Table S1. LCA results (FU: 1 kg dried material).

		Baseline				Scenario 1			
Impact category	**Unit**	**Natural gas**	**Light fuel oil**	**Biomethane**	**Hardwood chips**	**Natural gas**	**Light fuel oil**	**Biomethane**	**Hardwood chips**
Climate change	kg CO_2 eq	2.45E-02	2.74E-02	4.94E-03	2.21E-03	2.17E-02	2.37E-02	8.03E-03	6.12E-03
Ozone depletion	kg CFC11 eq	4.07E-09	4.97E-09	3.49E-10	2.27E-10	3.46E-09	4.09E-09	8.55E-10	7.70E-10
Ionising radiation	kBq U-235 eq	5.61E-04	9.74E-04	4.95E-04	1.44E-03	1.01E-03	1.30E-03	9.62E-04	1.62E-03
Photochemical ozone formation	kg NMVOC eq	2.50E-05	4.34E-05	1.27E-05	6.10E-05	2.76E-05	4.06E-05	1.90E-05	5.28E-05
Particulate matter	disease inc.	7.95E-11	3.71E-10	1.49E-10	3.29E-09	1.56E-10	3.60E-10	2.04E-10	2.40E-09
Human toxicity, non-cancer	CTUh	3.84E-11	8.96E-11	5.85E-11	2.25E-10	5.98E-11	9.57E-11	7.39E-11	1.91E-10
Human toxicity, cancer	CTUh	2.01E-12	1.85E-12	2.97E-12	5.46E-12	2.84E-12	2.73E-12	3.52E-12	5.26E-12
Acidification	mol H+ eq	2.65E-05	6.98E-05	2.25E-05	5.00E-05	4.11E-05	7.13E-05	3.82E-05	5.75E-05
Eutrophication, freshwater	kg P eq	8.72E-07	9.27E-07	1.37E-06	5.83E-07	1.70E-06	1.74E-06	2.05E-06	1.49E-06
Eutrophication, marine	kg N eq	5.67E-06	1.01E-05	4.06E-06	2.23E-05	7.24E-06	1.03E-05	6.11E-06	1.89E-05
Eutrophication, terrestrial	mol N eq	6.09E-05	1.09E-04	4.63E-05	2.52E-04	8.43E-05	1.18E-04	7.41E-05	2.18E-04
Ecotoxicity, freshwater	CTUe	3.42E-02	1.66E-01	6.93E-02	5.81E-01	7.33E-02	1.66E-01	9.79E-02	4.56E-01
Land use	Pt	1.01E-02	4.05E-02	4.15E-02	-1.16E-02	1.93E-02	4.06E-02	4.13E-02	4.11E-03
Water use	m^3 depriv.	2.41E-01	4.37E-01	7.72E-04	7.36E-01	1.71E-01	3.09E-01	3.53E-03	5.18E-01
Resource use, fossils	MJ	3.57E-01	3.76E-01	5.77E-02	3.60E-02	3.18E-01	3.32E-01	1.09E-01	9.37E-02
Resource use, minerals and metals	kg Sb eq	4.84E-09	5.74E-09	4.23E-08	4.88E-09	2.46E-08	2.53E-08	5.09E-08	2.47E-08
Climate change -	kg CO2 eq	2.45E-02	2.73E-02	4.02E-03	2.20E-03	2.16E-02	2.36E-02	7.32E-03	6.04E-03

Fossil									
Climate change - Biogenic	kg CO2 eq	8.31E-06	8.44E-06	9.21E-04	1.73E-05	6.96E-05	6.97E-05	7.08E-04	7.59E-05
Climate change - Land use and LU change	kg CO2 eq	1.77E-07	1.67E-07	5.01E-06	8.58E-08	9.67E-07	9.60E-07	4.35E-06	9.03E-07
Human toxicity, non-cancer - organics	CTUh	5.19E-12	7.65E-12	3.07E-12	7.89E-13	4.75E-12	6.47E-12	3.26E-12	1.67E-12
Human toxicity, non-cancer - inorganics	CTUh	9.47E-12	1.81E-11	1.42E-11	6.52E-11	1.36E-11	1.96E-11	1.69E-11	5.26E-11
Human toxicity, non-cancer - metals	CTUh	2.83E-11	6.50E-11	4.18E-11	1.59E-10	4.52E-11	7.09E-11	5.47E-11	1.37E-10
Human toxicity, cancer - organics	CTUh	1.01E-12	3.46E-13	1.56E-12	2.94E-12	1.32E-12	8.55E-13	1.70E-12	2.67E-12
Human toxicity, cancer - inorganics	CTUh	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Human toxicity, cancer - metals	CTUh	9.94E-13	1.50E-12	1.41E-12	2.52E-12	1.52E-12	1.88E-12	1.82E-12	2.59E-12
Ecotoxicity, freshwater - organics	CTUe	3.63E-04	2.13E-02	2.80E-04	7.58E-04	6.80E-04	1.53E-02	6.21E-04	9.56E-04
Ecotoxicity, freshwater - inorganics	CTUe	5.15E-03	5.15E-02	5.71E-03	2.41E-03	7.95E-03	4.04E-02	8.34E-03	6.03E-03
Ecotoxicity, freshwater - metals	CTUe	2.87E-02	9.37E-02	6.33E-02	5.78E-01	6.47E-02	1.10E-01	8.89E-02	4.49E-01

Table S2. eLCC results (FU: 1 kg dried material).

		Baseline				Scenario 1			
Damage category	**Unit**	**Natural gas**	**Light fuel oil**	**Biomethane**	**Hardwood chips**	**Natural gas**	**Light fuel oil**	**Biomethane**	**Hardwood chips**
Ecosystem services	ELU	9.61E-05	1.10E-04	1.51E-05	3.73E-06	8.49E-05	9.43E-05	2.81E-05	2.02E-05
Access to water	ELU	5.95E-06	6.77E-06	8.98E-07	1.85E-08	5.24E-06	5.82E-06	1.71E-06	1.09E-06
Biodiversity	ELU	3.05E-07	3.57E-07	4.95E-08	1.23E-08	2.72E-07	3.09E-07	9.35E-08	6.75E-08
Building technology	ELU	9.23E-07	1.01E-06	1.23E-07	-7.94E-09	7.96E-07	8.58E-07	2.36E-07	1.44E-07
Human health	ELU	3.13E-03	3.62E-03	8.37E-04	1.96E-03	2.87E-03	3.21E-03	1.26E-03	2.05E-03
Abiotic resources	ELU	3.89E-04	4.09E-03	3.94E-03	5.96E-04	2.40E-03	4.99E-03	4.89E-03	2.55E-03
TOTAL	ELU	3.62E-03	7.82E-03	4.80E-03	2.56E-03	5.36E-03	8.30E-03	6.18E-03	4.62E-03

Table S3. Contributions to LCA results: natural gas (FU: 1 kg dried material).

Impact category	Natural gas				
	Baseline		Scenario 1		
	Heat	Electricity	Heat	Electricity	Heat exchanger materials
Climate change	2.40E-02	4.95E-04	1.68E-02	4.78E-03	1.37E-04
Ozone depletion	4.00E-09	6.73E-11	2.80E-09	6.50E-10	7.69E-12
Ionising radiation	4.93E-04	6.78E-05	3.45E-04	6.55E-04	8.33E-06
Photochemical ozone formation	2.39E-05	1.07E-06	1.67E-05	1.03E-05	5.57E-07
Particulate matter	7.09E-11	8.60E-12	4.96E-11	8.30E-11	2.30E-11
Human toxicity. non-cancer	3.56E-11	2.82E-12	2.49E-11	2.72E-11	7.69E-12
Human toxicity. cancer	1.90E-12	1.11E-13	1.33E-12	1.07E-12	4.48E-13
Acidification	2.43E-05	2.25E-06	1.70E-05	2.17E-05	2.33E-06
Eutrophication. freshwater	7.59E-07	1.13E-07	5.31E-07	1.09E-06	7.68E-08
Eutrophication. marine	5.33E-06	3.43E-07	3.73E-06	3.31E-06	1.96E-07
Eutrophication. terrestrial	5.71E-05	3.82E-06	4.00E-05	3.69E-05	7.45E-06
Ecotoxicity. freshwater	2.94E-02	4.73E-03	2.06E-02	4.57E-02	7.04E-03
Land use	8.77E-03	1.30E-03	6.14E-03	1.25E-02	6.16E-04
Water use	2.40E-01	3.29E-04	1.68E-01	3.18E-03	3.96E-05
Resource use, fossils	3.49E-01	7.48E-03	2.45E-01	7.23E-02	1.50E-03
Resource use, minerals and metals	3.77E-09	1.07E-09	2.64E-09	1.03E-08	1.17E-08
Climate change - Fossil	2.40E-02	4.88E-04	1.68E-02	4.71E-03	1.36E-04
Climate change - Biogenic	1.23E-06	7.09E-06	8.58E-07	6.84E-05	2.96E-07
Climate change - Land use and LU change	1.14E-07	6.32E-08	7.96E-08	6.11E-07	2.76E-07
Human toxicity, non-cancer - organics	5.09E-12	1.02E-13	3.56E-12	9.84E-13	2.06E-13
Human toxicity, non-cancer - inorganics	8.84E-12	6.34E-13	6.18E-12	6.12E-12	1.26E-12
Human toxicity, non-cancer - metals	2.61E-11	2.14E-12	1.83E-11	2.07E-11	6.24E-12
Human toxicity, cancer - organics	9.65E-13	4.70E-14	6.75E-13	4.54E-13	1.92E-13
Human toxicity, cancer - inorganics	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Human toxicity, cancer - metals	9.31E-13	6.36E-14	6.51E-13	6.14E-13	2.57E-13
Ecotoxicity, freshwater - organics	3.19E-04	4.43E-05	2.23E-04	4.27E-04	2.90E-05
Ecotoxicity, freshwater - inorganics	4.77E-03	3.79E-04	3.34E-03	3.66E-03	9.45E-04
Ecotoxicity, freshwater - metals	2.44E-02	4.30E-03	1.71E-02	4.16E-02	6.06E-03

Table S4. Contributions to LCA results: light fuel oil (FU: 1 kg dried material).

Impact category	Light fuel oil				
	Baseline		Scenario 1		
	Heat	Electricity	Heat	Electricity	Heat exchanger materials
Climate change	2.69E-02	4.95E-04	1.88E-02	4.78E-03	1.37E-04
Ozone depletion	4.91E-09	6.73E-11	3.44E-09	6.50E-10	7.69E-12
Ionising radiation	9.06E-04	6.78E-05	6.34E-04	6.55E-04	8.33E-06
Photochemical ozone formation	4.24E-05	1.07E-06	2.97E-05	1.03E-05	5.57E-07
Particulate matter	3.63E-10	8.60E-12	2.54E-10	8.30E-11	2.30E-11
Human toxicity, non-cancer	8.68E-11	2.82E-12	6.08E-11	2.72E-11	7.69E-12
Human toxicity, cancer	1.73E-12	1.11E-13	1.21E-12	1.07E-12	4.48E-13
Acidification	6.75E-05	2.25E-06	4.73E-05	2.17E-05	2.33E-06
Eutrophication, freshwater	8.15E-07	1.13E-07	5.70E-07	1.09E-06	7.68E-08
Eutrophication, marine	9.71E-06	3.43E-07	6.80E-06	3.31E-06	1.96E-07
Eutrophication, terrestrial	1.05E-04	3.82E-06	7.36E-05	3.69E-05	7.45E-06
Ecotoxicity, freshwater	1.62E-01	4.73E-03	1.13E-01	4.57E-02	7.04E-03
Land use	3.92E-02	1.30E-03	2.74E-02	1.25E-02	6.16E-04
Water use	4.36E-01	3.29E-04	3.05E-01	3.18E-03	3.96E-05
Resource use, fossils	3.69E-01	7.48E-03	2.58E-01	7.23E-02	1.50E-03
Resource use, minerals and metals	4.67E-09	1.07E-09	3.27E-09	1.03E-08	1.17E-08
Climate change - Fossil	2.69E-02	4.88E-04	1.88E-02	4.71E-03	1.36E-04
Climate change - Biogenic	1.36E-06	7.09E-06	9.51E-07	6.84E-05	2.96E-07
Climate change - Land use and LU change	1.04E-07	6.32E-08	7.26E-08	6.11E-07	2.76E-07
Human toxicity, non-cancer - organics	7.55E-12	1.02E-13	5.29E-12	9.84E-13	2.06E-13
Human toxicity, non-cancer - inorganics	1.75E-11	6.34E-13	1.22E-11	6.12E-12	1.26E-12
Human toxicity, non-cancer - metals	6.29E-11	2.14E-12	4.40E-11	2.07E-11	6.24E-12
Human toxicity, cancer - organics	2.99E-13	4.70E-14	2.09E-13	4.54E-13	1.92E-13
Human toxicity, cancer - inorganics	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Human toxicity, cancer - metals	1.44E-12	6.36E-14	1.01E-12	6.14E-13	2.57E-13
Ecotoxicity, freshwater - organics	2.12E-02	4.43E-05	1.49E-02	4.27E-04	2.90E-05
Ecotoxicity, freshwater - inorganics	5.11E-02	3.79E-04	3.58E-02	3.66E-03	9.45E-04
Ecotoxicity, freshwater - metals	8.94E-02	4.30E-03	6.26E-02	4.16E-02	6.06E-03

Table S5. Contributions to LCA results: biomethane (FU: 1 kg dried material).

Impact category	Biomethane				
	Baseline		Scenario 1		
	Heat	Electricity	Heat	Electricity	Heat exchanger materials
Climate change	4.45E-03	4.95E-04	3.11E-03	4.78E-03	1.37E-04
Ozone depletion	2.82E-10	6.73E-11	1.97E-10	6.50E-10	7.69E-12
Ionising radiation	4.27E-04	6.78E-05	2.99E-04	6.55E-04	8.33E-06
Photochemical ozone formation	1.16E-05	1.07E-06	8.15E-06	1.03E-05	5.57E-07
Particulate matter	1.40E-10	8.60E-12	9.81E-11	8.30E-11	2.30E-11
Human toxicity, non-cancer	5.57E-11	2.82E-12	3.90E-11	2.72E-11	7.69E-12
Human toxicity, cancer	2.86E-12	1.11E-13	2.00E-12	1.07E-12	4.48E-13
Acidification	2.02E-05	2.25E-06	1.42E-05	2.17E-05	2.33E-06
Eutrophication, freshwater	1.26E-06	1.13E-07	8.82E-07	1.09E-06	7.68E-08
Eutrophication, marine	3.72E-06	3.43E-07	2.60E-06	3.31E-06	1.96E-07
Eutrophication, terrestrial	4.25E-05	3.82E-06	2.97E-05	3.69E-05	7.45E-06
Ecotoxicity, freshwater	6.46E-02	4.73E-03	4.52E-02	4.57E-02	7.04E-03
Land use	4.02E-02	1.30E-03	2.81E-02	1.25E-02	6.16E-04
Water use	4.43E-04	3.29E-04	3.10E-04	3.18E-03	3.96E-05
Resource use, fossils	5.02E-02	7.48E-03	3.51E-02	7.23E-02	1.50E-03
Resource use, minerals and metals	4.12E-08	1.07E-09	2.89E-08	1.03E-08	1.17E-08
Climate change - Fossil	3.53E-03	4.88E-04	2.47E-03	4.71E-03	1.36E-04
Climate change - Biogenic	9.14E-04	7.09E-06	6.40E-04	6.84E-05	2.96E-07
Climate change - Land use and LU change	4.95E-06	6.32E-08	3.46E-06	6.11E-07	2.76E-07
Human toxicity, non-cancer - organics	2.96E-12	1.02E-13	2.07E-12	9.84E-13	2.06E-13
Human toxicity, non-cancer - inorganics	1.36E-11	6.34E-13	9.50E-12	6.12E-12	1.26E-12
Human toxicity, non-cancer - metals	3.97E-11	2.14E-12	2.78E-11	2.07E-11	6.24E-12
Human toxicity, cancer - organics	1.51E-12	4.70E-14	1.06E-12	4.54E-13	1.92E-13
Human toxicity, cancer - inorganics	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Human toxicity, cancer - metals	1.35E-12	6.36E-14	9.46E-13	6.14E-13	2.57E-13
Ecotoxicity, freshwater - organics	2.36E-04	4.43E-05	1.65E-04	4.27E-04	2.90E-05
Ecotoxicity, freshwater - inorganics	5.33E-03	3.79E-04	3.73E-03	3.66E-03	9.45E-04
Ecotoxicity, freshwater - metals	5.90E-02	4.30E-03	4.13E-02	4.16E-02	6.06E-03

Table S6. Contributions to LCA results: hardwood chips (FU: 1 kg dried material).

Impact category	Hardwood chips				
	Baseline		Scenario 1		
	Heat	Electricity	Heat	Electricity	Heat exchanger materials
Climate change	1.72E-03	4.95E-04	1.20E-03	4.78E-03	1.37E-04
Ozone depletion	1.60E-10	6.73E-11	1.12E-10	6.50E-10	7.69E-12
Ionising radiation	1.37E-03	6.78E-05	9.57E-04	6.55E-04	8.33E-06
Photochemical ozone formation	5.99E-05	1.07E-06	4.19E-05	1.03E-05	5.57E-07
Particulate matter	3.28E-09	8.60E-12	2.30E-09	8.30E-11	2.30E-11
Human toxicity, non-cancer	2.22E-10	2.82E-12	1.56E-10	2.72E-11	7.69E-12
Human toxicity, cancer	5.35E-12	1.11E-13	3.74E-12	1.07E-12	4.48E-13
Acidification	4.78E-05	2.25E-06	3.34E-05	2.17E-05	2.33E-06
Eutrophication, freshwater	4.70E-07	1.13E-07	3.29E-07	1.09E-06	7.68E-08
Eutrophication, marine	2.20E-05	3.43E-07	1.54E-05	3.31E-06	1.96E-07
Eutrophication, terrestrial	2.48E-04	3.82E-06	1.74E-04	3.69E-05	7.45E-06
Ecotoxicity, freshwater	5.76E-01	4.73E-03	4.03E-01	4.57E-02	7.04E-03
Land use	-1.29E-02	1.30E-03	-9.05E-03	1.25E-02	6.16E-04
Water use	7.36E-01	3.29E-04	5.15E-01	3.18E-03	3.96E-05
Resource use, fossils	2.85E-02	7.48E-03	1.99E-02	7.23E-02	1.50E-03
Resource use, minerals and metals	3.81E-09	1.07E-09	2.67E-09	1.03E-08	1.17E-08
Climate change - Fossil	1.71E-03	4.88E-04	1.20E-03	4.71E-03	1.36E-04
Climate change - Biogenic	1.02E-05	7.09E-06	7.14E-06	6.84E-05	2.96E-07
Climate change - Land use and LU change	2.26E-08	6.32E-08	1.58E-08	6.11E-07	2.76E-07
Human toxicity, non-cancer - organics	6.87E-13	1.02E-13	4.81E-13	9.84E-13	2.06E-13
Human toxicity, non-cancer - inorganics	6.46E-11	6.34E-13	4.52E-11	6.12E-12	1.26E-12
Human toxicity, non-cancer - metals	1.57E-10	2.14E-12	1.10E-10	2.07E-11	6.24E-12
Human toxicity, cancer - organics	2.89E-12	4.70E-14	2.02E-12	4.54E-13	1.92E-13
Human toxicity, cancer - inorganics	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Human toxicity, cancer - metals	2.46E-12	6.36E-14	1.72E-12	6.14E-13	2.57E-13
Ecotoxicity, freshwater - organics	7.14E-04	4.43E-05	5.00E-04	4.27E-04	2.90E-05
Ecotoxicity, freshwater - inorganics	2.03E-03	3.79E-04	1.42E-03	3.66E-03	9.45E-04
Ecotoxicity, freshwater - metals	5.74E-01	4.30E-03	4.01E-01	4.16E-02	6.06E-03

Table S7. Contributions to eLCC results: natural gas (FU: 1 kg dried material).

Natural gas						
Damage category	**Unit**	**Baseline**		**Scenario 1**		
		Heat	**Electricity**	**Heat**	**Electricity**	**Heat exchanger materials**
Ecosystem services	ELU	9.42E-05	1.92E-06	6.59E-05	1.85E-05	3.76E-07
Access to water	ELU	5.83E-06	1.17E-07	4.08E-06	1.13E-06	2.93E-08
Biodiversity	ELU	2.98E-07	6.28E-09	2.09E-07	6.07E-08	2.56E-09
Building technology	ELU	9.06E-07	1.66E-08	6.34E-07	1.60E-07	1.04E-09
Human health	ELU	3.05E-03	7.21E-05	2.14E-03	6.96E-04	3.27E-05
Abiotic resources	ELU	2.54E-04	1.34E-04	1.78E-04	1.30E-03	0.000926
TOTAL	ELU	3.41E-03	2.08E-04	2.39E-03	2.01E-03	9.60E-04

Table S8. Contributions to eLCC results: light fuel oil (FU: 1 kg dried material).

Light fuel oil						
Damage category	**Unit**	**Baseline**		**Scenario 1**		
		Heat	**Electricity**	**Heat**	**Electricity**	**Heat exchanger materials**
Ecosystem services	ELU	0.000108	1.92E-06	7.54E-05	1.85E-05	3.76E-07
Access to water	ELU	6.65E-06	1.17E-07	4.66E-06	1.13E-06	2.93E-08
Biodiversity	ELU	3.50E-07	6.28E-09	2.45E-07	6.07E-08	2.56E-09
Building technology	ELU	9.96E-07	1.66E-08	6.97E-07	1.60E-07	1.04E-09
Human health	ELU	0.003547	7.21E-05	0.002483	6.96E-04	3.27E-05
Abiotic resources	ELU	0.003952	1.34E-04	0.002766	1.30E-03	0.000926
TOTAL	ELU	7.61E-03	2.08E-04	5.33E-03	2.01E-03	9.60E-04

Table S9. Contributions to eLCC results: biomethane (FU: 1 kg dried material).

Biomethane						
Damage category	**Unit**	**Baseline**		**Scenario 1**		
		Heat	**Electricity**	**Heat**	**Electricity**	**Heat exchanger materials**
Ecosystem services	ELU	1.31E-05	1.92E-06	9.20E-06	1.85E-05	3.76E-07
Access to water	ELU	7.81E-07	1.17E-07	5.46E-07	1.13E-06	2.93E-08
Biodiversity	ELU	4.33E-08	6.28E-09	3.03E-08	6.07E-08	2.56E-09
Building technology	ELU	1.07E-07	1.66E-08	7.48E-08	1.60E-07	1.04E-09
Human health	ELU	0.000764	7.21E-05	0.000535	6.96E-04	3.27E-05
Abiotic resources	ELU	0.00381	1.34E-04	0.002667	1.30E-03	0.000926
TOTAL	ELU	4.59E-03	2.08E-04	3.21E-03	2.01E-03	9.60E-04

Table S10. Contributions to eLCC results: hardwood chips (FU: 1 kg dried material).

Hardwood chips						
Damage category	**Unit**	**Baseline**		**Scenario 1**		
		Heat	**Electricity**	**Heat**	**Electricity**	**Heat exchanger materials**
Ecosystem services	ELU	1.81E-06	1.92E-06	1.27E-06	1.85E-05	3.76E-07
Access to water	ELU	-9.88E-08	1.17E-07	-6.92E-08	1.13E-06	2.93E-08
Biodiversity	ELU	6.04E-09	6.28E-09	4.23E-09	6.07E-08	2.56E-09
Building technology	ELU	-2.45E-08	1.66E-08	-1.72E-08	1.60E-07	1.04E-09
Human health	ELU	0.00189	7.21E-05	0.001323	6.96E-04	3.27E-05
Abiotic resources	ELU	0.000462	1.34E-04	0.000323	1.30E-03	0.000926
TOTAL	ELU	2.35E-03	2.08E-04	1.65E-03	2.01E-03	9.60E-04

Table S11. LCA results: electricity 100% hydroelectric (FU: 1 kg dried material).

		Baseline				Scenario 1			
Impact category	**Unit**	**Natural gas**	**Light fuel oil**	**Biomethane**	**Hardwood chips**	**Natural gas**	**Light fuel oil**	**Biomethane**	**Hardwood chips**
Climate change	kg CO_2 eq	2.40E-02	2.69E-02	4.45E-03	1.72E-03	1.70E-02	1.90E-02	3.31E-03	1.40E-03
Ozone depletion	kg CFC11 eq	4.01E-09	4.91E-09	2.82E-10	1.60E-10	2.82E-09	3.45E-09	2.09E-10	1.24E-10
Ionising radiation	kBq U-235 eq	4.94E-04	9.07E-04	4.28E-04	1.37E-03	3.63E-04	6.53E-04	3.17E-04	9.76E-04
Photochemical ozone formation	kg NMVOC eq	2.40E-05	4.24E-05	1.17E-05	5.99E-05	1.75E-05	3.04E-05	8.93E-06	4.27E-05
Particulate matter	disease inc.	7.15E-11	3.63E-10	1.41E-10	3.28E-09	7.88E-11	2.83E-10	1.27E-10	2.33E-09
Human toxicity, non-cancer	CTUh	3.57E-11	8.69E-11	5.58E-11	2.22E-10	3.39E-11	6.98E-11	4.80E-11	1.65E-10
Human toxicity, cancer	CTUh	1.91E-12	1.75E-12	2.87E-12	5.36E-12	1.88E-12	1.77E-12	2.55E-12	4.29E-12
Acidification	mol H+ eq	2.43E-05	6.75E-05	2.02E-05	4.78E-05	1.96E-05	4.98E-05	1.67E-05	3.60E-05
Eutrophication, freshwater	kg P eq	7.60E-07	8.16E-07	1.26E-06	4.72E-07	6.23E-07	6.61E-07	9.74E-07	4.21E-07
Eutrophication, marine	kg N eq	5.33E-06	9.72E-06	3.73E-06	2.20E-05	4.00E-06	7.07E-06	2.87E-06	1.56E-05
Eutrophication, terrestrial	mol N eq	5.72E-05	1.05E-04	4.25E-05	2.48E-04	4.82E-05	8.18E-05	3.80E-05	1.82E-04
Ecotoxicity, freshwater	CTUe	2.95E-02	1.62E-01	6.46E-02	5.76E-01	2.82E-02	1.21E-01	5.28E-02	4.11E-01
Land use	Pt	8.73E-03	3.91E-02	4.02E-02	-1.30E-02	6.32E-03	2.76E-02	2.83E-02	-8.87E-03
Water use	m^3 depriv.	1.12E+00	1.31E+00	8.79E-01	1.61E+00	8.66E+00	8.79E+00	8.49E+00	9.00E+00
Resource use, fossils	MJ	3.50E-01	3.69E-01	5.02E-02	2.85E-02	2.47E-01	2.60E-01	3.72E-02	2.20E-02
Resource use, minerals and metals	kg Sb eq	3.79E-09	4.69E-09	4.13E-08	3.84E-09	1.45E-08	1.51E-08	4.07E-08	1.45E-08
Climate change –	kg CO2 eq	2.40E-02	2.69E-02	3.53E-03	1.71E-03	1.70E-02	1.90E-02	2.66E-03	1.39E-03

Fossil									
Climate change – Biogenic	kg CO2 eq	1.60E-06	1.73E-06	9.14E-04	1.06E-05	4.77E-06	4.86E-06	6.44E-04	1.11E-05
Climate change - Land use and LU change	kg CO2 eq	1.14E-07	1.04E-07	4.95E-06	2.27E-08	3.57E-07	3.50E-07	3.74E-06	2.93E-07
Human toxicity, non-cancer – organics	CTUh	5.09E-12	7.55E-12	2.96E-12	6.88E-13	3.78E-12	5.50E-12	2.29E-12	7.00E-13
Human toxicity, non-cancer – inorganics	CTUh	8.86E-12	1.75E-11	1.36E-11	6.46E-11	7.66E-12	1.37E-11	1.10E-11	4.67E-11
Human toxicity, non-cancer – metals	CTUh	2.62E-11	6.30E-11	3.98E-11	1.57E-10	2.56E-11	5.13E-11	3.51E-11	1.17E-10
Human toxicity, cancer - organics	CTUh	9.65E-13	3.00E-13	1.51E-12	2.89E-12	8.72E-13	4.06E-13	1.25E-12	2.22E-12
Human toxicity, cancer – inorganics	CTUh	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Human toxicity, cancer – metals	CTUh	9.41E-13	1.45E-12	1.36E-12	2.47E-12	1.01E-12	1.36E-12	1.30E-12	2.07E-12
Ecotoxicity, freshwater - organics	CTUe	3.20E-04	2.12E-02	2.37E-04	7.16E-04	2.67E-04	1.49E-02	2.08E-04	5.43E-04
Ecotoxicity, freshwater – inorganics	CTUe	4.77E-03	5.11E-02	5.34E-03	2.04E-03	4.33E-03	3.68E-02	4.73E-03	2.42E-03
Ecotoxicity, freshwater - metals	CTUe	2.44E-02	8.94E-02	5.91E-02	5.74E-01	2.36E-02	6.91E-02	4.79E-02	4.08E-01

Table S12. eLCC results: electricity 100% hydroelectric (FU: 1 kg dried material).

		Baseline				Scenario 1			
Damage category	**Unit**	**Natural gas**	**Light fuel oil**	**Biomethane**	**Hardwood chips**	**Natural gas**	**Light fuel oil**	**Biomethane**	**Hardwood chips**
Ecosystem services	ELU	9.42E-05	1.08E-04	1.32E-05	6.65E-05	7.60E-05	9.79E-06	1.86E-06	6.65E-05
Access to water	ELU	5.83E-06	6.66E-06	7.82E-07	4.12E-06	4.70E-06	5.88E-07	-2.72E-08	4.12E-06
Biodiversity	ELU	2.98E-07	3.51E-07	4.33E-08	2.12E-07	2.49E-07	3.35E-08	7.48E-09	2.12E-07
Building technology	ELU	9.06E-07	9.96E-07	1.07E-07	6.37E-07	7.00E-07	7.77E-08	-1.42E-08	6.37E-07
Human health	ELU	3.06E-03	3.55E-03	7.66E-04	2.18E-03	2.53E-03	5.83E-04	1.37E-03	2.18E-03
Abiotic resources	ELU	2.57E-04	3.95E-03	3.81E-03	1.13E-03	3.72E-03	3.62E-03	1.28E-03	1.13E-03
TOTAL	ELU	3.41E-03	7.62E-03	4.59E-03	3.39E-03	6.33E-03	4.21E-03	2.65E-03	3.39E-03

Table S13. Ecoinvent dataset used in the analysis

Natural gas – 1 MJ heat dataset used:	**Heat. natural gas. at boiler modulating <100kW/RER**
Specific dataset for natural gas fuel:	*Natural gas. low pressure. at consumer/CH U*
Main characteristics:	Included processes: This dataset describes the energy requirements and the emissions of the low pressure distribution network in Switzerland. Remark: Total network losses are based on published data. repartition of losses on high and low pressure network on calculations with data for other countries.
Light fuel oil – 1 MJ heat dataset used:	**Light fuel oil. burned in boiler 100kW. non-modulating/CH**
Specific dataset for light fuel oil:	*Light fuel oil. at regional storage/CH*
Main characteristics:	Included processes: Transportation of product from the refinery to the end user. Operation of storage tanks and petrol stations. Emissions from evaporation and treatment of effluents. Excluding emissions from car-washing at petrol stations. Remark: Inventory for the distribution of petroleum product to the final consumer (household. car. power plant. etc.) including all necessary transports.
Biomethane – 1 MJ heat dataset used:	**Heat. central or small-scale. biomethane {Europe without Switzerland}| market for heat. central or small-scale. biomethane**
Specific dataset for biomethane fuel:	*Biomethane. high pressure {RoW}| market for biomethane. high pressure*
Main characteristics:	This dataset describes the energy requirements and the emissions of the high pressure distribution network of biomethane. This dataset is based on the dataset ""market for natural gas. high pressure. CH"". Modelling of network losses and energy requirements are adopted from the latter dataset: total network losses are based on published data. repartition of losses on high and low pressure network on calculations with data for other countries. For biomethane no long distance high pressure pipeline transport within Switzerland is taken into account. Biomethane is produced domestically in Switzerland and leaves the purification plant at a pressure of 5 bar. It is therefore assumed to be fed directly into the high pressure distribution network.
Hardwood chips – 1 MJ heat dataset used:	**Heat. hardwood chips from forest. at furnace 50kW/CH**

Specific dataset for hardwood chips fuel:	*Wood chips. from forest. hardwood. burned in furnace 50kW/CH*
Main characteristics:	Included processes: This module describes the combustion of natural wood chips. Included are the infrastructure. the wood requirements (hardwood chips from forest. u=80%). the emissions to air. the transport of the fuel. the electricity needed for operation. and the disposal of the ashes. Remark: Heat of combustion of wood based on low heating value. Characteristics of the available dataset of wood chips (humidity = 140%) as fuel input has been adjusted to actual humidity of 50%. which is achieved after some weeks of drying. The apparent density of the chips is 430 kg/m^3. the bulk density is 239 kg/m^3. and the low heating value is 4044 MJ/m^3. Air emission factors from measurements were adjusted based on operation experience of installed furnace. The inventory shall be considered valid also for boilers with nominal capacity in the approximate range of 30 to 100 kW.
Electricity from the grid – 1 kWh dataset used:	**Electricity. medium voltage {IT}| market for**
Main characteristics:	This activity starts from 1kWh of electricity fed into the medium voltage transmission network. This activity ends with the transport of 1 kWh of medium voltage electricity in the transmission network over aerial lines and cables. This dataset includes: electricity inputs produced in this country and from imports and transformed to medium voltage; the transmission network; direct emissions to air (SF6 from the insulation gas in the high voltage level switchgear are allocated to the electricity demand on medium voltage); electricity losses during transmission. This dataset doesn't include: electricity losses during transformation from high to medium voltage or medium to low. as these are included in the dataset for transformation; leakage of insulation oil from cables and electro technical equipment (transformers. switchgear. circuit breakers) because this only happens in case of accidental release; SF6 emissions during production and deconstruction of the switchgear. as these are accounted for in the transmission network dataset.
Electricity 100% hydoelectric – 1 kWh dataset used:	**Electricity. hydropower. at power plant/IT**
Main characteristics:	This dataset includes shares of electricity produced by of run-of-river and reservoir hydropower plants. Remark: Electricity production shares are determined on annual average and on the level of net production. The module for reservoir hydropower plants describes the average operation of major Swiss dams. It includes the area occupied; a preliminary estimation of greenhouse gas emissions out of the water

	reservoir; lubricant oil; volume of the reservoir; mass of water passing through the turbines. The module for run-of-river plants describes a representative mix of 4 Swiss and 1 Austrian run-of-river power plants. It includes the area occupied; lubricant oil; mass of water passing through the turbines.