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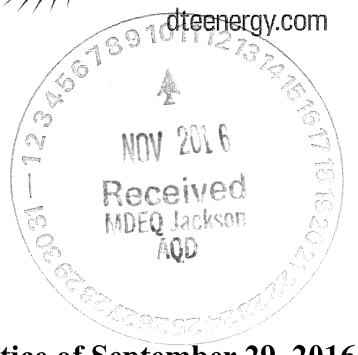


November 9, 2016

Mr. Brian Carley, Environmental Quality Specialist
Air Quality Division
Michigan Department of Environmental Quality
301 E. Louis B. Glick Highway
Jackson, MI 49201-1556

Re: DTE Electric Response to the MDEQ-AQD Violation Notice of September 29, 2016, Monroe Unit 2, MATS 30-day rolling Mercury Excursion

Dear Mr. Carley:

This letter is in response to the Michigan Department of Environmental Quality (MDEQ) Air Quality Division's (AQD) Violation Notice dated September 29, 2016. DTE Electric-Monroe Power Plant reported an emission limit deviation from the 40CFR63, Subpart UUUUU, (aka Mercury & Air Toxics rule or MATS) deviation during the semi-annual ROP Certification report dated September 14, 2016. The company determined that for 33 days, Unit 2 exceeded the MATS emission limit of 1.2 lbs/TBtu based on a 30-day rolling average as determined each calendar day the boiler operates. The MDEQ's Notice of Violation cited the following deviation:

Process Description	Rule/Permit Condition Violated	Comments
EU-UNIT2-S2	*Special Condition IX.3*	*Exceeded the 40 CFR 63, Subpart UUUUU mercury emission limit of 1.2 lbs/TBtu based on a 30-day rolling average as determined each calendar day the boiler operates for 33 days.*

Additionally, a second instance of MATS mercury emissions limit exceedances was communicated to the MDEQ by DTE Energy's Lisa Hagerty on September 23, 2016. While DTE was studying the initial exceedances on Monroe Unit 2, the MATS mercury limit was exceeded from August 5th to August 22nd. After further investigation, the August mercury exceedances were determined to be caused by similar circumstances as the initial exceedances for which the violation notice was issued. Therefore, the root cause and steps to prevent reoccurrence addressed in this response covers both sets of exceedances. However, DTE Electric reserves the right to present additional information as it becomes available.

Background

The process of controlling mercury emission is fairly complex, involving all three major components of the plant – the fuel in the boiler, the selective catalytic reduction system (SCR) and the flue gas desulfurization (FGD) system. The component of the system that removes vapor

phase mercury from the flue gas is the FGD. In order for mercury to be removed by the FGD, it first must be oxidized since elemental mercury cannot be removed by the FGD. The SCR is where the vapor phase mercury is oxidized. The presence of halogens can increase the ability of the catalyst in the SCR to oxidize the mercury at lower loads. Halogens, such as chlorine and bromine, are present in various levels in coal and the plant also utilizes two sorbents in the reduced emissions fuel (REF) process which add halogens to the fuel.

On June 9, 2016, Monroe Power Plant received analytical results of the May 15 - 25 operating period's mercury sorbent traps. Following review of the analytical data and calculating resulting emissions, it was determined that exceedances of the MATS 30-day average mercury emission limit of 1.2 lbs/TBtu had occurred. Monroe Power Plant took immediate corrective actions to reduce mercury emissions and initiate troubleshooting, which included adding eastern coal to the fuel blend, purging the FGD unit treatment liquor, and increasing the pH of the FGD unit treatment liquor. These corrective actions effectively reduced the mercury emissions, as discussed further below.

The next section presents more details regarding the initial response, root cause development, and experimental studies to develop explanation of the cause.

Summary of Events and Actions Taken

Attachment A summarizes the overall sequence of events from May – October 2016. On June 9th, upon recognizing that Unit 2 had elevated mercury emissions, the plant took actions to reduce mercury emissions. Actions taken included the following:

1. The FGD treatment fluid (liquor) was purged in an effort to lower the concentration of all metals, including mercury. If oxidized mercury captured in FGD liquor reaches the super saturation point, oxidized mercury could convert, or "reduce" back to the elemental species and be released from the liquor as a gaseous contaminant. This is known as "blowing down" the FGD.
2. The pH in the FGD was raised to lower the oxidation reduction potential (ORP). Lowering the ORP may reduce the likelihood of converting the oxidized mercury back to the elemental species. This is known in the industry as mercury "re-emissions."
3. The fuel blend was adjusted from 100% low sulfur western (LSW) coal to a 75% LSW and 25% high sulfur eastern (HSE) coal blend. This blend is consistent with the fuel blend at the time for Unit 1, which was not experiencing elevated mercury emissions.

On June 13, the plant received results from the mercury traps that were installed from June 8th through June 13th. The results confirmed that mercury emissions were back to normal range. The 30-day rolling average value fell below the MATS limit on June 24th, as summarized in Attachment B.

These actions were implemented simultaneously throughout the process in an attempt to address the elevated mercury emissions as quickly as possible. Although emissions were brought back into normal range, implementing multiple corrective actions at once did not allow Monroe to discern the root cause. Therefore, Monroe engaged in further data review and devised two hypotheses regarding the root cause of the exceedances. The first hypothesis was that oxidized mercury was being converted back to elemental mercury in the FGD and in turn being released into the flue gas stream leading out the stack. An elevated oxidation reduction potential (ORP)

in the scrubber can be used to indicate that this reaction may be occurring. In order to assess this theory, Monroe also needed a method to measure the effects during test periods when controlled unit operations would be conducted. To measure effect on ORP in the FGD, temporary ORP probes were needed on Unit 2's FGD.

ORP impacts were studied from July 18th-26th and probes were installed to measure the ORP in the FGD. New mercury sorbent traps were installed at the start of the test to identify mercury emissions during the test period. The unit was operated for three days burning 100% LSW with REF (Reduced Emissions Fuel), while not blowing down the FGD, and creating a lowered pH in the FGD liquor in an effort to simulate May's operating conditions. The mercury sorbent traps were then changed, while the unit operated for another four days with 100%LSW coal without REF additives. As can be seen in Attachment C, the test did not result in elevated ORP values that could indicate oxidized mercury being converted back to elemental mercury in the FGD. The sorbent traps from the first part of the test showed normal levels of mercury while the sorbent traps from the second part showed elevated levels of mercury. However, the ORP did not vary widely during the entire testing period. This test showed that ORP could not be used as an effective tool to indicate elevated mercury emissions in this case.

On July 27, 2016, Monroe Power Plant received analytical results of the July 21-25th operating period's mercury sorbent traps indicating elevated mercury results. Monroe initiated similar response as before, including adding REF fuel blend, purging the FGD unit treatment liquor, and adding eastern coal to the fuel blend. Since a subsequent mercury sorbent trap was already in service by the time corrective actions were initiated, that set of mercury traps also experienced elevated mercury results. Although corrective measures were reducing subsequent mercury sorbent trap results, the initial high mercury sorbent trap data from July 21-25 and July 25-August 3rd periods eventually resulted in an exceedance of the 30-day rolling average mercury emission limit on August 8, 2016.

In late August, Monroe contacted Electric Power Research Institute (EPRI) to further study captured mercury in the liquid phase of the scrubber reagent and the operational functionality of the ORP probes. The week of Sept 12–16, EPRI took FGD liquor samples and ORP operational data. Those study results are not yet available. DTE Electric will review those as they are made available for any additional insight to these exceedances. Working with EPRI also allows for DTE Energy to share learnings from this issue with other utilities as well as get information and data from others.

After the ORP study, Monroe's next hypothesis was that mercury oxidation was inhibited in the SCR due to insufficient halogen concentration at low loads. In order to assess this theory, Monroe also needed a method to measure the effects during test periods when controlled unit operations would be conducted. To measure effect of SCR mercury oxidation & fuel blend's halogen content on mercury emissions, a temporary mercury process monitor was needed to measure hourly, real time mercury data.

In early September, a temporary, continuous mercury process monitor was installed on the Unit 2 stack. Although not an EPA-certified monitor, it does provide operations with accurate, real-time mercury emissions data. From October 10-18th, Monroe studied the second hypothesis, whether a low halogen content fuel blend may inhibit mercury oxidation in the SCR at lower loads and result in elevated mercury emissions at the stack. Again, new sorbent traps were installed at the start of the test. The unit operated for three days burning 100% LSW with no

REF additives. The mercury sorbent traps were changed. The unit then operated for three days burning 100% LSW coal blend with REF additives. The mercury sorbent traps were changed again. Finally, the unit operated for three days burning a 70% LSW-30% HSE fuel blend with REF additives. Results of this test are summarized in Attachment D.

In this study, the results did show a correlation between the halogen concentration in the fuel blend and the mercury emission rate as measured by the temporary process monitor. The results showed a controlled, steady increase in mercury emissions after starting the 100% LSW fuel. A rapid decrease in mercury emissions was seen when the fuel blend was changed to 100% LSW blend with REF additives. Mercury emissions dropped further when the fuel blend was changed to the 70% / 30% blend of LSW/HSE.

Dates and Duration of the Violation

In summary, the dates for the two sets of MATS mercury emission limits exceedances are outlined below. Excess emissions are no longer occurring and the violation is not ongoing.

Dates violation occurred	Duration
May 22 – June 23, 2016	33 days
August 5 – August 22, 2016	18 days

It is important to understand that the MATs Mercury sampling method and analytical process creates the inherent longer duration of the exceedance and lag time in determining the mercury emission results.

First, each day's 30-day rolling average is determined from analytical results from multiple sets of sorbent traps covering that period. Sorbent traps are typically in the monitoring system for seven days. This can result in four or more pairs of traps needing analysis to calculate a single 30-day average. Additionally, analytical results for sorbent traps may not be available for 3 weeks or more from the time when the traps are first put in the monitoring system. The timing of this is dependent on several factors as the traps are analyzed. These include removing the traps from the stack, preparing them for shipment, shipping them to a lab, lab receipt, sample preparation at the lab, lab analysis, lab report preparation, lab report approval, and lab report distribution. This results in an inherent delay in being able to address excess emissions that have already occurred. This lag in the data is illustrated in the summary report of mercury emissions in Attachment B. Understanding this lag time involved in the mercury sorbent trap monitoring and analytical methodology leads to a better understanding of why the plant learned "after the fact" that mercury levels were elevated. Process changes to mercury trap handling, analytical, and reporting were enacted. DTE Energy has improved the overall turnaround time, reducing the time between trap removed from service and completion of analysis. The process now takes about one week, down from two weeks.

Explanation of the Causes

Testing correlated higher mercury emissions with lower halogen content fuel blends. However, Unit 2 and other Monroe units have run 100% LSW at various loads without mercury exceedances. At the time of the exceedances on Unit 2, the unit was operating at approximately half load while burning 100% LSW. The overall cause of the mercury emission exceedance is believed to be insufficient oxidation of mercury from various factors caused by fuel, equipment and operation.

Steps being taken to prevent a reoccurrence

Monroe has put additional countermeasures in place to prevent reoccurrence. The MATS rule allows mercury emissions to be calculated using sorbent traps. DTE Electric will improve response to real time mercury emission values by continuing to use a mercury process monitor. The temporary mercury process monitor on Unit 2 will be converted to a permanent process monitor. Procurement of the permanent monitor is underway and it will be installed as soon as the project plans allow. Some work may require a unit outage to perform. Although the process monitor cannot be certified to EPA standards, it provides real-time, accurate mercury emissions data. This provides the plant with data that allows for significantly more timely response to any emissions increase in order to avoid emissions exceedances.

Due to the fact that halogens promote mercury oxidation, efforts have also been taken to allow for additional halogen application. A temporary calcium bromide (CaBr) application system was installed and tested. The system adds CaBr to the fuel on the coal belt that feeds the plant. Although the REF sorbents contain halogens, there are periods of time when the REF system is not available. Additionally, there are inherent fluctuations in the amount of halogens in coal regardless of the fuel blend. The ability to add halogen through the CaBr system gives the plant another tool to use in the case of elevated mercury emissions are signaled by the process monitor. Plans are underway to make the temporary system permanent.

We believe these actions will ensure compliance with the MATS mercury limit in the future. Monroe Power Plant is committed to meeting all permit and other regulatory limits as can be seen by the large investments made by the company in pollution control equipment. The additional investments made as a result of these exceedances strengthens that commitment.

If you have any questions on the information contained herein or would like further information, please contact Ms. Kayla Maas at (734) 384-2562 or kayla.maas@dteenergy.com.

Sincerely,

Mike Twomley
Plant Manager – Monroe Power Plant

Cc: S. Miller – MDEQ Jackson
B. Rice – Monroe Power Plant
S. Boyd – DTE Energy
B. Marietta – DTE Energy
A. Hayden – DTE Energy

Attachment A: Overall Sequence of Events

Date & Action (or Situation)	Comment
May 14th, 2016 U2 returned from trip caused by boiler feed pump. Returned at half load with 100% Western Coal.	South Boiler Feed Pump rotary problems.
5/18 - 5/20, fuel blend to Unit 2 consisted of uncrushed coal without REF.	Coal belt scale testing work was being completed.
5/31, Lab received U2 mercury sorbent tube traps for the period 5/15/2016 - 5/25/2016.	
6/8, Lab report of U2 trap data for the 5/15-5/25/2016 indicated higher than normal levels of mercury.	Standard turn around time for trap analysis.
June 10-13, Monroe's intitial reaction to elevated mercury results	
6/9, Monroe Operations informed of elevated mercury emissions, began blowing down FGD.	Chlorides in the FGD liquor is the surrogate to monitoring FGD liquor's metal content (including mercury) in the scrubber absorber.
6/10, Raised pH on FGD into 5.4 range, to lower oxidation reduction potential (ORP) on mercury. If the oxidized mercury captured in the FGD liquor reached the super saturation point, and at lower pH, the mercury would convert back to elemental state and release back into an air contaminant.	Lowering the ORP would stop re-emission of captured mercury if that was occurring in the FGD.
6/10-6/11, Changed fuel blend from 100% Western to 75%LSW and 25%HSE	U1 on this blend. Match conditions on a unit that wasn't experiencing elevated levels.
6/10, Hourly handheld readings of ORP taken of FGD	Normally only done once a day
6/10/2016 CleanAir reviewed MET-80 data and found no abnormalities	Determine if there was an issue with the sorbent trap system
6/10/2016 I&C verified U2 Mercury system sample flow, both Path A and B were near perfect	
6/10/2016, analyzed the as-fired coal for the period of 5/17 -5/20. The as-fired mercury in 100% LSW normally averages 5 lb/tBtu of coal. The as-fired mercury was found in the 8-9 lb/tBtu range. Although higher than normal for 100% western coal, it is at upper range for 70/30 western/eastern blend.	Monroe has since concluded the higher as-fired mercury was not the root cause but exacerbated the likely root cause.
6/13/2016, Stopped purging chlorides by blowing down FGD	
6/16/2016 Brought pH back down to 5.0 range	
July 17-26, test hypothesis that Unit2 scrubber absorber could have had high ORP	
7/18, temporary ORP probes installed on U2 scrubber absorber providing continuous values into PI (plant database).	Good ORP range in FGD: <300 MV Bad ORP range (potential Hg reemission): >500 MV
7/18, changed mercury sorbent tube traps	
7/18 - 7/21, duplicated May's operating conditions: * not purging chlorides; burning 100% LSW with REF; and FGD liquor at pH 5	Goal was to build up total dissolved solids to replicate FGD's May conditions
7/22, changed mercury sorbent tube traps	To shorten the time that the test would affect Hg rolling average.
7/22 - 7/26, Removed REF blend, switched to just 100% LSW	Attempted to create elevated ORP condition.
7/26 changed mercury sorbent traps	To shorten the time that the test would affect Hg rolling average.

Results: The traps from 7/18-7/22 showed normal levels of mercury. The traps from 7/22-7/26 showed elevated levels of mercury 2.110 lb/TBTU. However, the ORP did not swing during the entire testing period. The ORP results ranged from 230 MV to 290 MV. An ORP swing may indicate a transition of mercury from oxidized to elemental would be from 230 MV to over 500 MV. Elevated ORP in FGD did not appear under those operating conditions.	
Continued investigation	
8/24/2016, Initiated a capital project for mercury process monitors to be installed in the stack.	Not a compliance monitor, but provides a way to have relative, real time mercury data.
8/24, held discussions and reviewed data with EPRI experts on possible causes	
8/31, U2 Temporary Process Monitor Installation meeting	
9/9, temporary mercury Process Monitor installed at FGD outlet; continuous Hg readings in PI (database).	
9/15/2016 reported Hg exceedances via semiannual ROP report	
9/23/16 received request for specific data surrounding exceedance from DEQ	
9/29/16 received emailed version of MDEQ's Notice of Violation	
Oct 10-18, test theory if fuel blend's halide content (Cl and Br) affects mercury emissions (thus showing mercury oxidation in SCR is effected).	
10/10 at 0000 hrs until 10/12 at 2359 hrs, U2 at 100% LSW with No REF	
10/13 at 0000 hrs until 10/15 at 2359 hrs, U2 at 100% LSW with REF	
10/16 at 0000 hrs until 10/18 at 2359 hrs, U2 at 70% LSW 30% HSE with REF	

Attachment B (part 1 of 2):

DTE Electric - Monroe Power Plant - Unit 2
Hg 30 Day Avg, lb/TBtu Summary Report
Emission Limit 1.2 lb/TBtu 30-Boiler Operating Day Rolling Average

	30 Day lb/TBtu Rolling Average						
	2HGLBTB_30						
Period Start:	Daily Average (lb/Tbt)	Num of Valid Hrs (24 hr)	Num of Op Hrs (24 hr)	Num of Valid Hrs (30 day)	Num of Op Hrs (30 dy)	Average (30 day) (lb/Tbt)	Counter
05/15/2016	4.125	11	19	695	706	0.478	
05/16/2016	3.882	24	24	695	706	0.605	
05/17/2016	3.904	24	24	695	706	0.734	
05/18/2016	3.898	24	24	695	706	0.862	
05/19/2016	3.911	24	24	695	706	0.991	
05/20/2016	3.909	24	24	695	706	1.116	
05/21/2016	3.908	24	24	695	706	1.239	
05/22/2016	3.901	24	24	695	706	1.361	1
05/23/2016	3.891	24	24	695	706	1.483	2
05/24/2016	3.908	24	24	695	706	1.605	3
05/25/2016	3.136	24	24	695	706	1.701	4
05/26/2016	2.349	24	24	695	706	1.769	5
05/27/2016	2.349	24	24	695	706	1.838	6
05/28/2016	2.347	24	24	695	706	1.906	7
05/29/2016	2.346	24	24	695	706	1.975	8
05/30/2016	2.345	24	24	695	706	2.044	9
05/31/2016	2.337	24	24	695	706	2.113	10
06/01/2016	1.914	24	24	695	706	2.167	11
06/02/2016	1.730	24	24	695	706	2.216	12
06/03/2016	1.732	24	24	695	706	2.265	13
06/04/2016	1.731	24	24	695	706	2.315	14
06/05/2016	1.739	24	24	695	706	2.365	15
06/06/2016	1.735	24	24	695	706	2.414	16
06/07/2016	1.719	24	24	695	706	2.463	17
06/08/2016	1.323	24	24	695	706	2.499	18
06/09/2016	0.890	24	24	695	706	2.52	19
06/10/2016	0.898	24	24	696	706	2.525	20
06/11/2016	0.900	24	24	696	706	2.526	21
06/12/2016	0.890	24	24	697	706	2.525	22
06/13/2016	0.611	24	24	707	715	2.445	23
06/14/2016	0.476	24	24	720	720	2.354	24
06/15/2016	0.456	24	24	720	720	2.24	25
06/16/2016	0.441	24	24	720	720	2.124	26
06/17/2016	0.437	24	24	720	720	2.009	27
06/18/2016	0.438	24	24	720	720	1.893	28
06/19/2016	0.442	24	24	720	720	1.777	29
06/20/2016	0.442	24	24	720	720	1.662	30
06/21/2016	0.437	24	24	720	720	1.546	31
06/22/2016	0.330	24	24	720	720	1.428	32
06/23/2016	0.283	24	24	720	720	1.307	33
06/24/2016	0.283	24	24	720	720	1.212	
06/25/2016	0.285	24	24	720	720	1.143	

Mercury Trap In-service dates: 5/15-5/25; 5/25-6/1; 6/1-6/8; 6/8-6/13; 6/13-6/22

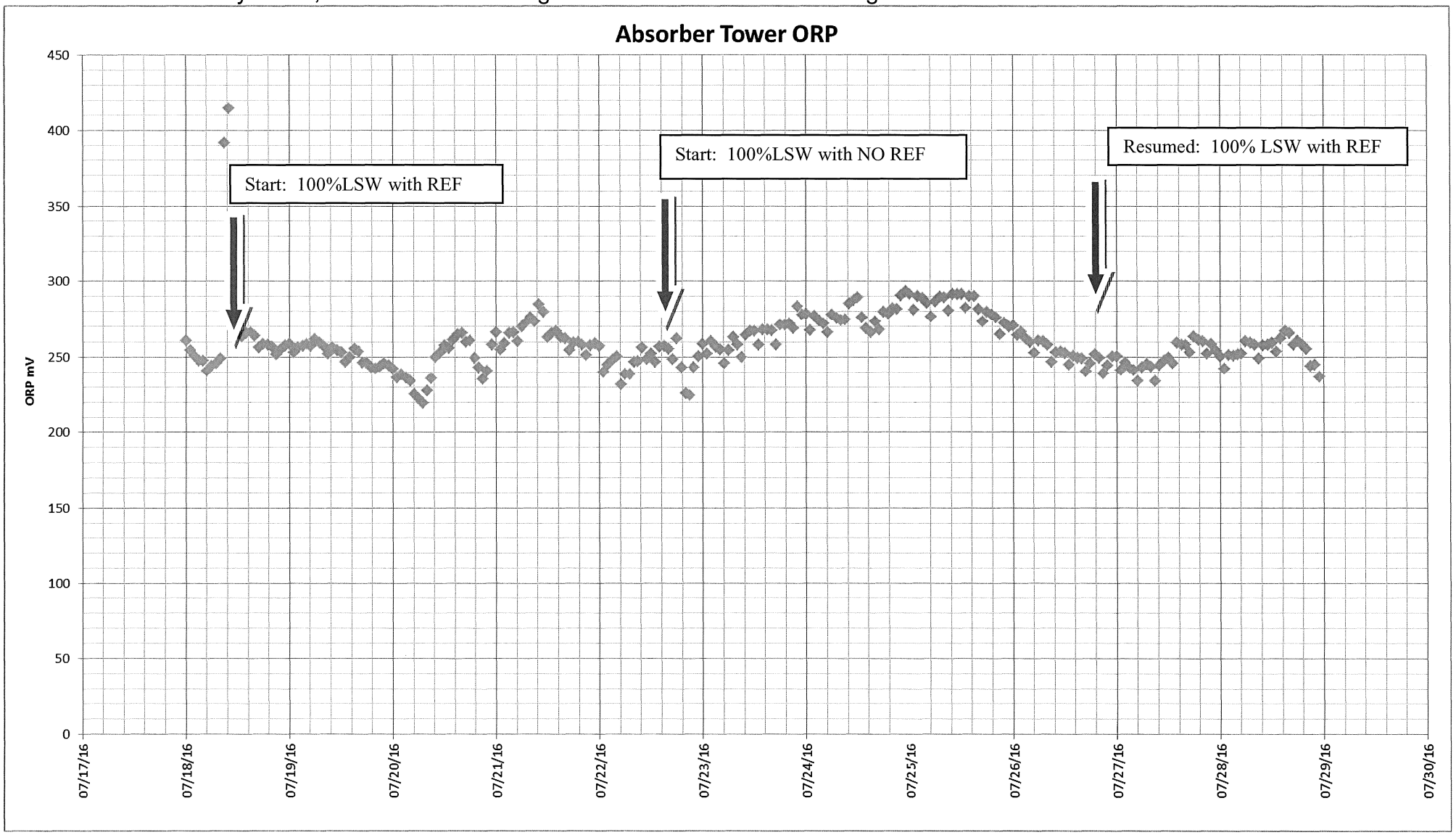
Attachment B (part 2 of 2):

DTE Electric - Monroe Power Plant - Unit 2

	30 Day lb/TBtu Rolling Average						
Period Start:	Daily Average (lb/Tbt)	Num of Valid Hrs (24 hr)	Num of Op Hrs (24 hr)	Num of Valid Hrs (30 day)	Num of Op Hrs (30 dy)	Average (30 day) (lb/Tbt)	Counter
07/18/2016	0.568	21	24	698	718	0.322	
07/19/2016	0.700	24	24	698	718	0.331	
07/20/2016	0.705	24	24	698	718	0.34	
07/21/2016	2.063	24	24	698	718	0.396	
07/22/2016	2.667	24	24	698	718	0.477	
07/23/2016	2.666	24	24	698	718	0.559	
07/24/2016	2.669	24	24	698	718	0.641	
07/25/2016	2.219	24	24	698	718	0.707	
07/26/2016	1.919	24	24	698	718	0.763	
07/27/2016	1.914	24	24	698	718	0.819	
07/28/2016	1.922	24	24	698	718	0.876	
07/29/2016	1.938	24	24	698	718	0.932	
07/30/2016	1.940	24	24	709	720	0.978	
07/31/2016	1.940	24	24	717	720	1.026	
08/01/2016	1.934	24	24	717	720	1.082	
08/02/2016	1.930	24	24	717	720	1.139	
08/03/2016	1.714	24	24	717	720	1.188	
08/04/2016	1.504	24	24	717	720	1.23	
08/05/2016	1.590	24	24	717	720	1.275	1
08/06/2016	1.503	24	24	717	720	1.316	2
08/07/2016	1.499	24	24	717	720	1.357	3
08/08/2016	1.502	24	24	717	720	1.399	4
08/09/2016	1.505	24	24	717	720	1.44	5
08/10/2016	1.514	24	24	717	720	1.482	6
08/11/2016	0.878	24	24	717	720	1.503	7
08/12/2016	0.417	24	24	717	720	1.504	8
08/13/2016	0.419	24	24	717	720	1.504	9
08/14/2016	0.418	24	24	717	720	1.504	10
08/15/2016	0.420	24	24	717	720	1.504	11
08/16/2016	0.417	24	24	717	720	1.504	12
08/17/2016	0.470	24	24	720	720	1.497	13
08/18/2016	0.500	24	24	720	720	1.49	14
08/19/2016	0.501	24	24	720	720	1.483	15
08/20/2016	0.505	24	24	720	720	1.431	16
08/21/2016	0.502	24	24	720	720	1.359	17
08/22/2016	0.547	24	24	720	720	1.288	18
08/23/2016	0.571	24	24	720	720	1.218	
08/24/2016	0.570	24	24	720	720	1.163	
08/25/2016	0.571	24	24	720	720	1.118	
08/26/2016	0.570	24	24	720	720	1.074	
08/27/2016	0.572	14	15	710	711	1.035	
08/28/2016	0.000	0	0	710	711	1.035	
08/29/2016	0.000	0	0	710	711	1.035	
08/30/2016	0.727	1	10	687	697	1.003	
08/31/2016	0.507	24	24	687	697	0.953	

Mercury Trap In-service dates: 7/21-7/25; 7/25-8/3; 8/3-8/11; 8/11-8/17

Attachment C: July 18-26, 2016 ORP monitoring results in the FGD while testing fuel blends



Attachment D: Oct 10 – 18, 2016 Mercury Process Monitor results while Testing SCR Effects & Fuel Blends