(This document is the English translation of the Swedish original document)

Listing of GWP Values as per Report IPCC WG1 AR4

Replaces FMV-dokument 47238/2007 edition 1.0

Background

The climate effects of a greenhouse gas depends on the ability of the gas to absorb heat radiation, how long the gas remains in the atmosphere, and on the amount of gas supplied to the atmosphere. In order to make it possible to compare the effects of different gases in an easy manner one often uses the so called GWP value of the gas (where GWP stands for Global Warming Potential) or its greenhouse gas potential. Since the greenhouse gases exhibit different dwell times in the atmosphere one can calculate the GWP for different time intervals. It is common to use a time perspective of a hundred years, but other time perspectives are sometimes also used. Usually one normalises the other greenhouse gases using carbon dioxide, which therefore always has a greenhouse potential of one (GWP = 1).

The greenhouse gases covered by the Kyoto protocol are carbon dioxide, methane, nitrous oxide (laughing gas), hydro-fluoro-carbons (HFC), fluorocarbons (FC) and sulphur hexafluoride (SF_6). Ozone depleting substances (ODS), which can also have climate effects (such as CFC and HCFC), are phased out in accordance with the so called Montreal protocol.

The Defence sector's criteria document – Chemical substances, chemical products and articles contains requirement levels for GWP.

Abbreviations

GWP = Global Warming Potential.

IPCC = Intergovernmental Panel on Climate Change.
The IPCC is a scientific intergovernmental body set up by the World Meteorological Organization (WMO) and by the United Nations Environment Programme (UNEP).

WG1 AR4 Report = Working Group 1, IPCC Fourth Assessment Report.

Use

The GWP values used for comparison with the limits in the criteria document is GWP 100 years. These values are highlighted in grey in the table below (*e.g.* the GWP value for sulphur hexafluoride is 22 800).

References

The website of IPCC http://www.ipcc.ch/

The website of the Swedish Environmental Protection Agency http://naturvardsverket.se/sv/

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Extract of table 2.14 (errata) from IPCC WG1 AR4 Report (*Lifetimes, radiative efficiences and direct (except for CH_4) GWPs relative to CO_2. For ozone-depleting substances and their replacements, data are taken from IPCC/TEAP (2005) unless otherwise stated*). The table can be found at: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/erratataserrata-errata.html#table214.

Industrial Designation or Common Name	Chemical Formula	Lifetime (years)	Radiative Efficiency (W m^{-2} ppb^{-1})	Global Warming Potential For Given Time Horizon			
				SAR‡ (100-yr)	20-yr	100-yr	500-yr
Carbon dioxide	**CO_2**	See below[a]	[b]1.4x10^{-5}	1	1	**1**	1
Methane	**CH_4**	12[c]	3.7x10^{-4}	21	72	**25**	7.6
Nitrous oxide	**N_2O**	114	3.03x10^{-3}	310	289	**298**	153
Substances controlled by the Montreal Protocol							
CFC-11	**CCl_3F**	45	0.25	3,800	6,730	**4,750**	1,620
CFC-12	**CCl_2F_2**	100	0.32	8,100	11,000	**10,900**	5,200
CFC-13	**$CClF_3$**	640	0.25		10,800	**14,400**	16,400
CFC-113	**CCl_2FCClF_2**	85	0.3	4,800	6,540	**6,130**	2,700
CFC-114	**$CClF_2CClF_2$**	300	0.31		8,040	**10,000**	8,730
CFC-115	**$CClF_2CF_3$**	1,700	0.18		5,310	**7,370**	9,990
Halon-1301	**$CBrF_3$**	65	0.32	5,400	8,480	**7,140**	2,760
Halon-1211	**$CBrClF_2$**	16	0.3		4,750	**1,890**	575
Halon-2402	**$CBrF_2CBrF_2$**	20	0.33		3,680	**1,640**	503
Carbon tetrachloride	**CCl_4**	26	0.13	1,400	2,700	**1,400**	435
Methyl bromide	**CH_3Br**	0.7	0.01		17	**5**	1
Methyl chloroform	**CH_3CCl_3**	5	0.06	100*	506	**146**	45
HCFC-21	**$CHCl_2F$**	1.7	0.14		530	**151**	46
HCFC-22	**$CHClF_2$**	12	0.2	1,500	5,160	**1,810**	549
HCFC-123	**$CHCl_2CF_3$**	1.3	0.14	90	273	**77**	24
HCFC-124	**$CHClFCF_3$**	5.8	0.22	470	2,070	**609**	185
HCFC-141b	**CH_3CCl_2F**	9.3	0.14	600	2,250	**725**	220
HCFC-142b	**CH_3CClF_2**	17.9	0.2	1,800	5,490	**2,310**	705
HCFC-225ca	**$CHCl_2CF_2CF_3$**	1.9	0.2		429	**122**	37
HCFC-225cb	**$CHClFCF_2CClF_2$**	5.8	0.32		2,030	**595**	181
Hydrofluorocarbons							
HFC-23	**CHF_3**	270	0.19	11,700	12,000	**14,800**	12,200
HFC-32	**CH_2F_2**	4.9	0.11	650	2,330	**675**	205
HFC-41	**CH_3F**	2.4	0.02	150	323	**92**	28
HFC-125	**CHF_2CF_3**	29	0.23	2,800	6,350	**3,500**	1,100
HFC-134	**CHF_2CHF_2**	9.6	0.18	1000	3,400	**1,100**	335
HFC-134a	**CH_2FCF_3**	14	0.16	1,300	3,830	**1,430**	435
HFC-143	**CH_2FCHF_2**	3.5	0.13	300	1,240	**353**	107
HFC-143a	**CH_3CF_3**	52	0.13	3,800	5,890	**4,470**	1,590
HFC-152	**CH_2FCH_2F**	0.60	0.09		187	**53**	16
HFC-152a	**CH_3CHF_2**	1.4	0.09	140	437	**124**	38
HFC-161	**CH_3CH_2F**	0.3	0.03		43	**12**	3.7
HFC-227ea	**CF_3CHFCF_3**	34.2	0.26	2,900	5,310	**3,220**	1,040
HFC-236cb	**$CH_2FCF_2CF_3$**	13.6	0.23		3,630	**1,340**	407
HFC-236ea	**CHF_2CHFCF_3**	10.7	0.3		4,090	**1,370**	418
HFC-236fa	**$CF_3CH_2CF_3$**	240	0.28	6,300	8,100	**9,810**	7,660

HFC-245ca	$CH_2FCF_2CHF_2$	6.2	0.23	560	2,340	**693**	211
HFC-245fa	$CHF_2CH_2CF_3$	7.6	0.28		3,380	**1,030**	314
HFC-365mfc	$CH_3CF_2CH_2CF_3$	8.6	0.21		2,520	**794**	241
HFC-43-10mee	$CF_3CHFCHFCF_2CF_3$	15.9	0.4	1,300	4,140	**1,640**	500
Perfluorinated compounds							
Sulphur hexafluoride	SF_6	3,200	0.52	23,900	16,300	**22,800**	32,600
Nitrogen trifluoride	NF_3	740	[d]0.21		12,300	**17,200**	20,700
PFC-14	CF_4	50,000	[e]0.10	6,500	5,210	**7,390**	11,200
PFC-116	C_2F_6	10,000	0.26	9,200	8,630	**12,200**	18,200
PFC-218	C_3F_8	2,600	0.26	7,000	6,310	**8,830**	12,500
PFC-318	$c\text{-}C_4F_8$	3,200	0.32	8,700	7,310	**10,300**	14,700
PFC-3-1-10	C_4F_{10}	2,600	0.33	7,000	6,330	**8,860**	12,500
PFC-4-1-12	C_5F_{12}	4,100	0.41	7,500	6,510	**9,160**	13,300
PFC-5-1-14	C_6F_{14}	3,200	0.49	7,400	6,600	**9,300**	13,300
PFC-9-1-18	$C_{10}F_{18}$	>1,000[f]	0.56		>5,500	**>7,500**	>9,500
Trifluoromethyl sulphur pentafluoride	SF_5CF_3	800	0.57		13,200	**17,700**	21,200
Perfluorocyclopropane	$c\text{-}C_3F_6$	>1000	0.42		>12,700	**>17,340**	>21,800
Fluorinated ethers							
HFE-125	CHF_2OCF_3	136	0.44		13,800	**14,900**	8,490
HFE-134	CHF_2OCHF_2	26	0.45		12,200	**6,320**	1,960
HFE-143a	CH_3OCF_3	4.3	0.27		2,630	**756**	230
HCFE-235da2	$CHF_2OCHClCF_3$	2.6	0.38		1,230	**350**	106
HFE-245cb2	$CH_3OCF_2CF_3$	5.1	0.32		2,440	**708**	215
HFE-245fa2	$CHF_2OCH_2CF_3$	4.9	0.31		2,280	**659**	200
HFE-254cb2	$CH_3OCF_2CHF_2$	2.6	0.28		1,260	**359**	109
HFE-347mcc3	$CH_3OCF_2CF_2CF_3$	5.2	0.34		1,980	**575**	175
HFE-347pcf2	$CHF_2CF_2OCH_2CF_3$	7.1	0.25		1,900	**580**	175
HFE-356pcc3	$CH_3OCF_2CF_2CHF_2$	0.33	0.93		386	**110**	33
HFE-449sl (HFE-7100)	$C_4F_9OCH_3$	3.8	0.31		1,040	**297**	90
HFE-569sf2 (HFE-7200)	$C_4F_9OC_2H_5$	0.77	0.3		207	**59**	18
HFE-43-10pccc124 (H-Galden 1040x)	$CHF_2OCF_2OC_2F_4OCHF_2$	6.3	1.37		6,320	**1,870**	569
HFE-236ca12 (HG-10)	$CHF_2OCF_2OCHF_2$	12.1	0.66		8,000	**2,800**	860
HFE-338pcc13 (HG-01)	$CHF_2OCF_2CF_2OCHF_2$	6.2	0.87		5,100	**1,500**	460
	$(CF_3)_2CFOCH_3$	3.4	0.31		1204	**343**	104
	$CF_3CF_2CH_2OH$	0.4	0.24		147	**42**	13
	$(CF_3)_2CHOH$	1.8	0.28		687	**195**	59
HFE-227ea	$CF_3CHFOCF_3$	11	0.40		4,540	**1,540**	468
HFE-236ea2	$CHF_2OCHFCF_3$	5.8	0.44		3,370	**989**	301
HFE-236fa	$CF_3CH_2OCF_3$	3.7	0.34		1,710	**487**	148
HFE-245fa1	$CHF_2CH_2OCF_3$	2.2	0.30		1,010	**286**	87
HFE 263fb2	$CF_3CH_2OCH_3$	0.2	0.1		38	**11**	3
HFE-329mcc2	$CHF_2CF_2OCF_2CF_3$	6.8	0.49		3,060	**919**	279
HFE-338mcf2	$CF_3CH_2OCF_2CF_3$	4.3	0.43		1,920	**552**	168
HFE-347mcf2	$CHF_2CH_2OCF_2CF_3$	2.8	0.41		1,310	**374**	114
HFE-356mec3	$CH_3OCF_2CHFCF_3$	0.94	0.30		355	**101**	31
HFE-356pcf2	$CHF_2CH_2OCF_2CHF_2$	2.0	0.37		931	**265**	80
HFE-356pcf3	$CHF_2OCH_2CF_2CHF_2$	3.6	0.39		1,760	**502**	153
HFE 365mcf3	$CF_3CF_2CH_2OCH_3$	0.27	0.11		41	**11**	4

HFE-374pc2	**$CHF_2CF_2OCH_2CH_3$**	5.0	0.25		1,930	**557**	169
	- $(CF_2)_4CH(OH)$ -	0.3	0.85		258	**73**	23
	$(CF_3)_2CHOCHF_2$	3.1	0.41		1,330	**380**	115
	$(CF_3)_2CHOCH_3$	0.25	0.30		94	**27**	8.2
Perfluoropolyethers							
PFPMIE	**$CF_3OCF(CF_3)CF_2OCF_2OCF_3$**	800	0.65		7,620	**10,300**	12,400
Hydrocarbons and other compounds – Direct Effects							
Dimethylether	**CH_3OCH_3**	0.015	0.02		1	**1**	<<1
Chloroform	**$CHCl_3$**	0.51	0.11	4	108	**31**	9.3
Methylene chloride	**CH_2Cl_2**	0.38	0.03	9	31	**8.7**	2.7
Methyl chloride	**CH_3Cl**	1.0	0.01		45	**13**	4
	CH_2Br_2	0.41	0.01		5.4	**1.54**	0.47
Halon-1201	**$CHBrF_2$**	5.8	0.14		1,380	**404**	123
Trifluoroiodomethane	**CF_3I**	0.005	0.23	<1	1	**0.4**	0.1

Notes:
[a] The CO_2 response function used in this report is based on the revised version of the Bern Carbon cycle model used in Chapter 10 of this report (Bern2.5CC; Joos et al. 2001) using a background CO_2 concentration value of 378 ppm. The decay of a pulse of CO_2 with time t is given by

$$a_0 + \sum_{i=1}^{3} a_i \cdot e^{-t/\tau_i}$$

Where $a_0 = 0.217$, $a_1 = 0.259$, $a_2 = 0.338$, $a_3 = 0.186$, $\tau_1 = 172.9$ years, $\tau_2 = 18.51$ years, and $\tau_3 = 1.186$ years.
[b] The radiative efficiency of CO_2 is calculated using the IPCC (1990) simplified expression as revised in the TAR, with an updated background concentration value of 378 ppm and a perturbation of +1 ppm (see Section 2.10.2).
[c] The perturbation lifetime for methane is 12 years as in the TAR (see also Section 7.4). The GWP for methane includes indirect effects from enhancements of ozone and stratospheric water vapour (see Section 2.10.3.1).
[d] Robson et al. (2006)
[e] Hurley et al. (2005)
[f] Shine et al. (2005c), updated by the revised AGWP for CO_2. The assumed lifetime of 1,000 years is a lower limit.
[‡] Second Assessment Report (IPCC, 1996)
* Compound in SAR (Table 2.8) was erroneously listed as CH_3Cl_3.

SWEDISH DEFENCE MATERIEL ADMINISTRATION

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