Middletown Cogeneration Facility Emission Calculations

Emission Point:	**P003**
Operating Scenario	**MWERF-4**
Description:	**MWER Flare - Natural Gas to Pilots**

		Maximum		
Physical Characteristics and Emission Data	Height of Stack above grade =	170	ft	
	Diameter of stack =	8	ft	
	Stack Gas Exit Temperature =	125	F	
	Nat Gas to Pilots =	2,100	SCFH	
	Nat Gas to Pilots =	2.1	MMBtu/hr HHV (dry)	
Inputs shaded in Green	Natural Gas Heating Value (HHV) =	1,019	Btu/SCF Fuel Specs	
	Average SO2 Emission Factor =	0.6	lb SO2/MMSCF (2,000 grains S/MMSCF)	
	Maximum SO2 Emission Factor =	1.5	lb SO2/MMSCF (5,000 grains S/MMSCF)	
	VOC emission factor =	0.005	lb-VOC/MMBtu EPA AP-42	
	PM Filterable emission factor =	1.9	lb PM_{fil}/MMSCF	
	NOx emission factor =	0.068	lb-NOx/MMBtu EPA AP-42	
	CO emission factor =	0.370	lb-CO/MMBtu - EPA AP-42	
	CO2 Emission Factor for Nat Gas =	53.02	kg/MMBtu	GHG Reporting Rule for Nat Gas Combustion
	CH4 Emission Factor for Nat Gas =	0.0010	kg/MMBtu	GHG Reporting Rule for Nat Gas Combustion
	N2O Emission Factor for Nat Gas =	0.00010	kg/MMBtu	GHG Reporting Rule for Nat Gas Combustion
	CO2 Global Warming Potential =	1	GHG Reporting Rule	
	CH4 Global Warming Potential =	21	GHG Reporting Rule	
	N2O Global Warming Potential =	310	GHG Reporting Rule	
	Hours of use in a year =	8,760		
	Lbs per ton =	2,000		

Average Emission Rate Calculations

NOx (lb/hr) =	**2.1**	MMBtu/hr X	**0.068**	lbs NOx/MMBtu =	**0.15**	**lb/hr - NOx**	
NOx (tpy) =	**0.15**	Lbs/hr NOx X	**8,760**	hrs/yr / 2000 =	**0.64**	**tpy - NOx**	
CO (lb/hr) =	**2.1**	MMBtu/hr X	**0.370**	lbs CO/MMBtu =	**0.792**	**lb/hr - CO**	
CO (tpy) =	**0.79**	Lbs/hr NOx X	**8,760**	hrs/yr / 2000 =	**3.47**	**tpy - CO**	
SO2 (lb/hr) =	**0.60**	Lb/MMSCF x MMSCF/1E6 SCF x	**2100**	SCF/hr =	**0.001**	**lb/hr - SO2**	
SO2 (tpy) =	**0.001**	Lb/hr x	**8760**	hrs/yr / 2,000 =	**0.006**	**tpy - SO2**	
PM_{fil} & PM_{tot} Emissions =	**1.9**	Lb/MMSCF x MMSCF/1E6 SCF x	**2100**	SCF/hr =	**0.004**	**lb/hr - PM**	
PM_{fil} & PM_{tot} (tons/yr) =	**0.004**	Lb/hr x	**8760**	hrs/yr / 2,000 =	**0.017**	**tpy - PM**	
VOC (lb/hr) =	**2.1**	MMBtu/hr X	**0.005**	lbs VOC/MMBtu =	**0.01**	**lb/hr - VOC**	
VOC (tpy) =	**0.011**	Lbs/hr x 8760 hrs/yr x ton/2000 lbs =			**0.047**	**tpy - VOC**	

Nat Gas CO2 (tpy) =	2	MMBtu/hr **X**	53.02	kg/MMBtu **X**	1	Global Warming Potential **X** 2.204 lb/kg **X** 8760 **/** 2000 =	**1,095**	**CO2 (tpy)**
Nat Gas CH4 (tpy) =	2	MMBtu/hr **X**	0.001	kg/MMBtu **X**	21	Global Warming Potential **X** 2.204 lb/kg **X** 8760 **/** 2000 =	**0.43**	**CH4 (tpy)**
Nat Gas N2O (tpy) =	2	MMBtu/hr **X**	0.0001	kg/MMBtu **X**	310	Global Warming Potential **X** 2.204 lb/kg **X** 8760 **/** 2000 =	**0.6**	**N2) (tpy)**

CO2e (tpy) = BFG + Nat Gas (CO2 + CH4 + N2O) = **1,096 CO2e (tpy)**