

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

CALPINE CORPORATION)	
(ZION ENERGY CENTER),)	
)	
Petitioner,)	
)	
v.)	PCB 16-112
)	(Variance-Air)
ILLINOIS ENVIRONMENTAL)	
PROTECTION AGENCY,)	
)	
Respondent.)	

NOTICE OF FILING

TO: Office of the Clerk of the Illinois Pollution Control Board James R. Thompson Center 100 West Randolph Street, Suite 11-500 Chicago, Illinois 60601	Division of Legal Counsel Illinois Environmental Protection Agency 1021 North Grand Avenue East P.O. Box 19276 Springfield, Illinois 62794-927
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PLEASE TAKE NOTICE that on the 22nd day of September, 2016, **Petitioner Calpine Corporation (Zion Energy Center)'s Responses to the Illinois Pollution Control Board's September 1, 2016 Questions** with the Office of the Clerk of the Illinois Pollution Control Board.

Respectfully submitted,

CALPINE CORPORATION (ZION
ENERGY CENTER)

By: /s/ Richard M. Saines

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(ZION ENERGY CENTER),)	
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v.)	PCB 16-112
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ILLINOIS ENVIRONMENTAL)	
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**PETITIONER CALPINE CORPORATION (ZION ENERGY CENTER)'S
RESPONSES TO THE ILLINOIS POLLUTION CONTROL BOARD'S SEPTEMBER
1, 2016 QUESTIONS**

Calpine Corporation (Zion Energy Center) (“Calpine” or “Facility”), by and through its attorneys, Baker & McKenzie LLP, respectfully offers the following responses to the questions posed by the Illinois Pollution Control Board (“Board”) in the Hearing Officer's Order dated September 1, 2016 (“Order”). The Order directs Zion Energy Center to respond on or before September 22, 2016. Below, Zion Energy Center sets forth the Board’s question in italics and provides an answer immediately following the question.

Questions

1. *On a map from Illinois EPA's most recent Annual Air Quality Report, show the locations of:*

- *Zion Energy Center;*
- *Illinois EPA's air quality monitoring stations;*
- *Areas currently in nonattainment for SO₂; and*
- *Areas being modeled for future SO₂ area designation recommendations.*

Please find enclosed a map as Exhibit A that includes the location of Zion Energy Center, Illinois EPA’s air quality monitoring stations and areas currently in nonattainment for SO₂. Calpine does not currently have knowledge of or access to areas being modeled for future

SO2 area designation recommendations. This information would need to be provided by Illinois EPA staff.

2. Calpine projects that the distillate oil in the tanks at Zion Energy Center (the facility) will exceed 15 ppm sulfur when the requested variance expires (2021). The Board cannot grant a variance from a regulation without a plan to achieve full compliance before the requested variance expires. Provide a plan for full compliance with 35 Ill. Adm. Code 214.161(b)(2) (the sulfur content rule) without a variance by 2021 in all projected fuel usage scenarios.

The Facility intends to be able to meet the 15 ppm sulfur content requirements by the end of the variance period. This is due to the continual dilution of the distillate oil that would remain in the tank, as each subsequent re-filling of the tank will be with less than or equal to 15 ppm sulfur distillate oil. Once the fuel level and sulfur concentration in the tank are low enough, the tank will be filled with distillate oil less than or equal to 15 ppm sulfur content to achieve full compliance. At this time, the Facility cannot predict with precision what the concentration levels of the distillate oil in the tank will be at the end of the variance period, but it will commit to carefully monitoring such concentration levels and reporting the same. As the end of the variance period gets closer, the Facility will evaluate its options for ensuring compliance, such as purchasing additional distillate oil with less than or equal to 15 ppm sulfur content to bring the average concentration within the limits as described below. At this time, it would be premature to predict the best method for ensuring compliance as such method will depend on the actual concentration in the tank upon the conclusion of the variance period.

The Facility intends to comply with Section 214.161 (b)(2) in a way that is similar to the description for other existing electrical generating units found in Section 214.161 (c) and (d). The Facility has reviewed the most recent long term operating projections for the Facility to determine that compliance by January 1, 2022 is the most realistic date. The Facility will

achieve compliance by January 1, 2022 by implementing the items identified below in conjunction with increased opportunity for operating on distillate oil.

1. From the date of variance issuance, the Permittee shall not purchase distillate oil for combustion in the CTs exceeding 15 ppm sulfur content;
2. From January 1, 2017 through December 31, 2021, the sulfur content of all distillate oil combusted by the CTs shall not exceed 115 ppm sulfur content;
3. On or after January 1, 2022, the sulfur content of all distillate oil combusted by the CTs shall not exceed 15 ppm sulfur content;
4. Work with the Illinois EPA to finalize the construction permit to allow for fuel oil use during OFOs.
5. The Permittee shall maintain records demonstrating compliance with the requirements in this section (1-3), such as records from the fuel supplier indicating the sulfur content of the distillate oil or lab analysis of fuel sulfur content;
6. The Permittee shall submit copies of the records in subsection 4, along with the test results of the sulfur content of the distillate oil by December 31, 2021;
7. Retain the records for at least 5 years, and provide copies of the records to the Agency within 30 days after receipt of a request by the Agency; and
8. Notify the Agency within 30 days after discovery of deviations from any of the requirements in this subsection (1-5). At minimum, and in addition to any permitting obligations, the notification must include a description of the deviations, a discussion of the possible cause of the deviations, any corrective actions taken, and any preventative measures taken.

This schedule will allow the Facility to operate the CTs on distillate oil as market conditions allow and minimize the potential loss that would be incurred due to immediate compliance.

After a series of dilutions have occurred from operation and refill using less than or equal to 15 ppm sulfur distillate oil have lowered the sulfur concentration in the storage tank and there is sufficient tank capacity allows, Calpine will order distillate oil with less than or equal 15 ppm sulfur content in order to dilute down to 15 ppm. As previously stated, it is very difficult to predict when peaking facilities will be called to operate and these data are based on Calpine's most recent long term operating projections for the Facility.

3. Calpine states that the emission factor for Zion is 22.39 pounds of SO₂ per hour when using distillate oil with 115 ppm sulfur content. With the existing supply of distillate oil (960,000 gallons), Calpine states that the facility can operate for 68.6 hours and can emit a total of 0.77 tons of SO₂ emissions. Alternatively, using 15 ppm sulfur distillate oil (emissions factor of 2.92 pounds of SO₂ per hour), Zion could emit a total of 0.1 tons of SO₂ over 68.6 hours.

Provide a clear comparison of projected emissions under the requested variance versus projected emissions under compliance with the sulfur content rule absent a variance.

Calpine cannot combust the distillate oil in excess of market demand or need and outside current or anticipated permit conditions. Therefore, immediate compliance with the 15 ppm sulfur limit could only be achieved by draining the tank and shipping the distillate oil off site. As described in the variance request, this option is economically infeasible and cost prohibitive for Calpine. Therefore, the fuel currently in the tank would be burned over the subsequent 5 year period.

Assuming Calpine instead burns the fuel over the five year variance period as requested, the table below describes the difference in emissions between burning distillate oil with a 115 ppm sulfur content and distillate with a 15 ppm sulfur content.

Operating Conditions	Maximum Sulfur Content ppmv	Maximum Sulfur Content %	Fuel Oil Emission Factors ¹			Total Emissions based on 68.6 hours (tons)	Annualized Emissions (TPY)
Requested Variance	115	0.0115	0.0116 lb/MMBtu	22.39 lb/hr	0.77	0.15	
Rule Limit	15	0.0015	0.0015 lb/MMBtu	2.92 lb/hr	0.10	0.02	
Additional SO ₂ emitted due to variance (tons):					0.67	0.13	

¹ Hourly emissions are based on the maximum design maximum horsepower output.

Thus, the total additional emissions over the entire five year period are 0.67 tons, which amounts to an annualized average of 0.13 tons per year of additional emissions.

4. *Calpine describes a "worst case" for each of the averaging periods for the significant impact levels when operating at 75% and 100% load on distillate oil.*

In the scenario where Zion operates at 100% load, are all three combustion turbines operating simultaneously for 22.9 hours each (each burning 14,000 gallons of 115 ppm fuel per hour)? In this scenario, would the facility consume all 960,000 gallons of fuel and emit 0.77 tons of SO₂ in 22.9 hours? How likely is this scenario?

The Board is correct that under the worst case modeled assumption, all three turbines would be modeled to run simultaneously for 22.9 hours. Under that unrealistic, but worst case modeling scenarios, the Facility would indeed consume all 960,000 gallons of fuel and emit 0.77 tons of SO₂ in 22.9 hours. However, the Zion Energy Center has never burned the worst case scenario mentioned above. Since the plant was commissioned, the Facility has only burned fuel oil on three (3) separate days. This occurred during the 2014-2015 Winter Season. A summary of each is provided below and shows that the above described scenario has never achieved and is unlikely to occur in the future, but as stated previously, it is very difficult to predict when peaking facilities will be called to operate and for how long.

January 7, 2014

- Unit 1 – Zero gallons of fuel oil burned
- Unit 2 – Burned 88,837 gallons of fuel oil in 6 hour period
- Unit 3 – Burned 8,301 gallons of fuel oil in 1 hour period

February 15, 2014

Unit 1 – Burned 6,685 gallons of fuel oil in 1 hour period

Unit 2 – Burned 72,468 gallons of fuel oil in 5 hour period

Unit 3 – Burned 55,929 gallons of fuel oil in 4 hour period

March 3, 2014

Unit 1 – Burned 166,232 gallons of fuel oil in 12 hour period

Unit 2 – Burned 87,374 gallons of fuel oil in 6 hour period

Unit 3 – Burned 67,738 gallons of fuel oil in 5 hour period

5. Provide a detailed description of the “high first high” modeling method discussed in the petition. Explain whether this modeling method accurately characterizes the requested variance's impacts.

US EPA has established the National Ambient Air Quality Standards (NAAQS) at different thresholds and forms of the standard for applicable pollutants and averaging periods. In the case of 1-hour SO₂, the standard is 196 µg/m³ (75 ppb) and the form of the standard is the 99th percentile averaged over 3 years. The 99th percentile is that monitored concentration below which nominally 99% of all daily maximum 1-hour concentration values fall. For a monitoring station with a complete record of 365 days of monitoring data, the 99th percentile corresponds to the 4th highest monitored concentration. A violation of the NAAQS only occurs when the 3-year average of the 99th percentile values exceeds 75 ppb.

When using dispersion modeling to evaluate compliance with the 1-hour SO₂ NAAQS, the analysis typically uses five years of meteorological data and compliance is determined based upon the highest 5-year average of the 4th high maximum daily 1-hour average concentration at all receptors being evaluated. A “high number high” nomenclature is an integral part of the modeling results and their evaluation. The first ‘high’ denotes the highest value of monitored data for the rank, the “number” denotes what rank that value is (1 for highest value, 2 for second highest, etc...), and the second “high” denotes that it is the highest value for specified rank for that receptor. The “high 4th high” (H4H) value or the average of the

4th highest values for each year at each receptor being modeled is a primary focus of the analysis.

The model results are averaged across years by rank and not time. This means for each receptor for each year modeled, the days are ranked 1st through 365th and not pairing the results from January 1 of one year to the results of January 1 of another year. So the highest values for each receptor for each year are averaged for comparison against the NAAQS.

The high first high (H1H) modeling method is a standard, conservative method used for comparison against Significant Impact Levels (SILs) to determine if refined modeling against the NAAQS is required. A SIL analysis is completed using only the emission sources for the Facility completing the analysis. Results from this analysis will determine if a NAAQS analysis is required and the extent of the locations that need to be reviewed under that analysis. IEPA Modeling Unit Outline (March 29, 2016) Section III describes this type of analysis for modeling of Prevention of Significant Deterioration (PSD) sources and the methodology was followed for this situation.

If refined modeling is required for a PSD project, then compliance is demonstrated using the H4H values for the 1-hour SO₂ NAAQS using the Facility emission sources, nearby sources, and background concentration data per the IEPA Modeling Unit Outline (March 29, 2016) Section IV.

6. Calpine conducted significant impact level analysis for its requested variance assuming the continued use of 115 ppm fuel. Its analysis showed that Zion would exceed significant impact levels in several circumstances. According to this analysis, though the facility would not cause an exceedance of the SO₂ NAAQS by itself, it could contribute to one.

In a revised compliance plan, propose limits on Zion's operation such that, under all projected scenarios, it would not contribute to an exceedance of the SO₂ NAAQS.

The SIL analysis for 115 ppm fuel has a radius of impact (area exceeding the SIL) of approximately 660 feet (0.12 miles) outside the Facility's fenceline using the H1H methodology described in the response to Question 5 above for the worst-case scenario of all 3 CTs operating on oil at 100% load. This type of operation is rare and confined to when there is a call for power and only in certain circumstances. For instance, during calls of power in 2014, fuel oil combustion was required 3 times. Only 2 units operated on fuel oil during one event, all 3 units operated for approximately half an hour for the second event, and all 3 units operated for approximately 5 hours for the third event.

During 2016 readiness testing, each CT will go through startup and operates at full load for 2-8 hours. However, each unit is tested separately and has a far lower impact than the worst-case scenario.

The operation of the CTs on fuel oil is limited by the permit to readiness testing and emergency situations where natural gas is not available. Calpine cannot predict emergency situations in advance, but it does control the scheduling of readiness testing.

Calpine proposes the following be added to the compliance plan to minimize the possibility of contributing to an exceedance of the SO₂ NAAQS:

From the date of variance issuance, the Permittee shall not startup or operate more than one CT at a time during readiness testing. The Permittee shall maintain records demonstrating compliance with this requirement.

Calpine does not propose any further limitations during emergency situations, as public safety could be compromised by the Facility's reduced or lack of ability to operate.

7. A variance petition must discuss minimizing emissions' impact on human, plant, and animal life in the affected area. Provide this statement and propose a condition to the requested variance that minimizes the impact of additional emissions allowed by the requested variance.

The NAAQS limits are established to protect human health (primary standards) and public welfare, including protection against damage to animals, crops, vegetation, and buildings (secondary standards). As described in previous responses and the variance request, the modeled impacts of the requested variance are far below the NAAQS and will have a minimal effect on human, plant and animal health and welfare in the radius of impact.

The additional compliance plan condition described in Response 6 is intended to minimize the possibility of contributing to an exceedance of the SO₂ NAAQS, which is protective of human, plant, and animal life, during non-emergency operations. In addition, Calpine proposes to avoid any readiness testing prior to October of each year, such that the Spring and Summer seasons of maximum activity for flora and fauna would not be impacted by such testing.

Respectfully submitted,

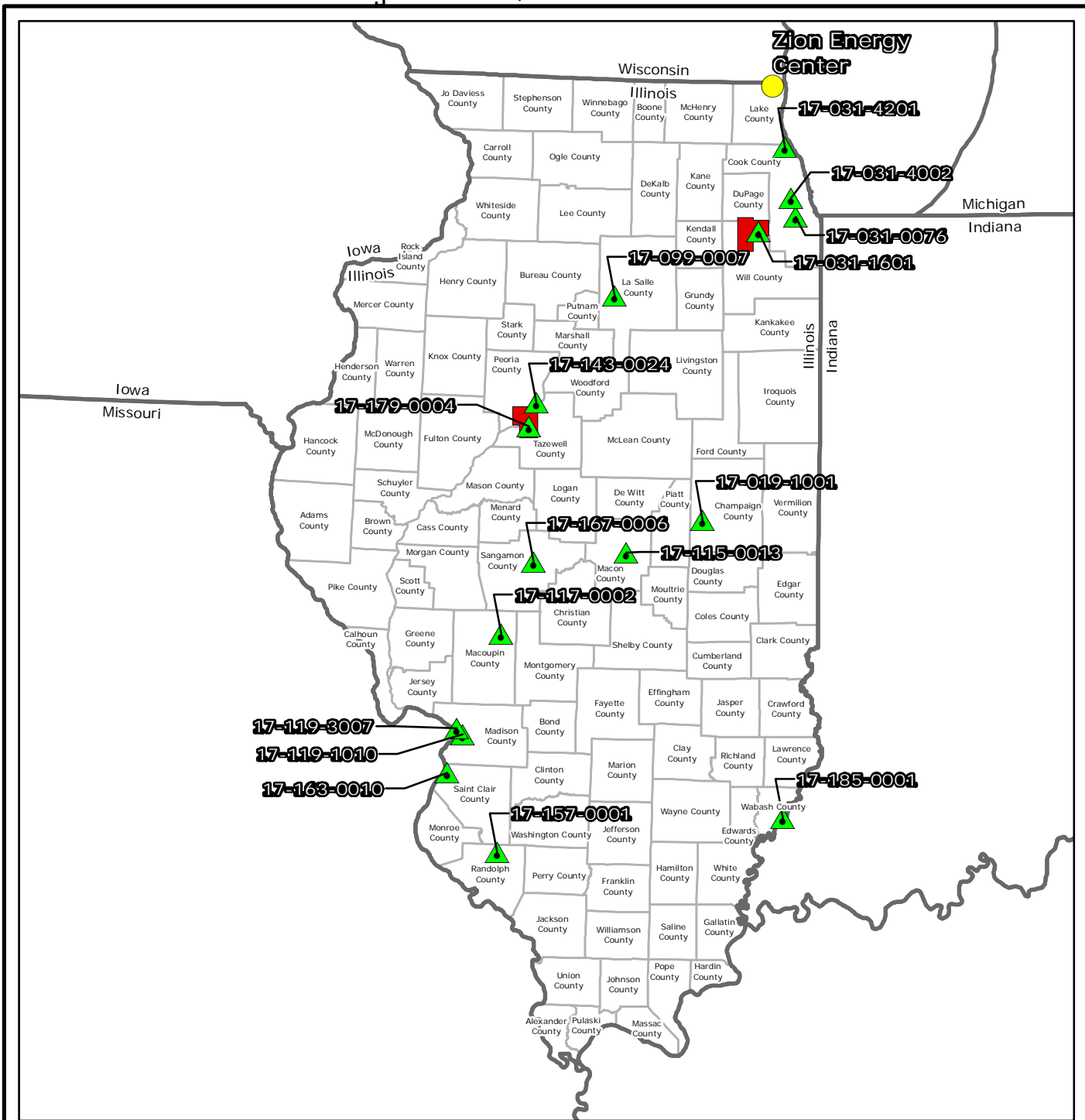
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EXHIBIT A

Map



17-119-3007
 17-119-1010
 17-163-0010

17-179-0004

17-143-0024

17-099-0007

17-031-1601

17-031-4002

17-031-4201

Zion Energy Center

17-019-1001

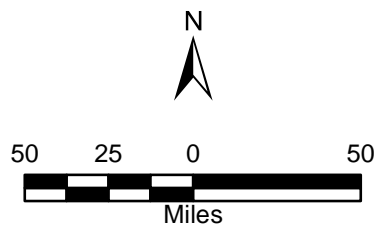
17-167-0006

17-115-0013

17-117-0002

17-185-0001

17-157-0001



- Legend**
- Zion Energy Center
 - ▲ IL SO₂ Monitoring Locations
 - Non-attainment Areas
 - State Boundary
 - County Boundary (US)



Path: L:\1294\0040\MXD\SO2 Monitoring Stations.mxd
 Date: 9/12/2016 Time: 9:48:57 AM User: KacHD0606

CERTIFICATE OF SERVICE

I, the undersigned, certify that on September 22, 2016, I electronically served the attached **Petitioner Calpine Corporation (Zion Energy Center)'s Responses to the Illinois Pollution Control Board's September 1, 2016 Questions** on the following persons:

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