Short description

Source category 1.A.4 comprises stationary combustion systems in the sectors *Commercial and Institutional (1.A.4.a)*, *Residential (1.A.4.b)*, and *Agriculture (1.A.4.c)*.

~ NFR-Code	~ Name of Category
= **1.A.4**	= **Small Combustion**
~ including / consisting of sub-categories	
= 1.A.4.a i	Commercial and Institutional: Stationary Combustion]
= 1.A.4.b i	Residential: Stationary Combustion]
= 1.A.4.c i	Agriculture/Forestry/Fishing: Stationary]

Method

Activity data

The activity data in source category *1.A.4* are based on the Energy Balance for the Federal Republic of Germany prepared by the Working Group on Energy Balances (AGEB). For the period prior to 1995, separate Energy Balances are used for the new and old German Länder. Lines 66 (residential) and 67 (commercial, trade, services and other consumers) of the Energy Balance are of primary importance.

At present, the final Energy Balances are published with a delay of one year. This means that Energy Balances until 2017 are available. In order to meet the requirements of up-to-date emissions reporting, the Working Group on Energy Balances (AGEB) has prepared a provisional Energy Balance for the year 2018. Every year, in the summer, the Working Group on Energy Balances provides a provisional Energy Balance of the past year.

Since large quantities of wood fuels, used in households and in commerce and trade, are purchased privately or obtained from system owners' own forest parcels, data are outside official statistics. For this reason, in the Energy Balance, the relevant data from the Federal Statistical Office are supplemented with data from a survey of firewood consumption in private households. Data relative to use of firewood in the source categories commercial and institutional are based on a study from the year 2000. The consumption-level figures determined in that study have been adopted for subsequent years since then.

Energy data and emissions from small engines using biomass as fuel are reported in source category 1.A.1.a, since all the plants feed electricity into the local network. However a small amount of biogas and liquid biofuel, used for heat production, is reported in source category 1.A.4. The determination of these fuel activities is a result of a comprehensive evaluation of invoicing data of the EEG (Renewable Energy Law), provided by the Federal Network Agency. The EEG-accounting system contains primarily electricity generation data, but also additional information, since a bonus is paid for heat extraction. For the calculation a typical power to heat ratio is necessary according to manufacturers specification.

++ Emission factors

The database for the emission factors used for NO,,x,,, SO,,2,,, NMVOC, CO, TSP, PM,,10,,, PM,,2.5,,, heavy metals, PCDD/PCDF and PAH is the research report “Efficient provision of current emissions data for purposes of air quality control” (“Effiziente Bereitstellung aktueller Emissionsdaten für die Luftreinhaltung”; Struschka 2008). Within the context of that project, appliance-related and source-

category-specific emission factors for the combustion systems in the residential and commercial/ institutional sectors were calculated, with a high level of detail, for all important emission components for the reference year 2005. In 2016 the revision of the emission factors for the main pollutants was necessary due to changes in legislation. Data source for emission factors of several pollutants from 2010 onwards is the research report “Ermittlung und Aktualisierung von Emissionsfaktoren für das nationale Emissionsinventar bezüglich kleiner und mittlerer Feuerungsanlagen der Haushalte und Kleinverbraucher”; Tebert, 2016) The determination of emission factors is based on a source-category-specific “bottom-up” approach that, in addition, to differentiating (sub-) source categories and fuels, also differentiates appliance technologies in detail. In the process, several technology-specific emission factors are aggregated in order to obtain mean emission factors for all systems within the source categories in question. Use of system-specific / category-specific emission factors ensures that all significant combustion-related characteristics of typical systems for the various categories are taken into account. The procedure is in keeping with the Tier-2 and Tier-3 methods, respectively. The emission factors are structured in accordance with the relevant fuels involved in final energy consumption in Germany: * Light Heating Oil, * Natural gas, * Lignite (briquettes from Rhine and Lausitz areas, and imported briquettes), * Hard coal (coke, briquettes, anthracite) and * Wood (unprocessed wood, wood pellets, residual wood). In addition, emission factors for combustion systems are determined in accordance with device design, age level, output category and typical mode of operation. The emissions behaviour of the combustion systems in question were determined via a comprehensive review of the literature, in an approach that distinguished between results from test-bench studies and field measurements. Transfer factors were used to take account of the fact that emissions in a test-bench environment tend to be considerably lower than those of corresponding installed systems. The description of the structure for installed combustion systems was prepared using statistics from the chimney-sweeping trade, as well as with the help of surveys conducted by the researchers themselves in selected chimney-sweep districts of Baden-Wuerttemberg, North-Rhine Westphalia and Saxony. These data were used to estimate the energy inputs for various system types, to make it possible to determine sectoral emission factors weighted by energy inputs.

The SO,,2,, emission factors for natural gas and lignite briquettes is calculated by the sulfur content of the fuel which is determined by measurents. In terms of light fuel oil the limit values were used. Since 2008 there are two qualities of light fuel oil available: fuel oil with a sulfur content of 1000 mg/kg and fuel oil with a sulfur content of 50 mg/kg. In small combustion plants nowadays almost exclusively low-sulfur fuel oil is used. the share of the different light fuel oil qualities is annually available from the oil statistic. Regarding lignite briquettes can be assumed that 10 % of the sulfur were stored in the ash while 90 % were emitted as SO,,2,,. Since the sulfur content of lignite briquettes depends on the region, a weighted average emission factor has been calculated.

Black carbon emission factors are given by the EMEP EEA Guidebook 2016.

More detailed information on emission factors for different pollutants are provided within the sub-chapters for 1.A.4.a.i], 1.A.4.b.i], and 1.A.4.c.i].

+ Trend Discussion for Key Sources

More detailed information on key source emissions trends are provided within the sub-chapters for 1.A.4.a.i], 1.A.4.b.i], and 1.A.4.c.i].

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