The Climate Risks of Natural Gas: Fugitive Methane Emissions

An Infographic from the Union of Concerned Scientists

Methodology and Assumptions

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Data sources and assumptions for the infographic The Climate Risks of Natural Gas: Fugitive Methane Emissions.

Total U.S. natural gas production (dry production) in 2012—24,057,609 million cubic feet (volume)—is based on EIA reported data (EIA 2014).

The range of natural gas production that escapes into the atmosphere is between 1 and 9 percent. This is based on a variety of published studies (Cathles et al. 2012; Howarth et al. 2012; Petron et al. 2012; Skone 2012; Tollefson 2013; Weber and Clavin 2012).

1 percent: 240,576 million cubic feet (volume)
9 percent: 2,165,185 million cubic feet (volume)

Million cubic feet of natural gas was converted to million metric tons (volume to mass) using the specific volume of the gas at 70 degrees Fahrenheit (21.1degrees Celsius), 1 atmosphere of pressure: 1.474 m3/kg

Methane, a primary component of natural gas, is 34 times more potent than carbon dioxide (CO_2) at trapping heat (Myhre et al. 2013).

Using these assumptions, we converted volume of natural gas leakage to CO_2 equivalent tons:

Million cubic feet natural gas	Cubic feet natural gas	Cubic meter	Cubic meter/kg (Specific Volume)	Kilograms	Million metric tons methane	Methane is more potent than CO_2	Million metric tons CO_2 equivalent (CO_2-e)
240,576	240,576,090,000	6,812,356,373	1.474	4,621,680,036	4.62	34	157
2,165,185	2,165,184,810,000	61,311,207,361	1.474	41,595,120,326	41.60	34	1,414

We assume that a typical coal plant is 600 megawatts in size, and emits 4.5 million metric tons of CO_2 per year (based on a heat rate of 10,000 Btu/kWh and a CO_2 emissions rate of 2,200 lbs/MWh).

Using these emissions estimates for a typical-sized existing coal plant translates into:

157 million metric tons CO_2-e ~ 35 coal power plants

1,414 million metric tons CO_2-e ~ 314 coal power plants

References

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