BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

DOCKET NO. UE-19____

EXHIBIT NO. ___(TCD-3)

THOMAS C. DEMPSEY

REPRESENTING AVISTA CORPORATION

TALEN MONTANA

Gordon Criswell • Director, Environmental & Compliance
PO Box 38 • 580 Willow Avenue • Colstrip, MT 59323
(406) 748-5002• gordon.criswell@talenenergy.com

September 17, 2018

David L. Klemp

Air Quality Bureau Chief

Montana Department of Environmental Quality

Sent via email to: DKlemp@mt.gov

Dear Mr. Klemp,

In response to your August 31, 2018 letter requesting information related to compliance with the Mercury & Air Toxics Standard for Colstrip, the following response is provided. Each requested item identified in the 8/31/18 letter is stated first, followed by the response.

1. The daily calculation of the weighted 30-boiler operating day rolling average emission rate (WAER) for each of Units 1-4 as specified by Equation 2a at §63.10009(b)(2), from September 8, 2016 to present. The calculation must identify the emissions rate used for each unit and the source of the 30-day total heat input (HI) for that unit for each daily calculation. Provide a description of the calculation methodology, including rationale for the chosen methodology, and citation of applicable rules to justify the methodology used.

   A. The daily calculation of the weighted 30-boiler operating day rolling average emission rate (WAER) for each of Units 1-4 as specified by Equation 2a at 63.10009(b)(2), from September 8, 2016 to September 12, 2018 is provided in the attached excel spreadsheet titled Colstrip PM MATS DEQ Submittal 2018-09-17, tab DEQ Items 1&2. Note that the calculation is not performed "for each of Units 1-4", but data from each of Units 1-4 is used to calculate site-wide weighted 30-day rolling average emission rate per Equation 2a and it is identified in column R.

   B. The emission rate used for each unit, which is the most recent MATS Method 5 stack test result for that unit for each day, is identified in columns F-I.

   C. The daily heat input for each unit is identified in columns J-M and the rolling 30-boiler operating day heat input for each unit is identified in columns N-Q. Note that the spreadsheet also contains heat input data from 8/9/16 through 9/7/16 so that a rolling 30-day average could be calculated starting September 8, 2016. These data are in gray cells.

D. The relevant equation for calculating WAER is Equation 2-A from 40 CFR 63.10009. The equation as provided addresses both calculations for pollutants using continuous monitoring (the terms that include a summation from i=1 to p, on the left side of the equation) as well as for pollutants using stack testing (on the right side of the equation). For these calculations which are based on stack testing, only the right side of the equation is relevant.

$$WAER = \frac{\sum_{i=1}^{p}\left[\sum_{i=1}^{n}(Her_i \times Rm_i)\right]_p + \sum_{i=1}^{m}(Ter_i \times Rt_i)}{\sum_{i=1}^{p}\left[\sum_{i=1}^{n}(Rm_i)\right]_p + \sum_{i=1}^{m} Rt_i} \quad (Eq.\ 2a)$$

Where:

Her_i = hourly emission rate (*e.g.*, lb/MMBtu, lb/MWh) from unit i's CEMS for the preceding 30-group boiler operating days,

Rm_i = hourly heat input or gross output from unit i for the preceding 30-group boiler operating days,

p = number of EGUs in emissions averaging group that rely on CEMS or sorbent trap monitoring,

n = number of hours that hourly rates are collected over 30-group boiler operating days,

Ter_i = Emissions rate from most recent emissions test of unit i in terms of lb/heat input or lb/gross output,

Rt_i = Total heat input or gross output of unit i for the preceding 30-boiler operating days, and

m = number of EGUs in emissions averaging group that rely on emissions testing.

a. The numerator
   i. First multiplies two terms
      1. Ter_i, the unit-specific emission rate from the most recent emissions test in lb/MMBtu
      2. Rt_i, the unit-specific heat input in MMBtu for the preceding 30 boiler operating days
      3. The product of which equals mass emissions for that unit (lbs.)
   ii. Then sums the mass emissions for each unit across the four units
b. The denominator is simpler and just sums Rt_i for each unit across the four units (MMBtu's)

E. The 30-boiler operating day heat input is developed consistent with the definition in 40 CFR 63.10042.

Boiler operating day means a 24-hour period that begins at midnight and ends the following midnight during which any fuel is combusted at any time in the EGU, excluding startup periods or shutdown periods. It is not necessary for the fuel to be combusted the entire 24-hour period.

a. Boiler operating day is determined using hourly data for each unit
b. Hours when the unit is in startup or shutdown are excluded consistent with the definition
c. To determine whether any fuel is combusted, both heat input and power output values are reviewed on an hourly basis. In a day, if there is an hour that is not startup or shutdown which has a non-zero value for either power output or heat input (or both), that day is a boiler operating day.
d. The 30-boiler operating day heat input value for a unit is calculated by summing the calculated daily heat input values for the current (or most recent) boiler operating day plus the 29-preceding boiler operating days.

2. Records of the daily heat input (HI) for each of Units 1-4 from September 8, 2016 to present. Please clearly demonstrate how these daily HI values are used in calculating the WAER.

The daily heat input (HI) for each of Units 1-4 from September 8, 2016 to September 12, 2018 is also provided in the attached spreadsheet, columns J-M. A daily heat input value is presented for a unit, if there was at least one hour of non-startup/shutdown heat input within that day. Each day's calculated 30-boiler operating day (BOD) heat input for a unit (in columns N-Q for Units 1-4, also referred to as Rt_i in equation 2a, is the total of the preceding 30 heat input values for the unit corresponding to the unit's preceding 30 boiler operating days (i.e., the last 30 days when there is at least one hour of operations under non-startup/shutdown condition). To sum values for the preceding 30 boiler operating days for a unit, the 30 boiler operating days do not have to be consecutive.

3. Records of the occurrence and duration of each startup and/or shut down for each of Units 1-4 from September 8, 2016 to present. Provide a narrative description of how Talen complies with the work practice standards of MATS during these occurrences and demonstrate how these situations are addressed in the WAER calculations.

The occurrence and duration of each startup and/or shut down for each of Units 1-4 from September 8, 2016 to September 12, 2018 is provided in the attached spreadsheet titled Colstrip PM MATS DEQ Submittal 2018-09-17, tab DEQ Item 3. The data in this tab are on an hourly basis and each startup and/or shut down hour is identified by a 1 designation. Unit 1 startup times are found in column E and Unit 1 shut down times are found in column D. Unit 2 startup times are found in column I and Unit 2 shut down times are found in column H. Unit 3 startup times are found in column M and Unit 3 shut down times are found in column L. Unit 4 startup times are found in column Q and Unit 4 shut down times are found in column P.

The Colstrip Steam Electric Station complies with the MATS work practice standards during startup and shut down by taking the following actions:

- All Continuous Emission Monitoring Systems (CMS) are operated during startup and shut down periods.
- Clean fuel, Liquefied Petroleum Gas (LPG) for Units 1&2 and Low Sulfur #2 Diesel Fuel Oil for Units 3&4, are used for startup.
- When firing on coal, all the applicable control technologies (Low-NOx systems, Mercury Control systems, and Wet Venturi Scrubber systems) are in operation.
- Records of startup/shut down periods are maintained.
- Dates of most recent boiler tune-ups and burner inspections are provided in the MATS Semi-annual Reports submitted to MDEQ.

Periods of startup and shut down are not included in the site-wide weighted average emission rate (WAER).

4. A description of all non-routine work performed, any operational changes, and any changes to the coal supply or quality at Units 3 and 4 for the period between the fourth quarter 2017 and the second quarter 2018 that may have impacted the PM emissions performance.

A review of activities from 4th quarter 2017 to 2nd quarter 2018 was conducted with engineers, operations, and maintenance; including the boiler and scrubber crews, to get a thorough understanding of any changes that may have impacted the PM emissions performance.

Coal supply or quality – all coal burned from 4th quarter 2017 through 2nd quarter 2018 were from the normal permitted mine areas. Coal quality analysis was reviewed including ash content, heating value, moisture, sulfur and ash characteristics. The coal quality varied during this period but was within contract specifications.

Relevant work and Operational changes between 4th quarter 2017 and 2nd quarter 2018

- Scrubber makeup water (pond return water) increased in solids concentration for two reasons;
    - Pond return level (3&4 EHP B Cell) was low due to forced evaporation of pond water during 2017 to eliminate water in the ash ponds and help ensure protection of groundwater. This level was raised to provide required make-up volume by transferring water from the 3&4 EHP F Cell which contained higher solids.
    - Additional water was transferred from the 3&4 EHP F Cell (higher solids) to pond return (3&4 EHP B Cell) to facilitate liner repairs at the 3&4 EHP F Cell and help ensure protection of groundwater.
- Low-NOx tuning at Units 3&4 boilers – optimizing the SmartBurn Low-NOx system to minimize NOx emissions.
- Although neither the continuous Opacity Monitors nor the PM CEMS provided an indication of an increased PM emission level across the time frame indicated, it appears that the characteristics of the PM had changed. The change, potentially the particle size distribution in the stack, appears to have changed the ratio of PM mass to detected concentration, i.e., the correlation curve of the PM CEMS. In other words, particles of a different size with more total mass may have been emitted, but the Opacity Monitors and PMCEMS were still "seeing" the same concentration in the stack gas. Colstrip is still investigating this issue to determine what could be done to prevent it from happening in the future.

5. A description of all inspection, maintenance, and operation activities associated with the boilers and venturi scrubbers since the deviations.

Quarterly MATS PM Test results were received on June 28, 2018 that indicated a deviation of the MATS PM limit. MDEQ was notified on June 28 and Unit 3 was removed from service on June 28 and Unit 4 was removed from service on June 29. Talen proposed and MDEQ acknowledged that limited operation of Units 3&4 for evaluation of a corrective action or for data gathering related to potential corrective action was a prudent approach to solving the issue.

An extensive inspection of the Units was conducted including the coal mills, boiler, ductwork, air preheater, scrubbers, and the stack. Cleaning, adjustments, and repairs were conducted as needed. Areas of inspection included:

- Coal Mills
    - Classifiers
    - Air flow controls
- Boiler
    - Windboxes
    - Separated Over Fire Air (SOFA) dampers
    - Top Over Fire Air (TOFA) dampers
    - Burners
- Ductwork
    - Air Preheater
    - Scrubber inlet ducts
    - Scrubber outlet ducts
- Scrubbers
    - Venturi/Plumb Bob area
    - Venturi/Plumb Bob sprays
    - Venturi & Absorption pumps
    - Absorption sprays
    - Wash Trays
    - Wash Tray sprays
    - Mist Eliminators
    - Mist Eliminator sprays
    - Reheaters
    - Reheater soot blowers
- Stack
    - liner

Unit 3 was off from June 28 – July 8 for this work, Unit 4 was off from June 29 – July 17 for this work. No major equipment issues were identified during these outages. Additional outages and inspections continued to occur as needed during the trouble shooting period as corrective actions were evaluated and implemented.

Four main areas were investigated to determine and address the cause of the 2nd quarter MATS PM test results on Units 3&4:

- **Compliance Test Method**
- **Fuel Quality**
- **Boiler Combustion**
- **Scrubber Performance**

Nationally recognized expertise was brought on-site to help conduct the investigation and implement corrective actions:

- AECOM – overall root cause investigation & scrubber expertise
- GE/Alstom – boiler combustion expertise
- SmartBurn – boiler combustion expertise
- Power Technical Services – boiler combustion expertise
- Munters – scrubber mist eliminator expertise
- Bison Engineering – stack testing expertise
- Air Control Techniques – stack testing & pollution control expertise

Compliance Test Method

Qualified Source Testing Individuals (QSTI Certified) conducted the PM tests. They verified that the proper method, procedures, QA/QC, and calculations were used. An audit of the testing was conducted following the EPA Air Emissions Testing Body (AETB) Manual. Independent side-by-side testing was conducted for single run tests, with consistent results between test groups.

Fuel Quality

Coal analysis including proximate analysis and ultimate analysis was reviewed. While variations in coal quality were observed, the results were within contract specifications.

Boiler Combustion

Coal mill performance was evaluated and compared to target guidelines related to coal grind (fineness) as well as fuel distribution in the boiler. Minor adjustments were made to some mills to meet the target guidelines. Some fouling/slagging was observed in the boiler which was cleaned up and adjustments and minor repairs were made to the furnace to help reduce slagging/fouling. Boiler conditions were evaluated and adjusted to establish a focus on overall furnace condition compared to the low-NOx focus that had recently occurred. Boiler conditions were also evaluated to ensure excess SO3/acid mist, a condensable PM that could affect the results, was not being formed and emitted.

Scrubber Performance

The entire scrubber system from the inlet ductwork to the stack were inspected. Cleaning, adjustments, and repairs were completed as necessary. Evaluation of scrubber performance focused on three main areas – liquid spray flow, flue gas flow, and scrubber chemistry.

Liquid spray flow – the wet venturi scrubbers remove both particulate and SO2 and proper spray flow to the different sections of the scrubber are important. The scrubber sprays include the venturi sprays, plumb bob sprays, absorption sprays, wash tray sprays, and mist eliminator sprays. All sprays were inspected and evaluated during operation to verify proper spray. Adjustments were made (flow orifices installed) to the venturi/plumb bob sprays to provide a more effective balance of sprays in this area. This venturi/plumb bob section of the scrubber is where most of the particulate removal occurs.

Flue gas flow – overall flue gas flow and proper distribution of the flue gas is important to effective scrubber operation. The mist eliminator section of the scrubber controls carry-over of droplets from the wet scrubbing process. These droplets contain solids which can contribute to particulate emissions. Testing of the mist eliminator section of the scrubber indicated that, although meeting manufacturer specifications, flue gas flow through the mist eliminators was not optimally balanced, resulting in areas of higher flows. A mist eliminator flow distribution plate was installed on all scrubbers to better balance the flue gas flow through this area of the scrubber and help keep velocities at a level for proper mist eliminator performance. A more detailed description of this work is described in the De Minimis Notification for Changes to Colstrip Units 3&4 Scrubbers – Scrubber Flow Distribution Plates that was submitted to MDEQ on August 24, 2018 (this notification is attached).

Scrubber Chemistry – A review of scrubber chemistry, primarily scrubber solids, was conducted to evaluate previous levels in comparison to current levels. There are two separate scrubber water supplies that were evaluated, scrubber recycle tank water and scrubber wash tray water. Historic levels of scrubber recycle tank solids range from 25–30% solids. Levels in early 2018 were up to 35% solids. Historic levels of scrubber wash tray solids range from 10-15% solids. Levels in early 2018 were up to 17% solids. Testing of scrubber chemistry indicates that a target of 20-25% recycle tank solids and 10-15% wash tray solids is good point that balances the benefits of lower solids in regards to carry-over and PM emissions with the benefits of higher solids that help prevent scale buildup which results in equipment shutdown for cleaning. Scrubber additives were also tested to determine if scrubber performance could be improved, with the results from that testing indicating little to no improvement in scrubber performance.

6. Records of the date and time (start and end) for each period of noncompliance from June 21, 2018 to present.

MATS PM Deviations are recorded for daily rolling 30-day site-wide average above 0.030 lb/mmbtu from June 21, 2018 through September 5, 2018. Data provided in response to Request for Information #1 shows compliance with the site-wide MATS PM limit from September 6, 2018 to present.

Unit 4 MATS PM Compliance Test conducted on 9/6/18 demonstrated a PM emission rate of 0.021 lb/mmbtu. Unit 3 MATS PM Compliance Test conducted on 9/11/18 demonstrated a PM emission rate of 0.024 lb/mmbtu.

If you have any questions regarding this response to your information request, please don't hesitate to contact me at 406-748-5002 or gordon.criswell@talenenergy.com.

Sincerely,

Gordon Criswell

Gordon Criswell

Director, Environmental & Compliance

Talen Montana