

Air Pollution Emissions Inventory

Dickinson's state-of-the-art low-pressure steam central energy plant delivers steam and chilled water to heat and cool two-thirds of the buildings on campus, a more efficient system for heating and cooling buildings than using individual boilers and condensers. The plant's two 800 horsepower boilers are dual-fuel, meaning they can burn either heating oil or natural gas. Because it is less costly and less polluting, the boilers are run on natural gas most of the time. The system uses flue gas recirculation and low NOx burners to control emissions of air pollutants.

Annual emissions of nitrogen oxides (NO_x), sulfur dioxide (SO₂), carbon monoxide (CO), particulate matter (PM), volatile organic compounds (VOC), lead and mercury from the combustion of natural gas in Dickinson's central energy plant are estimated using national average emission factors from the USEPA's Technology Transfer Network Clearinghouse for Inventories & Emissions Factors database (Table 1). Emissions of the greenhouse gases carbon dioxide (CO₂) and nitrous oxide (N₂O) are accounted for in [Dickinson's Greenhouse Gas Inventory](#) and are not reported here.

The methodology provides a rough approximation of emissions as actual emissions per unit of natural gas combusted by a particular boiler can differ significantly from the national average. The estimates do not use direct measurements of emissions from Dickinson's central energy plant.

Table 1. Emission factors for external combustion boiler; 10 million to 100 million Btu/hr; flue gas recirculation and low NOx burners

Pollutant	Emission Factors	
	Lbs/1000 cubic ft natural gas	Lbs/million Btu natural gas
Nitrogen oxides (NO _x)	32	0.031
Sulfur dioxide (SO ₂)	0.6	0.00058
Carbon monoxide (CO)	9.4	0.009
Particulate Matter (PM)	7.6	0.0074
Volatile organic compounds (VOC)	5.5	0.0054
Lead	0.0005	4.864 E-7
Mercury	0.00026	2.529 E-7

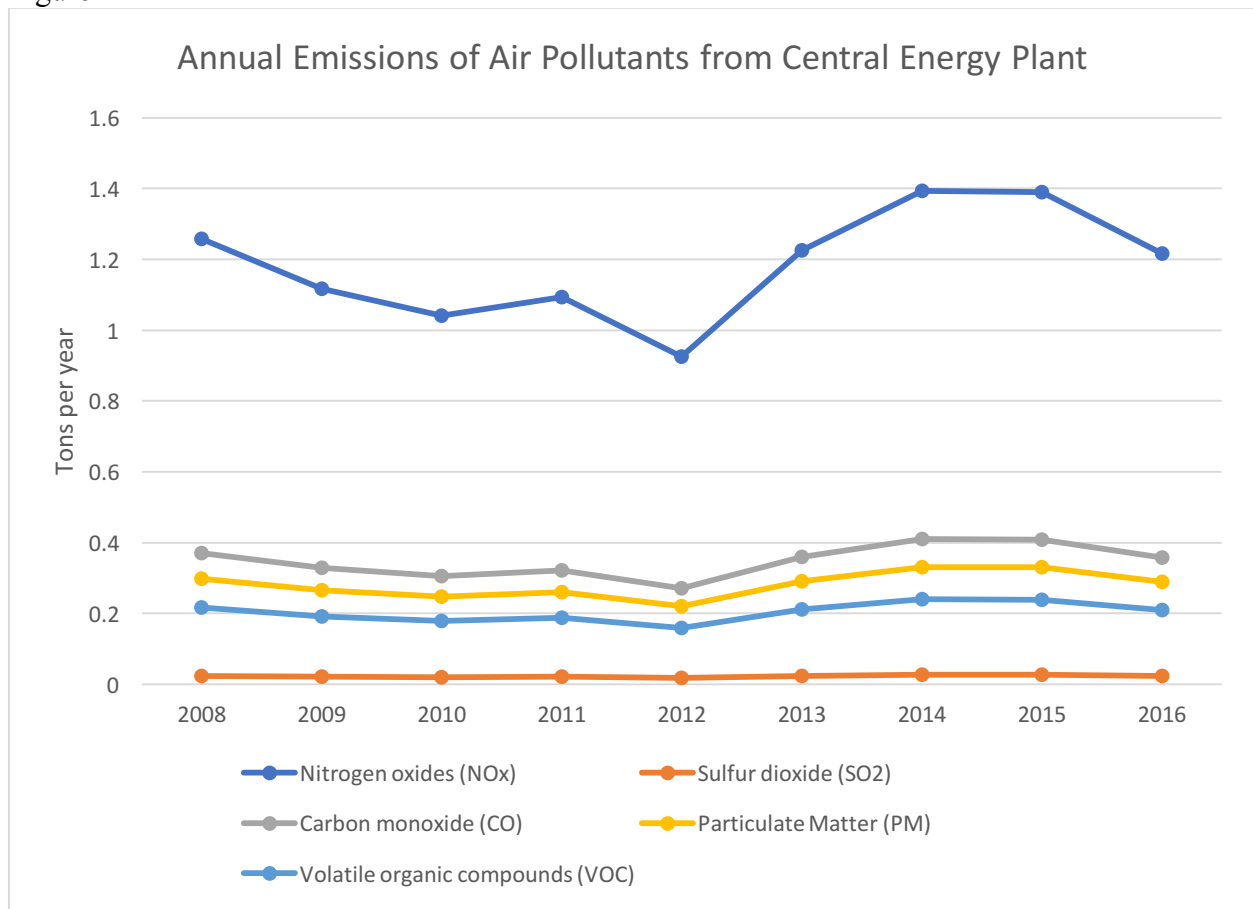
Source: USEPA, Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, accessed 1/19/2018. <https://cfpub.epa.gov/webfire/index.cfm?action=fire.detailedsearch>.

The emission factors in Table 1 are applied to Dickinson's annual use of natural gas from 2008 through 2016 to estimate emissions of air pollutants. Estimates are reported in Table 2 and displayed in Figure 1.

Table 2. Estimated emissions of air pollutants, 2008 – 2016, tons/year

	2008	2009	2010	2011	2012	2013	2014	2015	2016
NOX	1.26	1.12	1.04	1.09	0.92	1.23	1.39	1.39	1.22
SO2	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02
CO	0.37	0.33	0.31	0.32	0.27	0.36	0.41	0.41	0.36
PM	0.30	0.27	0.25	0.26	0.22	0.29	0.33	0.33	0.29
VOC	0.22	0.19	0.18	0.19	0.16	0.21	0.24	0.24	0.21
Lead	0.00002	0.00002	0.00002	0.00002	0.00001	0.00002	0.00002	0.00002	0.00002
Mercury	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001

Figure 1



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