

Potential Emissions for Netting for Conversion to Natural Gas and Regulatory Impact

DRAFT

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Case No. 2022-00402
PPL companies
Attachment 2 to Response to JI-1 Question No. 1(c)

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Imber

Major Assumptions and Observations

- Emission based upon NGCC emissions based upon March 2017 Black & Veatch Study for the EW Brown Units.
- Emissions tend to be trending down. The further out the project is pushed, the lower the emissions for netting will be.
- Additional controls will be required to address pollutants that exceed the significance threshold.
 - EW Brown
 - Consent Decree will need to be revised. Current limits:
 - Heat Input: 5,300 MMBtu/hr
 - Continuous operation of SCR and FGD.
 - PM Emission Rate: 0.030 lb/MMBtu
 - SO₂ Emissions: 2,300 tons/yr
 - SO₂ Emission Rate (30-day Rolling Avg): 0.100 lb/MMBtu or 97% removal efficiency
 - NO_x Emission Rate (30-day Rolling Avg): 0.070 lb/MMBtu
 - Mill Creek
 - Emissions limit of 15 tons per calendar day during ozone season will likely remain.
 - Attainment status of Jefferson County with 2015 Ozone NAAQS may impact project.

Emissions Netting Pollutants of Concern

NOx

- BR3 would require the operation of the existing SCR to meet the NOx emission limit of 0.070 lb/mmBtu in the Title V permit and consent decree.
- MC1/MC2 NOx emissions would decrease. It is unlikely that the units would exceed a 15 tons/day limit during ozone season on natural gas with a NOx emission rate of 0.08-0.12 lb/mmBtu, however this could be an issue if the units were above this rate.

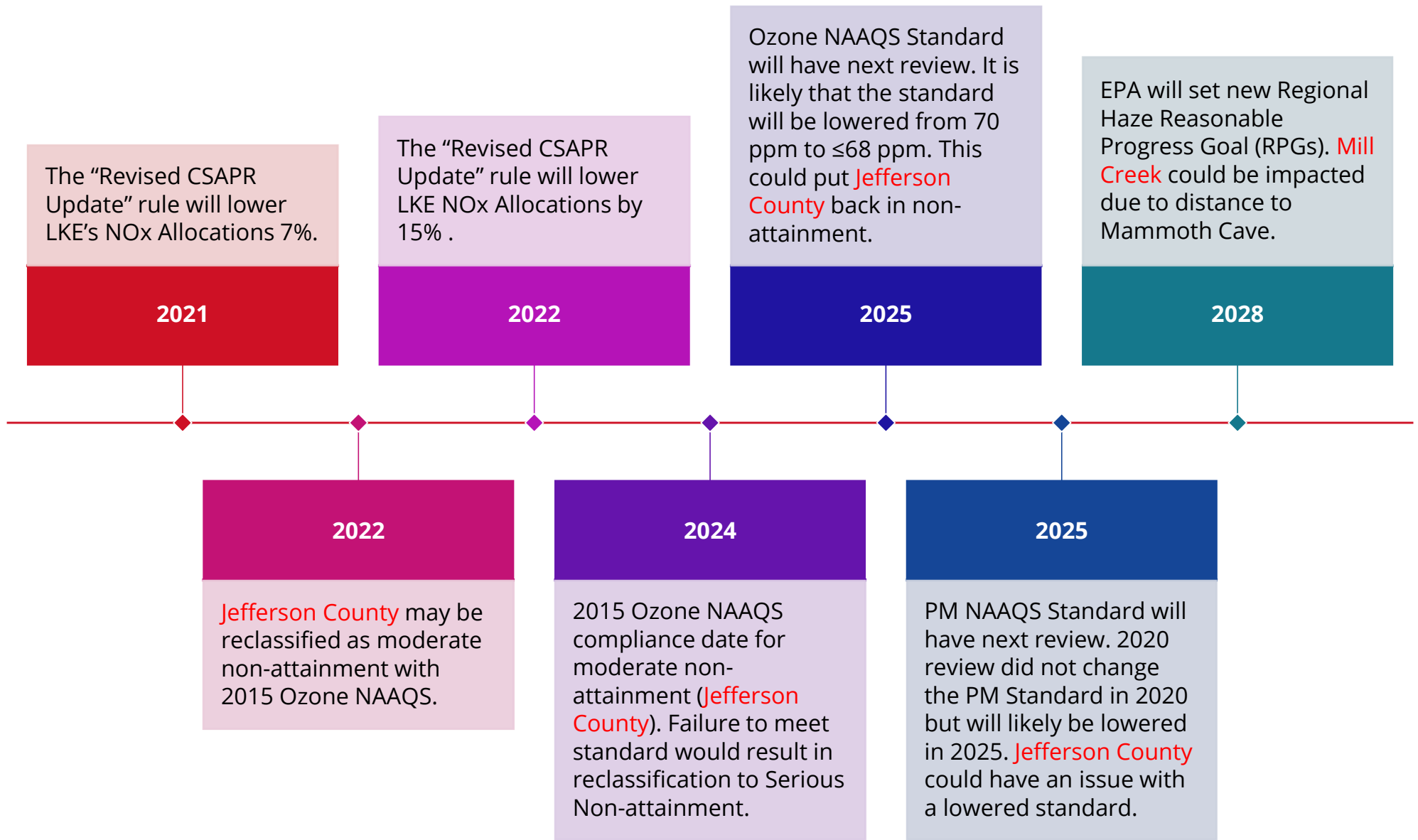
CO

- Both MC and BR would exceed the significance level of CO. A catalyst would be required to minimize CO emissions for BACT.

VOCs

- Both MC and BR would exceed the significance level of VOC. A catalyst would be required to minimize VOC emissions for BACT.
- For MC, any VOC emissions increase may require a multiplier for off-set emissions in Jefferson County depending upon the attainment status at the time of the unit conversion. The multiplier can range from 1.15-1.5 based upon the area's attainment status. NOx emission reductions may be used for inter-pollutant trading since ozone regulations cover both NOx and VOCs as criteria pollutants. Modelling would need to be conducted to determine the appropriate inter-pollutant trading ratio.

Key Regulations that Impact Project



MC12 Emissions

Mill Creek (Baseline January 2018-Present)

Draft 03/15/2021

Estimation of Net Emissions Increases Associated with Converting MC1 and MC2 to Natural Gas Boilers

Step 1. Project Emissions Increases

	New Units Potential to Emit Totals (tpy)								
	NO _x	CO	PM ²	PM ₁₀ ³	PM _{2.5} ⁴	SO ₂ ²	VOC ²	H ₂ SO ₄ ⁵	Lead ⁶
MC1 and MC2 NG									
Conversion ¹	5,067.5	6,334.4	314.6	314.6	173.1	24.8	227.7	0.4	< 0.1
Fuel Gas Heater	3.2	5.8	0.4	0.4	0.4	0.2	0.4		
Facility Total	5,070.7	6,340.2	315.0	315.0	173.4	25.0	228.1	0.4	0.0
SER	40	100	25	15	10	40	40	7	0.6
Exceeds SER?	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No

Notes: 1) Data for E.W. Brown 3 from Table 1-1, Table 1-2 of March 14, 2017 Black & Veatch Natural Gas Conversion Study of E.W. Brown 1, 2, and 3. Assuming: 8760 annual operating hours, 4820.68 Btu/hr (Table 1-1), maximum 0.12 lb/mmBtu of NO_x, 0.15 lb/mmBtu of CO, and no SCR operation, no PJFF control, no SO₂ control, no VOC control, and no H₂SO₄ control. Data is multiplied by 2 because of two converted boilers.

2) PM (PM total), SO₂, and VOC values developed from factors in Table 1.4.2 of EPA's "AP 42, Fifth Edition, Volume I, Chapter 1: External Combustion Sources". PM total is filterable plus condensable.

3) Assumed PM₁₀ is the same level as PM.

4) PM_{2.5} value is derived by ratioing the PM₁₀ value with PM₁₀ and PM_{2.5} emission factors used in Cane Run 7's annual emissions inventory. Those emission factors came from EPA's emission inventory and analysis group guidance, 3/30/2012.

5) H₂SO₄ calculated from 2018 EPRI "Estimating Total Sulfuric Acid Emissions from Stationary Power Plants", example calculation #8.

6) Lead is not expected to be of any concern. This calculation is same as NGCC evaluation.

Step 2. Contemporaneous Decreases

	Emissions Decrease from Mill Creek 1 & 2 Existing Coal-Fired Generation Shut Down (tpy)								
	NO _x	CO	PM ⁷	PM ₁₀ ⁷	PM _{2.5} ⁷	SO ₂	VOC	H ₂ SO ₄	Lead
MC 1/2 with coal handling	5,399.2	3,244.1	439.2	430.7	400.5	1,192.1	47.7	18.3	0.04

Note: 7) PM, PM₁₀, and PM_{2.5} values include AP42 based PM condensable value.

Other emission unit decreases beyond unit and coal handling not yet calculated. Don't expect other notable decreases in VOC, CO.

Step 3. Netting Analysis

	Net Emissions Increase/Decrease (tpy)*								
	NO _x	CO	PM	PM ₁₀	PM _{2.5}	SO ₂	VOC	H ₂ SO ₄	Lead
Net Emissions Change¹	(329)	3,096	(124)	(116)	(227)	(1,167)	180	(18)	(0)
SER	40	100	25	15	10	40	40	7	0.6
Exceeds SER?	No	Yes	No	No	No	No	Yes	No	No

* Project emissions increase (Step 1) minus contemporaneous decreases (Step 2)

BR3 Emissions

EW Brown (Baseline 2018 - Present)

Draft 03/15/2021

Estimation of Net Emissions Increases Associated with BR3 Conversion to Natural Gas Boiler

Step 1. Project Emissions Increases

	New Units Potential to Emit Totals (tpy)								
	NO _x	CO	PM ²	PM ₁₀ ³	PM _{2.5} ⁴	SO ₂ ²	VOC ²	H ₂ SO ₄ ⁵	Lead ⁶
BR3 NG									
Conversion ¹	2,533.7	3,167.2	157.3	157.3	86.5	12.4	113.9	0.2	< 0.1
Fuel Gas Heater	3.2	5.8	0.4	0.4	0.4	0.2	0.4		
Facility Total	2,536.9	3,173.0	157.7	157.7	86.9	12.6	114.3	0.2	0.0
SER	40	100	25	15	10	40	40	7	0.6
Exceeds SER?	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No

Notes: 1) Data from Table 1-1, Table 1-2 of March 14, 2017 Black & Veatch Natural Gas Conversion Study of E.W. Brown 1, 2, and 3. Assuming: 8760 annual operating hours, 4820.68 Btu/hr (Table 1-1), maximum 0.12 lb/mmBtu of NO_x, 0.15 lb/mmBtu of CO, and **no SCR operation, no PJFF control, no SO₂ control, no VOC control, and no H₂SO₄ control.**

2) PM (PM total), SO₂, and VOC values developed from factors in Table 1.4.2 of EPA's "AP 42, Fifth Edition, Volume I, Chapter 1: External Combustion Sources".

3) Assumed PM₁₀ is the same level as PM.

4) PM_{2.5} value is derived by ratioing the PM₁₀ value with PM₁₀ and PM_{2.5} emission factors used in Cane Run 7's annual emissions inventory. Those emission factors came from EPA's emission inventory and analysis group guidance, 3/30/2012.

5) H₂SO₄ calculated from 2018 EPRI "Estimating Total Sulfuric Acid Emissions from Stationary Power Plants", example calculation #8.

6) Lead is not expected to be of any concern. This calculation is same as NGCC evaluation.

Step 2. Contemporaneous Decreases

	Emissions Decrease from Existing Coal-Fired EW Brown 3 Shut Down (tpy)								
	NO _x	CO	PM ⁷	PM ₁₀ ⁷	PM _{2.5} ⁷	SO ₂	VOC	H ₂ SO ₄	Lead
BR1,2,&3	1,088.3	192.9	228.5	221.0	198.5	709.2	23.3	120.9	0.1

Note: 7) PM, PM₁₀, and PM_{2.5} values include AP42 based PM condensable value.

Other emission unit decreases beyond unit and coal handling not yet calculated. Don't expect other notable decreases in VOC, CO, CO₂.

	Net Emissions Increase/Decrease (tpy)*								
	NO _x	CO	PM	PM ₁₀	PM _{2.5}	SO ₂	VOC	H ₂ SO ₄	Lead
Net Emissions									
Change ¹	1,449	2,980	(71)	(63)	(112)	(697)	91	(121)	(0)
SER	40	100	25	15	10	40	40	7	0.6
Exceeds SER?	Yes	Yes	No	No	No	No	Yes	No	No

* Project emissions increase (Step 1) minus contemporaneous decreases (Step 2)