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Wood burning.. real numbers for a green-hyped energy



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Prof. Fritz Vahrenholt's and Dr. Sebastian Lüning's blog "Die kalte Sonne" has a discussion on the US movie "Burned: are trees the new coal?" (streaming [here](#)) which shows what happens in American forests that are the source for European wood-burning installations (power stations, heating...). Since the EU made what I think the completely wrong decision to hype wood burning as "green" and "renewable", massive quantities of wood are transported from the US East to the EU, where converted power stations like the UK [Drax](#) burn yearly wood felled from a surface of 830 km², corresponding to 1/3 of the surface of Luxembourg ([link](#)). "Die kalte Sonne" gives a very instructive document from the Swiss Bafu (Bundes Amt für Umwelt) which shows the emissions of wood-burning installations, compared to natural gas and light oil (HEL) facilities. You may find the document [here](#).

Tabelle 1: Mittlere Emissionsfaktoren von Erdgas-, Heizöl Extraleicht- und Holzfeuerungen, sowie Angaben zu Heizwert H_u , Abgasvolumen V_{ab} und Holzfeuchte u

	Heizwert H_u	Abgasvolumen V_{ab}	Holzfeuchte u	Emissionsfaktoren bezogen auf Inputenergie							
				SO ₂	NO _x	CH ₄	NM/VOC	CO	Staub	CO ₂	
Erdgas											
Feuerung	[MJ/m ³]	[m ³ /m ³]									[g/MJ]
<50 kW	36.3	10.2		0.5	18	6	2	14	0.1		
50-350 kW	36.3	10.2		0.5	19	6	2	11	0.1		56.4
>350 kW	36.3	10.2		0.5	19	6	2	10	0.1		
HEL											
Gebäldebrenner	[MJ/kg]	[m ³ /kg]									
<50 kW	42.9	12.4		12 ⁽¹⁾	37	1	6	13	0.2		
50-350 kW	42.9	12.4		12 ⁽¹⁾	36	1	6	7	0.2		73.7
>350 kW	42.9	12.4		12 ⁽¹⁾	33	1	2	8	0.2		
Holz											
Anlagenkategorien nach Holzenergiestatistik	[MJ/kg] ⁽¹⁾	[m ³ /kg] ⁽²⁾	[%]								[g/MJ]
Offene Kaminöfen	14.6	9.6	25	10	80	120	180	3'000	100		
Geschlossene Kaminöfen und Kachelöfen	14.6	9.6	25	10	80	100	150	2'500	100		
Zimmer- und Kachelöfen	13.7	9.0	33	10	80	100	150	2'500	100		
Pelletöfen (Wohnbereich)	13.8	9.0	33	10	60	12	18	300	60		
Holzkoch- und Zentralheizungsherde	13.7	9.0	33	10	70	160	240	4'000	200		
Stückholzkessel	13.7	9.0	33	10	80	50	75	1'250	50		
Doppel-/Wechselbrandkessel	13.7	9.0	33	10	70	160	240	4'000	200		
Autom. Feuerungen < 50 kW	11.7	7.8	54	10	120	8	12	600	100		92.0
Pelletkessel < 50 kW	13.8	9.0	33	10	60	3	4	200	50		
Autom. Feuerungen 50 - 500 kW a. HVB	11.6	7.8	54	10	120	7	10	500	80		
Pelletfeuerungen 50 - 500 kW	14.1	9.0	33	10	60	2	3	150	40		
Autom. Feuerungen > 500 kW l. HVB	13.9	9.0	33	10	220	7	10	500	80		
Autom. Feuerungen > 500 kW a. HVB	11.0	7.8/6.2	54	10	135	4	6	300	70		
Pelletfeuerungen > 500 kW	14.1	9.0/7.2	33	10	70	2	3	150	35		
Autom. Feuerungen > 500 kW l. HVB	12.6	9.0/7.2	33	10	220	4	6	300	70		
Holz-Wärme-Kraftkopplungsanlagen	10.5	7.8/6.2	54	10	120	1.3	2	100	12		
Anlagen für erneuerbare Abfälle	13.0	10.8/8.6	11	20	100	1.3	2	100	8		

¹⁾ spezifischer Heizwert H_u bezogen auf eingesetztes Holz der Holzfeuchte u gemäss Schweizerische Holzenergiestatistik, Erhebung für das Jahr 2013, BFE 2014 (Tabellen 1.3, 1.5, D und E)

²⁾ spezifisches trockenes Abgasvolumen V_{ab} bei Bezugssauerstoffgehalt nach LRV (Feuerungswärmeleistung ≤ 1 MW: 13%vol O₂, > 1 MW: 11%vol O₂) bezogen auf eingesetztes Holz der Holzfeuchte u

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Concerning fine particle and dust emissions ("Staub"), just compare the numbers that I highlighted in turquoise (the unit is mg/MJ, i.e. a mass per unit of energy produced, not a mass per m³ of air!). A "normal" household heating has a power < 50kW; so comparing these, we see that wood burning has dust emissions per energy unit that are between 250 and 1000 times higher than corresponding oil or gas installations. That says it all!

PS: You may read the research paper "The Burning Question: does Forest Bioenergy Reduce Carbon Emissions" ([link](#))

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