead redhorse, and spottail shiner.

35 Ill. Adm. Code 303.230.

In Subdocket D of the CAWS UAA Rulemaking, the Board concluded that the UDIP Use waters should have thermal water quality standards identical to those found in General Use waters. The Board recognized that some thermal dischargers would need to seek additional relief from these thermal standards and noted that relief mechanisms such as the pursuit of alternate thermal effluent limitations were available. To allow dischargers like MWGen to pursue that relief, the Board delayed application of the thermal standards until three years after the 2015

effective date of the CAWS UAA Rulemaking. *See in the Matter of: Water Quality Standards and Effluent Limitations for the Chicago Area Waterway System and Lower Des Plaines River: Proposed Amendments to 35 Ill. Adm. Code 301, 302, 303, and 304,* PCB R08-9(D), slip op. at 77 (Mar. 19, 2015). Thus, the Board adopted the following temperature standards for the UDIP that are on par with the most stringent thermal standards in the state:

Section 302.408 Temperature

b) The temperature standards in subsections (c) through (i) will become applicable beginning July 1, 2018. Starting July 1, 2015, the waters designated at 35 Ill. Adm. Code 303 as Chicago Area Waterway System Aquatic Life Use A, Chicago Area Waterway System and Brandon Pool Aquatic Life Use B, and Upper Dresden Island Pool Aquatic Life Use will not exceed temperature (STORET number (ºF) 00011 and (ºC) 00010) of 34ºC (93ºF) more than 5% of the time, or 37.8ºC (100ºF) at any time.

c) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.

d) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.

e) The maximum temperature rise above natural temperatures shall not exceed 2.8ºC (5ºF).

f) Water temperature at representative locations in the main river shall not exceed the maximum limits in the applicable table in subsections (g), (h) and (i), 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 exceed the maximum limits in the applicable table that follows by more than 1.7ºC (3.0ºF)

g) [*Subsection (g) contains the water temperature standards for "Aquatic Life Use A" waters (35 Ill. Adm. Code 303.235) which are not applicable to the UDIP or the Five Mile Stretch*]

h) [*Subsection (h) contains the water temperature standards for "Aquatic Life Use B" waters (35 Ill. Adm. Code 303.240) which are not applicable to the UDIP or Five-Mile Stretch*]

i) Water temperature for the Upper Dresden Island Pool Aquatic Life Use waters, as defined in 35 Ill. Adm. Code 303.230, shall not exceed the limits in the following table in accordance with subsection (f):

Months	Daily Maximum (°F)
January	60
February	60
March	60
April	90
May	90
June	90
July	90
August	90
September	90
October	90
November	90
December	60

(Source: Amended at 39 Ill. Reg. 9388, effective July 1, 2015)[11]

Because the Joliet Stations' NPDES permits each provide for an allowed mixing zone for the thermal discharge, their thermal discharges are also subject to the requirement in 35 Ill. Adm. Code 302.102(b)(6) that the allowed mixing zone must provide for "a zone of passage for aquatic life in which [thermal] water quality standards are met." Section 302.102(b)(8) mandates that the area and volume in which mixing occurs "must not contain more than 25% of the cross-sectional area or volume of flow of a stream except for those streams for which the dilution ratio is less than 3:1." In other words, a zone of passage of 75% or more of the cross-sectional area

[11] The Board set an "Effective Date" for these standards of July 1, 2015 but delayed "applicability" of those standards until July 1, 2018. However, on February 24, 2017, Governor Rauner signed legislation (Public Act 99-937) amending the Act to authorize the Board to issue Time-Limited Water Quality Standards (TLWQS's). If a discharger applies for a TLWQS from the water quality standard in their receiving waters then, under certain conditions, the standard will be stayed while the Board resolves the petition. *See* 415 ILCS 5/38.5(h). At the time the standards in Section 302.408 became "applicable," MWGen's discharges were subject to a TLWQS stay, based on a Section 35 variance petition that MWGen filed on July 1, 2015, and then was converted into a TLWQS petition by operation of law on February 27, 2017. As of the filing date of this petition, that stay remains active. *See* PCB 16-19.

of the waterway must be maintained. When the UDIP's dilution ratio drops below 3:1, a smaller zone of passage of 50% or more of the cross-sectional area of the waterway is allowed. *Id.*

The Joliet Stations remain in full compliance with the interim temperature standards imposed by Section 302.408(b). Further, based on the hydrothermal modeling results presented in the Joliet Stations Demonstration Report, under typical winter weather and canal flow conditions, the Joliet Stations could nominally meet the new 2018 Thermal Standards. However, during extreme summer weather conditions, which occur most often in July and August (but can also occur during the other two summer months), review of the historical data, as well as the results of the summer thermal hydrothermal analysis discussed herein, indicate that the Joliet Station 9 and 29 thermal discharges would be unable to consistently meet the 2018 Thermal Standard numeric summer limit of 90°F nor the 93°F maximum limit in the UDIP. The results also show that these discharges would not consistently meet the General Use Standard's summer numeric limit of 90°F nor the 93°F maximum limit in the Five-Mile Stretch.

Moreover, the small number of allowable excursion hours (1% of the hours in any 12-month period, equivalent to approximately 87 hours per year) provided by the 2018 Thermal Standards and the General Use Thermal Standards are entirely insufficient to support Joliet Station 9 or 29 operations during both the summer and winter months, especially if unseasonal weather patterns and/or low flow conditions persisted during any given year.

However, based on review of historical operating and flow data, it can be expected that a 75% or greater zone of passage under the proposed maximum thermal AELs would continue to be available in the UDIP near Joliet Stations 9 and 29, even under the worst-case modeled conditions. Erratic flows in the waterway can result in the dilution ratio dropping below 3:1, and the Demonstration Report shows that the Joliet Stations would be able to comply with the lower 50% zone-of-passage requirement during that time. Therefore, based on hydrothermal modeling results, both Joliet Stations' thermal discharges would be able to meet the existing zone of passage criteria in place under the proposed near-field thermal AELs.

The following chart compares the proposed UDIP Thermal AELs with the 2018 UDIP Thermal Standards and the currently enforced interim thermal standards:

Month	Prior Secondary Contact Standards & Interim 35 IAC § 302.408(b) Standards (effective 1 July 2015-30 June 2018)	2018 UDIP Use Thermal Standards (Applicable July 1, 2018)***	Proposed UDIP Thermal AELs
	Daily Maximum	Daily Maximum	Daily Maximum
	(°F)	(°F)	(°F)
January	93	60	70
February	93	60	70
March	93	60	75
April	93	90	80
May	93	90	85
June	93	90	93
July	93	90	93
August	93	90	93
September	93	90	93
October	93	90	90
November	93	90	85
December	93	60	75
Excursion Hours	Shall not exceed 93°F more than 5% of the time, or 100°F at any time	Shall not exceed maximum limits during more than 1% of the hours in the 12-month period ending with any month; At no time shall water temperature exceed the maximum limits by more than 3.0°F[12]	Daily maximum not to be exceeded by more than 5% of the time in a calendar year;[13] at no time shall water temperature exceed the maximum limits by more than 3°F

[12] 35 Ill. Adm. Code 302.408 expresses the maximum limit as "3.0°F". This phrasing is different from otherwise similar language in the General Use thermal standard in 302.211(e), which expresses the maximum excursion limit range as "3°F": "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)." Because the 2018 ALU B thermal standards were intended to be consistent with the General Use thermal standards, the AEL maximum excursion temperature proposed in this

***In addition to the numeric limits, the UDIP Use standards also have the following narrative requirements:

(c) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.

(d) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.

(e) The maximum temperature rise above natural temperatures shall not exceed 5°F (2.8°C).

The Joliet Stations Demonstration Report shows that there is no evidence that operation of the Joliet Stations in accordance with the former Secondary Contact Waters thermal limits, nor the identical current interim thermal limits, have caused appreciable harm to a BIC in the UDIP/Five-Mile Stretch. The numeric thermal AELs proposed for the Joliet Stations in this petition are more stringent than the prior Secondary Contact and Indigenous Aquatic Life limits and logically should also not result in appreciable harm. The Joliet Stations Demonstration Report data and analysis demonstrates that the UDIP/Five-Mile Stretch BIC will be protected under the proposed thermal AELs. Furthermore, the Report shows that the UDIP/Five-Mile Stretch has been adequately protected by water standards using numeric criteria exclusively. Accordingly, the proposed thermal UDIP AEL does not include narrative criteria.

The Board recently approved a thermal AEL for MWGen's Will County Generating Station, located eleven miles upstream. In its Subpart K Petition for the Will County Station, MWGen conducted retrospective studies showing that the Secondary Contact and Indigenous Aquatic Life limits had not caused appreciable harm to that Station's receiving waters, the CSSC. Granting the petition, the Board agreed that an AEL will generally be appropriate

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petition is also "3°F". In adopting alternative effluent limits for the Will County Generating Station, the Board also expressed the three-degree excursion limit as "3°F". See *Midwest Generation, LLC v. IEPA*, PCB 18-58, p.74 (Nov. 7, 2019).

[13] The proposed UDIP AEL would track the use of excursion hours on a calendar-year basis, rather than the rolling 12-month period described in the 2018 Thermal Standards. Allowing for calendar-year accounting is consistent with AELs previously issued by the Board, including for the MWGen Will County Station. *See* Exelon Generation (Quad Cities Station) v. IEPA, PCB 14-123, slip op. at 48, 54 (Sept. 18, 2014); *Midwest Generation, LLC v. IEPA*, PCB 18-58, p.71 (Nov. 7, 2019)

when it represents a tightening of historical thermal standards that were shown to be protective of the waterway's BIC:

> MWG's Type I Retrospective Demonstration reviewed 23 years of monitoring data in the CSSC near [Will County Station], both upstream and downstream. That period captured a range of conditions. Not only did the less-stringent water quality standards apply under Secondary Contact and Indigenous Aquatic Life Use, but the CSSC was subject to greater thermal loading from all four [Will County Station generating] units, as well as from the Fisk and Crawford generating units. Now, [Will County Station] operates one unit and Fisk and Crawford have been shut down. Despite the significant changes in thermal loading over the years, the demonstration shows that the aquatic community has not displayed statistically significant changes in abundance, richness, or diversity in fish species or nuisance species. The key factors limiting the aquatic community throughout this period have been navigation, CSOs, and physical conditions of the Lockport Pool and CSSC.

Midwest Generation, LLC v. IEPA, PCB 18-58, p.71 (Nov. 7, 2019) (internal citations omitted).

2. Background on Proposed Thermal Standards for the Five-Mile Stretch

In 1996, Commonwealth Edison ("ComEd"), the previous owner of the Joliet Stations, sought an adjusted thermal standard pursuant to 35 Ill. Adm. Code 304.141(c) and CWA § 316(a). The requested relief was granted by the Board in 1996 pursuant to Section 28.1(c) of the Act. *See* AS 96-10, dated October 3, 1996 (amended March 16, 2000). The Board granted the adjusted thermal standards after ComEd "presented adequate proof" that the impact of its facilities on water temperatures past the I-55 Bridge did not cause nor could be reasonably expected to cause significant ecological damage to the waters of the Five-Mile Stretch. See Opinion and Order of the Board in AS 96-10, at 7 (Oct. 3, 1996); *see also* Response of the Illinois EPA in AS 96-10 (filed Aug. 9, 1996).

The adjusted standards provisions of Section 28.1 apply to all Illinois environmental regulations of general applicability, not just water regulations. The Joliet Demonstration Report establishes that, in addition to meeting the evidentiary burden for an adjusted standard, MWGen is able to establish the appropriateness of alternative thermal limitations under the Subpart K Regulations as well. The Subpart K Regulations are specific to dischargers of heated effluent. The far-field AELs proposed in the Thermal Demonstration Report would result in temperature

standards that are more stringent than the AS 96-10 Standards that currently govern the waterway:

Month	General Use Thermal Standard (35 Ill. Admin Code 302.211(e)) (°F)	Existing I-55/AS 96-10 Limit (°F)	Proposed Far-Field Alternative Effluent Limit (°F)[14]
January	60	60	60
February	60	60	60
March	60	65	65
April 1-15	90	73	**73**
April 16-30	90	80	
May 1-15	90	85	**85**
May 16-31	90	90	
June 1-15	90	90	**90**
June 16-30	90	91	
July	90	91	91
August	90	91	91
September	90	90	90
October	90	85	85
November	90	75	75
December	60	65	65
Excursion Hours	Water temperature at representative locations in the main river shall not exceed the maximum limits during more 1% of the hours in the 12-month period ending with any month. Moreover, at no time shall the water temperature exceed the maximum by more than 1.7°C (3.0°F)	These standards are in lieu of the requirements of 35 Ill. Adm. Code 302.211(c), (d) and (e) and may be exceeded by no more than 3°F during 2% of the hours in the 12-month period ending December 31, except that at no time shall the MWGen Joliet 9 and/or Joliet 29 plants cause the temperature at the I-55 Bridge to exceed 93°F	These standards are in lieu of the requirements of 35 Ill. Adm. Code 302.211(c), (d) and (e) and may be exceeded by no more than 3°F during 2% of the hours in the 12-month period ending December 31, except that at no time shall the MWGen Joliet 9 and/or Joliet 29 plants cause the temperature at the I-55 Bridge to exceed 93°F

These seasonally-based far-field thermal AELs would, in effect, replace both the existing AS96-10 limits and the Stations' obligation to comply with the existing General Use thermal

[14] MWGen further proposes that the split-month limitations for April, May, and June be turned into monthly limits by applying the lower value for each of these months, as shown in the table in bold, underscored type.

standards that would otherwise be effective at and below the I-55 Bridge (specifically, Sections 302.211 (b), (c), (d), and (e) of Ill. Adm. Code Title 35, Subtitle C, Chapter I).

3. Methods and Conclusions of Retrospective Studies

The Demonstration Report uses a retrospective analysis of aquatic community monitoring data collected during the Joliet Stations' operations over the past 20-plus years. This extensive biological database was collected during a period when the less-stringent Secondary Contact Waters standards applied. The data analyzed includes data collected in the vicinity of the Joliet Stations during prior, "base-load" operations and under current, "peaker" operations.

The retrospective evaluation was conducted in two parts. First, the condition of each biotic category as a whole was analyzed by comparing available information on its abundance and species composition to what would be expected based on existing habitat, flow, and chemical characteristics of the UDIP and Five-Mile Stretch. Second, the long-term trends abundance for each of the biotic categories within the UDIP/Five-Mile Stretch BIC were analyzed to determine whether a change in population abundance has occurred that can be attributed to the operation of Joliet Stations. (See Ex. A, Appendix C.) Taken together, the biotic category and long-term trend analyses provide a thorough and technically sound assessment of the status of the biological community in the UDIP and Five-Mile Stretch, consistent with § 316(a) guidance and practice.

The aquatic community protected by § 316(a) includes different biotic categories including phytoplankton, habitat formers, zooplankton, mussels and macroinvertebrates, fish, and other vertebrate wildlife. The Joliet Stations Detailed Study Plans, like many § 316(a) studies before them, proposed focusing on the local fish community. The Illinois EPA provided input on and approved this approach. Focusing on fish is practical and is based on the reasonable assumption that significant disruption at lower trophic levels will be reflected in the fish community that relies on those biotic communities for food. Nonetheless, the Demonstration Report collects and summarizes available data on all of the biotic categories, providing individual summaries of each. (Id.)

Based on the years of studies, data, and other information evaluated for the different biotic categories of the UDIP/Five-Mile Stretch aquatic community, the Demonstration Report reaches several conclusions:

1. There have been no substantial increases in abundance or distribution of any nuisance species or heat-tolerant community;
2. There have been no substantial decreases of formerly abundant indigenous species other than nuisance species;
3. There had been no elimination of an established potential economic or recreational use of the waters;
4. There have been no reductions in the successful completion of life cycles of indigenous species, including those of migratory species;
5. There have been no substantial reductions of community heterogeneity or trophic structure;
6. There have been no adverse impacts on threatened or endangered species;
7. There has been no destruction of a unique or rare habitat; and
8. There have been no detrimental interactions with other pollutants, discharges, or water-use activities.

The Joliet Demonstration Studies took longer than originally anticipated so that MWGen could collect biological monitoring data for the UDIP during "peaker" operations at the Joliet Stations. The segment-based UDIP electrofishing results from May through September 2017 and 2018 are consistent with findings from the pre-peaker historical studies (conducted between 1994 and 2016). This substantiates the conclusion that mean summertime water temperatures have not influenced catch results within the UDIP on a consistent basis among the past 24 years. Similarly, the results of electrofishing conducted during winter months during this period, demonstrate that water temperature is not the primary limiting factor to the UDIP fish community. (Ex. A, Summary Report, at pp. "6-15" to "6-17".)

4. Methods and Conclusions of Predictive Studies

MWGen has also prepared a predictive assessment using the MIKE3 model outputs to characterize and predict resultant hydrothermal conditions in the UDIP downstream of the Joliet Stations' thermal discharges under on both typical and worst-case scenarios based on real-world data (Ex. A, Appendix D). The MIKE 3-predicted thermal plume dimensions and distribution in the UDIP were compared to available biothermal metric data related to survival,

avoidance, spawning, and growth of fish. This assessment evaluated the predicted effects of the Joliet Stations' thermal plume temperatures on the aquatic community represented by ten selected representative species under three summer period scenarios, including worst-case, typical, and typical low flow, paired with corresponding projected station operational data.

The maximum surface temperature near the theoretical edge of the allowable mixing zones of the Joliet Stations under the "worst-case" scenario was approximately 96°F, which is the maximum compliance temperature requested by MWGen as part of the proposed near-field summer thermal AEL. Based on continuous temperatures from 2012-2017 recorded at the Joliet Stations' thermal discharges and historical operating data, temperatures of the magnitude approaching those modeled for the "worst-case" scenario are expected in July and August no more than 10% of the time over a 6-year period. Discharge temperatures exceeding 93°F (33.9°C) can be expected up to a maximum of 20% of the time from June through September, based upon actual data from 2012-2017. It is, however, important to note that on an annual basis, the Joliet Stations' discharge temperatures have not exceeded 93°F for more than 5% of the time.

The summer worst-case scenario results demonstrate that neither Joliet Station could consistently meet the numerical and narrative criteria required by the 2018 Thermal Standards for the UDIP. The narrative criteria include the "5°F above natural" requirement, which is difficult to apply in a regulated and anthropogenically influenced waterway such as the LDPR. However, the model results indicate that both Joliet Stations would be able to meet less stringent thermal limitations which are proposed as part of this Demonstration. These alternative limitations would still provide adequate protection of the UDIP/Five-Mile Stretch BIC. Under more typical, favorable weather and river flow conditions, both Joliet Stations would be able to meet the UDIP numeric limits, but the Stations would not be able to consistently meet the narrative portions.

Modeling results also indicate that a major portion of the UDIP cross-sections between the Joliet Stations' thermal discharges and the downstream model extent (I-55 Bridge) maintain temperatures fully adequate to support biological communities under both typical and more adverse flow and summer weather conditions while continuing to provide an adequate zone of passage for aquatic life (Ex. A, Appendix B). Moreover, support of the biological communities is maintained with edge of mixing zone temperatures that are above the 2018 Thermal Standards imposed by 35 Ill. Adm. Code 302.408.

Modeling of winter conditions showed a similar pattern: Thermal discharges that comply with UDIP and General Use numerical thermal limits most of the time, but that fail to comply under worst-case scenarios. The modeling results, along with the actual historical data record, confirm that when adverse flow conditions coincide with unseasonal winter weather, neither Joliet Station 9 nor Joliet Station 29 would be able to consistently meet the UDIP winter thermal limit of 60°F at the edge of their respective mixing zones, even with the allowed 3°F excursion for up to 1% of the hours in any 12-month period. (Id. at Appendix D).

In addition to assessing the need for an AEL, the Joliet Stations Demonstration Report also utilizes predictive studies to assess whether the proposed AELs will "assure the protection and propagation of a balanced, indigenous, community of shellfish, fish, and wildlife." This approach uses quantitative hydrothermal modeling to predict thermal conditions under various operating and ambient flow conditions, integrated with metrics of thermal requirements and tolerance limits identified in scientific literature for selected aquatic species representative of the BIC. This prospective analysis is used to predict the response of the aquatic community and receiving water body to the Joliet Stations' thermal discharge plumes.

Collectively, the hydrothermal model and predictive analysis were integrated with representative important species ("RIS") life history requirements to develop proposed monthly AELs that are protective of the UDIP/Five-Mile Stretch BIC. The RIS, selected using the criteria found in the U.S. EPA's 1977 Draft 316(a) Guidance Manual, were River Redhorse (*Moxostoma carinatum*), White Sucker (*Catostomus commersonii*); Gizzard Shad (*Dorosoma cepedianum*), Bluntnose Minnow (*Pimephales notatus*), Banded Killifish (*Fundulus diaphanous menona*), Common Carp (*Cyprinus carpio*), Channel Catfish (*Ictalurus punctatus*), Largemouth Bass (*Micropterus salmoides*); Bluegill (*Lepomis macrochirus*); Freshwater Drum (*Aplodinotus grunniens*).[15] (Ex. A, Appendix B.) The model was calibrated and validated for the seasonal conditions using a recent bathymetric survey and field surveys of water temperature under various canal flow and weather conditions conducted during 2011, 2016 and early 2017. (Id. at

[15] This was identical to the RIS list contained in the Detailed Study Plans approved by the Agency. It also was presented to the U.S. EPA during the November 2016 consultation with the Agencies concerning the modifications to the Detailed Study Plan. It bears mentioning the Joliet Stations' RIS list covers three more species than the seven that were studied in the Will County Station Thermal Demonstration. *See Midwest Generation, LLC v. IEPA*, PCB 18-58, p.38-39 (Nov. 7, 2019) (internal citations omitted).

Appendix D.) The calibrated model was used to estimate water temperature within each model cell under various ambient flow and station operating scenarios by simulating dilution and dispersion of elevated thermal plume temperatures. (Id.) Model-estimated cross-section and bottom water temperatures are compared to biothermal metrics to estimate the extent of otherwise available aquatic habitat that would be excluded or would be at less than optimum conditions for selected life history functions (*e.g.*, spawning, growth, and survival) of RIS due to water temperature, while still allowing for an adequate zone of passage.

The data reviewed for the predictive assessment demonstrate that the Joliet Station 9 and 29 thermal discharges would not have an adverse effect on spawning and early development of the RIS that could potentially utilize habitat in the UDIP and the Five Mile Stretch; water temperatures acceptable for these activities would be available outside of the Joliet Station 9 and 29 allowable mixing zones under typical temperature scenarios throughout most of the spawning period of these species. In addition, no unique or critical habitat for spawning and early development of RIS or threatened/endangered species exists in the UDIP or Five-Mile Stretch.

5. Potential for Cold Shock Mortality

The Demonstration Report also assessed the potential for "cold shock" mortality. (Id. at Appendix B, p. B-44.) Cold shock occurs when fish become acclimated to an elevated waterway temperature during winter months, but a sudden termination of the heat source causes a rapid drop in temperatures that can, in extreme circumstances, result in fish kills. The magnitude of the change in temperature is important, but the driving factor in whether that change will harm the aquatic community is the acclimation temperature. At ambient temperatures exceeding 45°F, cold shock typically does not occur, regardless of the magnitude of the change.[16]

In the case of the Joliet Stations, mean winter ambient temperatures are normally between 40.6°F and 48.1°F, with maximums from 52.2 to 72°F (2012-2017 period of record). These are higher temperatures than what would occur naturally, because the source of much of the UDIP flow is treated wastewater contributed from upstream sources during the winter. Furthermore, the decay of the near-field thermal plume of each Station's discharge is not extremely rapid after

[16] Brungs, W. and B. Jones. *Temperature criteria for freshwater fish: protocol and procedures*. EPA Ecological Research Series: EPA-600/3-77-061 (1977).

a shutdown in operations. There is residual heat in the system following a shutdown, such that temperatures of the discharge will remain elevated for a period of time as the "tripped" station's circulating water pumps generally continue to operate as the equipment is cooled. Therefore, the decline in temperature of the near-field plume is relatively gradual (hours versus minutes) in the event of a shutdown. For these reasons, historically, the Joliet Stations have not caused cold shock in the UDIP/Five-Mile Stretch, and cold shock is not expected to be an issue or concern for the UDIP/Five-Mile Stretch BIC in the future.

F. Overall Thermal Demonstration Conclusions

The retrospective assessment shows that there have been no substantial changes in abundance of nuisance species or in the physical and biological components of the ecology of the UDIP/Five-Mile Stretch during the past 24 years of biological monitoring data collected in these waterways. During most of those 24 years, the UDIP was subject to thermal standards that were significantly less stringent than both the 2018 Thermal Standards and the standards contained in the proposed AEL. And during that time, both the UDIP and the Five-Mile Stretch were subject to significantly more thermal loading from upstream sources like the Crawford and Fisk Generating Stations (both inactive since 2012), and the Will County Station (which by 2015 had dropped to 551 MW of generating capacity from an original design maximum of 1,163 MW) What's more, the Joliet Stations have converted from "base load" operations to "peaker" operations, creating a dramatic drop in annual thermal loading as the Stations now spend long stretches of time offline during suboptimal market conditions.

Even with these large, sustained, reductions in thermal loading, the waterway continues to be dominated by tolerant and highly tolerant species suited to the subpar ecological conditions found in the UDIP and Five Mile Stretch. Though these waterbodies can be warmer than "natural" waterways, the temperatures found there are not limiting or harming the UDIP/Five-Mile Stretch BIC. Thus, this BIC can be adequately protected by the AELs proposed in this Petition, and applying the narrative thermal criteria like those in 35 Ill. Admin. Code 302.211(b)-(d) would offer no foreseeable benefit to aquatic life. Accordingly, those narrative standards (and the numeric standards in the 2018 Thermal Standards) are more stringent than necessary.

The predictive assessment also provides reasonable assurance that the proposed numeric AELs will allow for the protection and propagation of the UDIP/Five-Mile Stretch BIC.

The thermal standards in the proposed AEL are designed to maintain temperatures that are consistent with normal patterns of growth for aquatic life in the UDIP/Five-Mile Stretch. The proposed AEL also considers the elevated temperatures that may be reached during "worst-case" scenarios where elevated ambient air and water temperatures coincide with instances of low water flow in the Joliet Stations' receiving waters. The proposed AEL allows for excursion hours so that the Joliet Stations can continue to remain in compliance during these periods of time. The Joliet Thermal Demonstration Report shows that, because the species inhabiting the UDIP/Five-Mile Stretch are generally tolerant and have the ability to sense and avoid areas of water temperatures outside of their preferred range, these temporary instances of increased thermal discharge temperatures will not fundamentally change the habitability of the UDIP or Five-Mile Stretch.

The Joliet Stations Demonstration Report also documents that even during "worst-case" modeled conditions, it can be expected that a 75% or greater zone of passage under the proposed maximum thermal AELs would continue to be available in the UDIP and Five-Mile Stretch.[17] Erratic flows in the waterway can result in the dilution ratio dropping below 3:1, and the Demonstration Report shows that the Joliet Stations would be able to comply with the 50% zone-of-passage requirement during that time. Therefore, based on hydrothermal modeling results, both Joliet Stations' thermal discharges would be able to meet the existing zone of passage criteria in place under the proposed near-field thermal AELs.

G. Additional Information or Studies (Section 106.1130(f))

Each appendix of the Joliet Stations Demonstration Report lists the other studies and guidance documents relied on by that section.

H. Statement of Requested Relief (Section 106.1130(g))

In lieu of the General Use thermal water quality standards contained in 35 Ill. Adm. Code 302.211 and the Upper Dresden Island Pool Use thermal water quality standards provisions contained in 35 Ill. Adm. Code 302.408 (c)-(f), and (i), MWGen respectfully requests that the

[17] Except that normal operations of the Brandon Road Lock and Dam (located upstream from the Joliet Stations and marking the upstream endpoint of the UDIP) present a large-scale, intermittent, physical barrier to upstream passage by motile aquatic life. MWGen has no control over this facility.

Board find that the attached Demonstration Report adequately demonstrates that the following thermal effluent limits will allow for the protection and propagation of a balanced indigenous, community in the UDIP and Five-Mile Stretch:

> (1) Water temperature at representative locations in the UDIP and Five-Mile Stretch shall not exceed the maximum limits listed below for more than 5% of the time in a calendar year. Moreover, at no time shall water temperature exceed the daily maximum limit by more than 1.7ºC (3ºF).
>
> (2) Proposed Near-Field (UDIP) and Far-Field (Five-Mile Stretch) Numeric Thermal Alternative Effluent Limits for Joliet Generating Station 9 and Joliet Generating Station 29:

Month	Proposed Near-Field AELs for Joliet Stations 9 and 29 (°F)	Proposed Far-Field AELs for Joliet Stations 9 and 29 (°F)
January	65	60
February	65	60
March	70	65
April	80	73
May	85	85
June	93	90
July	93	91
August	93	91
September	93	90
October	90	85
November	85	75
December	70	65

> (3) For purposes of this AEL, the "Five-Mile Stretch" refers to the segment of the Lower Des Plaines River running from the I-55 Bridge (River Mile 277.9) to the Illinois River (River Mile 273.0).

The above-proposed near-field thermal alternative effluent limits for the Joliet Stations are effective at the edge of each Station's respective 26-acre mixing zone, as determined for compliance monitoring purposes through the continued use of the Joliet Stations Near-Field Models under the terms of their respective NPDES Permits. As discussed above, these proposed seasonally-based thermal AELs will operate in lieu of the Upper Dresden Island Pool (c), (d), and (e) narrative criteria, which will not apply to the UDIP under the proposed AEL. *See* 35 Ill.

Adm. Code 304.141(c). Similarly, the General Use Standard narrative criteria (35 Ill. Adm. Code 302.211(b)-(d)) will not apply to the Five-Mile Stretch.

IV. CONCLUSION

The Board designated the UDIP as a UDIP Use water because poor habitat quality and quantity and anthropogenically-influenced flows create conditions that "may not fully attain the CWA aquatic use goal." Though the UDIP itself is not a man-made waterway, it is not a "natural" waterway in any conventional sense. Stream flow near the Joliet Stations consists primarily of wastewater effluent from the MWRDGC water reclamation plants upstream. The UDIP remains a channelized and heavily regulated waterbody, so that it can function as a passageway for commercial barge traffic to and from the Chicago metropolitan area. Flow rates are controlled by a series of locks and dams, which act both to facilitate navigation and to provide control during flood events. The UDIP's few areas of suitable aquatic habitat are limited by increasingly excessive aquatic vegetation, which can negatively affect dissolved oxygen levels, as well as limit access/free passage for aquatic life. Continued CSO discharges from upstream sources impact nutrient as well as pathogen levels in the waterway. Advances of aquatic nuisance species in the Upper Illinois Waterway system, unrelated to thermal influences, are prompting a $778 million dollar upgrade to the Brandon Road Lock and Dam to minimize the chances that nuisance species will cause additional ecological damage in upstream waters.

Despite these limitations, the Board ruled that these waters should, as a baseline, face the same, stringent, thermal standards as any natural waterbody. MWGen noted at the time that the Joliet Stations cannot consistently meet those standards. It also presented evidence that, because of those other limiting factors on the waterway, arbitrarily tightening the thermal effluent standards for the UDIP would not produce appreciable ecological benefits.

The Board's response to this was not to reject MWGen's interpretation of the scientific evidence. Instead, it suggested that the generating stations avail themselves of existing regulatory relief procedures. MWGen has followed the Board's direction: In consultation with the Agency, the IDNR, and the U.S. EPA, MWGen (and its consultant, EA Engineering, Science, and Technology, Inc., PBC, a respected environmental consulting firm) developed two DSPs for assessing the effects of various levels of heated loading on the UDIP. It has now executed

those plans. MWGen has also continued to study conditions in the Five-Mile Stretch, even though MWGen is unaware of any claims or concerns that the AS 96-10 Standards are providing inadequate protection of aquatic life in those waters.

The Joliet Demonstration is comprised of a combination of two studies: one a retrospective ("Type I") demonstration of the effects and non-effects of thermal loading on the waterbody and the other a predictive modeling ("Type II") demonstration that studied the three-dimensional movement, accumulation, and dissipation of heat in the UDIP and Five-Mile Stretch. Both studies found that the proposed AEL will allow for the protection and propagation of a BIC in the waterbodies.

The Joliet Demonstration Report (Exhibit A) demonstrates that in the UDIP:

> (a) The generally applicable thermal water quality standard is more stringent than necessary to assure the protection and propagation of a balanced and indigenous population of shellfish, fish, and wildlife in and on the receiving water; and
>
> (b) The requested alternative thermal effluent limitation assures the protection and propagation of a balanced and indigenous population of shellfish, fish, and wildlife in the receiving water.

The Joliet Demonstration Report further demonstrates that in the Five-Mile Stretch:

> (a) The generally applicable thermal water quality standard is more stringent than necessary to assure the protection and propagation of a balanced and indigenous population of shellfish, fish, and wildlife in and on the receiving water; and
>
> (b) The requested alternative thermal effluent limitation (which is more stringent than the adjusted thermal standards currently applicable to the Five-Mile Stretch) assures the protection and propagation of a balanced and indigenous population of shellfish, fish, and wildlife in the receiving water.

Finally, MWGen also respectfully requests that, as part of granting the AELs proposed in this Petition, the Board should exercise its authority pursuant to 35 Ill. Adm. Code 106.1170(c) to order the IEPA to expeditiously modify the Joliet Stations' NPDES permits consistent with the new AELs. *See, e.g.*, *Midwest Generation, LLC v. IEPA*, PCB 18-58, p.71 (Nov. 7, 2019). This modification should include removing the Special Conditions related to AS 96-10, which are effectively superseded by the far-field AEL proposed in this Petition.

Respectfully submitted,

Midwest Generation, LLC

By: /s/Susan M. Franzetti
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