

**Electronic Supplementary Information for**

**Greenhouse gas and air pollutant emissions from power barges  
(powerships)**

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Table S1. Reported natural gas combustion greenhouse gas and air pollutant emission factors <sup>a</sup>

CO <sub>2</sub>	Emission factors [kg MWh <sup>-1</sup> ]						Reference
	CH <sub>4</sub>	N <sub>2</sub> O	SF <sub>6</sub>	SO <sub>2</sub>	NO <sub>x</sub>	PM	
393	$5.9 \times 10^{-4}$	$1.5 \times 10^{-5}$	$3.4 \times 10^{-7}$	$1.2 \times 10^{-3}$	$3.1 \times 10^{-2}$	$3.7 \times 10^{-4}$	NETL (2012)
201	–	–	–	–	–	–	Ladage et al. (2021)
203	–	–	–	–	–	–	Ladage et al. (2021)
199	–	–	–	–	–	–	Ladage et al. (2021)
200	–	–	–	–	–	–	Ladage et al. (2021)
–	–	–	–	$1.0 \times 10^{-3}$	$1.7 \times 10^{-1}$	$7.2 \times 10^{-4}$	EEA (2019)
185	–	–	–	–	–	–	EEA (2018)
408	–	–	–	–	–	–	Hondo (2005)
371	$4.4 \times 10^{-2}$	–	–	$2.0 \times 10^{-3}$	$9.5 \times 10^{-2}$	$6.2 \times 10^{-2}$	Spath and Mann (2000)
355	$7.6 \times 10^{-3}$	–	–	$2.8 \times 10^{-3}$	$1.3 \times 10^{-2}$	–	NETL (2018)
384	$9.2 \times 10^{-3}$	$2.0 \times 10^{-5}$	$7.0 \times 10^{-11}$	$3.6 \times 10^{-3}$	$1.1 \times 10^{-1}$	$6.3 \times 10^{-2}$	NETL (2012)

<sup>a</sup> Values compiled to calculate median and ranges (25<sup>th</sup> to 75<sup>th</sup> percentile) in emission factors (Figure 1)

Table S2. Reported heavy fuel oil combustion greenhouse gas and air pollutant emission factors

Emission factors [kg MWh <sup>-1</sup> ]					
CO <sub>2</sub>	N <sub>2</sub> O	SO <sub>2</sub>	NO <sub>x</sub>	PM	Reference
780	–	9.0	9.4	–	Streibel et al. (2017)
667	–	7.7	14.2	0.3	Moldanová et al. (2009)
634	–	–	15.9	0.5	Fridell et al. (2008)
634	–	–	19.9	0.7	Fridell et al. (2008)
–	–	–	17.8	0.8	Trozzi (2019)
677	–	11.5	14.0	0.8	Winnes and Fridell (2012)
620	–	10.5	16.6	1.7	Ekmekçioğlu et al. (2020)
620	–	10.5	17.0	1.7	Entec (2010)
565	–	11.1	19.3	2.0	Yusuf Khan et al. (2013)
593	–	8.0	19.6	1.5	Yusuf Khan et al. (2013)
617	–	11.5	19.8	2.4	Agrawal et al. (2008)
620	–	10.3	18.1	1.3	US EPA (2009)
620	–	10.5	18.1	1.5	CARB (2008)
–	–	–	18.7	1.2	Lloyds (1995)
620	1.6 × 10 <sup>-2</sup>	–	–	–	IPCC (2000)

<sup>a</sup> Values compiled to calculate median and ranges (25<sup>th</sup> to 75<sup>th</sup> percentile) in emission factors (Figure 1)

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