

	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN
1	, and fugitive methane										Entity emissions from combustion, venting, flaring, and fugitive methane																											
2											Richard Heede Climate Accountability Institute 19-Oct-20																											
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6																																						
7	Peabody Energy, USA										Peabody Energy, USA																											
8																																						
9																																						
10	1920s					1930s					1940s					1950s																						
11	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
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18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	7	10	13	16	27	21	16	18	23	43	45	44	51	56	58	
19																																						
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	7	10	13	16	27	21	16	18	23	43	45	44	51	56	58
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33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	
38																																						
39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	1	1	2	3	2	2	2	3	5	5	5	6	6	7
42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	1	1	2	3	2	2	3	5	5	5	6	6	7	
43																																						
44																																						
45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	8	11	14	18	30	24	18	20	25	48	51	49	56	63	65
46																																						
47																																						
48	3,525	3,573	3,606	3,891	3,906	4,195	3,855	3,441	3,104	3,276	3,565	3,759	4,141	4,430	4,188	4,364	4,760	4,884	4,914	5,097	5,068	4,254	4,536	5,104	5,383	5,199	5,976	6,475	6,577	6,742	6,834	7,490	7,977	8,318	8,538	8,857	9,345	9,366
49	962	975	984	1,062	1,066	1,145	1,052	939	847	894	973	1,026	1,130	1,209	1,143	1,191	1,299	1,333	1,341	1,391	1,383	1,161	1,238	1,393	1,469	1,419	1,631	1,767	1,795	1,840	1,865	2,044	2,177	2,270	2,330	2,417	2,550	2,556
50	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.09%	0.14%	0.19%	0.25%	0.27%	0.41%	0.33%	0.24%	0.27%	0.30%	0.54%	0.55%	0.51%	0.57%	0.60%	0.62%
51																																						
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53																																						
54	21.1	21.2	21.2	23.0	22.8	24.4	22.3	19.9	17.9	18.8	20.4	21.0	23.3	24.8	23.4	24.8	26.2	27.0	27.0	27.4	26.9	23.5	24.7	27.6	29.2	28.1	30.4	32.2	32.7	33.1	33.1	35.9	38.4	39.7	40.9	42.7	44.6	44.3
55																																						
56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
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	DO	DP	DQ	DR	DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	EE	EF	EG	EH	EI	EJ	EK	EL	EM	EN	EO	EP	EQ	ER	ES	ET	EU	EV	EW	EX	EY	EZ		
1	Entity emissions from combustion, venting, flaring, and fugitive methane																																							
2																																								
3	Richard Heede Climate Accountability Institute 18-Oct-20																																							
4																																								
5																																								
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7	Peabody Energy, USA																																							
8																																								
9																																								
10	1960s					1960s					1970s					1980s					1990s																			
11	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999		
12																																								
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14																																								
15																																								
16																																								
17	64	77	91	96	106	110	114	117	133	110	141	137	134	144	139	129	103	127	116	102	113	105	127	122	131	164	168	180	194	217	240	263	285	305	316	336	350	364		
18	64	77	91	96	106	110	114	117	133	110	141	137	134	144	139	129	103	127	116	102	113	105	127	122	131	164	168	180	194	217	240	263	285	305	316	336	350	364		
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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29	64	77	91	96	106	110	114	117	133	110	141	137	134	144	139	129	103	127	116	102	113	105	127	122	131	164	168	180	194	217	240	263	285	305	316	336	350	364		
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34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
35	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	1	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	
36	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.6	0.6	0.5	0.6	0.6	0.5	0.4	0.5	0.5	0.4	0.5	0.4	0.5	0.5	0.5	0.7	0.7	0.7	0.8	0.9	1.0	1.1	1.2	1.2	1.3	1.4	1.4	1.5		
37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
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41	7	9	10	11	12	12	13	13	15	12	16	16	15	16	16	15	12	14	13	11	13	12	14	14	15	19	19	20	22	24	27	30	32	34	36	38	40	41		
42	7	9	10	11	12	12	13	13	15	12	16	16	15	16	16	15	12	14	13	11	13	12	14	14	15	19	19	20	22	24	27	30	32	34	36	38	40	41		
43																																								
44																																								
45	72	86	102	107	118	122	126	130	148	122	157	153	149	160	154	143	115	141	129	113	126	117	141	136	146	182	187	200	216	241	267	292	318	340	352	374	390	405		
46																																								
47																																								
48	9,699	10,248	10,781	11,282	11,807	12,184	12,849	13,705	14,840	15,440	16,158	17,016	16,943	16,921	17,819	18,308	18,979	19,485	19,392	18,865	18,725	18,903	19,453	20,146	20,433	21,095	21,902	22,232	22,547	23,032	22,313	22,580	22,742	23,232	23,963	24,103	24,018	24,326		
49	2,647	2,797	2,942	3,079	3,222	3,325	3,507	3,740	4,050	4,214	4,410	4,644	4,624	4,618	4,863	4,996	5,180	5,318	5,292	5,149	5,110	5,159	5,309	5,498	5,576	5,757	5,977	6,067	6,153	6,286	6,089	6,162	6,207	6,340	6,540	6,578	6,555	6,639		
50	0.66%	0.75%	0.85%	0.85%	0.90%	0.90%	0.88%	0.86%	0.90%	0.71%	0.87%	0.81%	0.79%	0.85%	0.78%	0.70%	0.54%	0.65%	0.60%	0.54%	0.61%	0.56%	0.65%	0.61%	0.64%	0.78%	0.77%	0.81%	0.86%	0.94%	1.07%	1.16%	1.26%	1.31%	1.32%	1.39%	1.46%	1.50%		
51																																								
52																																								
53																																								
54	45.1	47.1	49.4	51.3	53.4	54.7	57.2	60.6	86.8	92.3	99.4	112.6	112.5	105.2	117.3	114.8	122.9	119.4	110.5	93.4	92.8	89.4	86.3	87.0	86.8	84.9	92.0	93.2	90.0	89.1	89.9	89.7	90.1	89.9	91.9	89.3	84.0	82.0		
55	0.58%	0.66%	0.75%	0.75%	0.80%	0.81%	0.80%	0.78%	0.62%	0.48%	0.57%	0.49%	0.48%	0.55%	0.48%	0.45%	0.34%	0.43%	0.42%	0.44%	0.49%	0.47%	0.59%	0.57%	0.61%	0.78%	0.74%	0.78%	0.87%	0.98%	1.08%	1.18%	1.28%	1.37%	1.39%	1.52%	1.68%	1.79%		
56																																								
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	FA	FB	FC	FD	FE	FF	FG	FH	FI	FJ	FK	FL	FM	FN	FO	FP	FQ	FR	FS	FT	FU	FV	FW	FX	FY	FZ	GA	GB	GC	GD	GE	GF														
1	Entity emissions from combustion, venting, flaring, and fugitive methane																																													
2	Richard Heede Climate Accountability Institute 18-Oct-20																																													
3	Peabody Energy, USA																																													
4	to 2015																																													
5	2000s										2010s										Cumulative		Entity emissions										Cumulative													
6	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	MtCO2e		Entity emissions										MtCO2e												
7																							(except where noted)		V (V = verified)										(except where noted)											
8	347	381	389	399	446	472	488	464	502	479	483	450	450	437	451	420	353	372	358	14,867	14,867	Entity CO2 emissions										kg CO2/CO2	to 2015													
9	347	381	389	399	446	472	488	464	502	479	483	450	450	437	451	420	353	372	358	14,867	14,867	Entity CO2 emissions										kg CO2/CO2	to 2015													
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Entity CO2 emissions										kg CO2/CO2	to 2015
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Entity CO2 emissions										kg CO2/CO2	to 2015
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Entity CO2 emissions										kg CO2/CO2	to 2015
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Entity CO2 emissions										kg CO2/CO2	to 2015
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Entity CO2 emissions										kg CO2/CO2	to 2015
15	1.4	1.5	1.6	1.6	1.8	1.9	2.0	1.9	2.0	1.9	2.0	1.8	1.8	1.8	1.8	1.7	1.4	1.5	1.4	60	60	Entity methane emissions										kg CH4/CO2	to 2015													
16	1.4	1.5	1.6	1.6	1.8	1.9	2.0	1.9	2.0	1.9	2.0	1.8	1.8	1.8	1.8	1.7	1.4	1.5	1.4	60	60	Entity methane emissions										kg CH4/CO2	to 2015													
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Entity methane emissions										kg CH4/CO2	to 2015	
18	39	43	44	45	50	53	55	52	57	54	55	51	51	49	51	47	40	42	40	1,680	1,680	Entity methane emissions										GWP	to 2015													
19	39	43	44	45	50	53	55	52	57	54	55	51	51	49	51	47	40	42	40	1,680	1,680	Entity methane emissions										GWP	to 2015													
20	386	424	433	445	497	525	543	517	559	533	538	501	501	487	502	468	393	414	398	16,547	16,547	Entity methane emissions										GWP	to 2015													
21	386	424	433	445	497	525	543	517	559	533	538	501	501	487	502	468	393	414	398	16,547	16,547	Entity methane emissions										GWP	to 2015													
22	25,025	25,235	25,788	27,034	28,308	29,264	30,231	31,135	31,854	31,414	33,018	34,136	34,660	34,825	35,089	35,106	35,251	35,681	36,443	1,612,851	1,612,851	Entity methane emissions										GWP	to 2015													
23	6,830	6,887	7,038	7,378	7,726	7,986	8,250	8,497	8,693	8,573	9,011	9,316	9,459	9,504	9,576	9,581	9,620	9,738	9,946	440,166	440,166	Entity methane emissions										GWP	to 2015													
24	1.39%	1.51%	1.51%	1.48%	1.58%	1.61%	1.61%	1.49%	1.58%	1.52%	1.46%	1.32%	1.30%	1.26%	1.29%	1.20%	1.04%	0.98%	0.92%	0.92%	Entity methane emissions										GWP	to 2015														
25	82.6	83.0	82.8	88.0	91.7	94.7	98.4	99.5	101.2	99.9	105.1	109.5	113.4	115.2	118.2	117.8	118.4	120.0	122.7	6,971	6,971	Entity methane emissions										GWP	to 2015													
26	1.69%	1.85%	1.90%	1.83%	1.96%	2.01%	2.00%	1.88%	2.00%	1.93%	1.86%	1.66%	1.60%	1.53%	1.54%	1.44%	1.20%	1.25%	1.18%	0.86%	0.86%	Entity methane emissions										GWP	to 2015													
27																							CDIAC sums December 2019		CDIAC CO2 emissions										Mt Carbon	to 2015										
28																							CDIAC sums December 2019		CDIAC CO2 emissions										Mt Carbon	to 2015										
29																							CDIAC sums December 2019		Entity percent of total CO2 emissions										Percent	to 2015										
30																							CDIAC sums December 2019		Entity percent of total CO2 emissions										Percent	to 2015										
31																							CDIAC sums December 2019		CDIAC/EDGAR methane										Tg CH4	to 2015										
32																							CDIAC sums December 2019		CDIAC/EDGAR methane										Tg CH4	to 2015										
33																							CDIAC sums December 2019		Entity percent of total CH4 emissions										Percent	to 2015										
34																							CDIAC sums December 2019		Entity percent of total CH4 emissions										Percent	to 2015										
35																							CDIAC sums December 2019		Entity percent of total CH4 emissions										Percent	to 2015										
36																							CDIAC sums December 2019		Entity percent of total CH4 emissions										Percent	to 2015										
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60																							CDIAC sums December 2019		Entity percent of total CH4 emissions										Percent	to 2015										
61																							CDIAC sums December 2019		Entity percent of total CH4 emissions										Percent	to 2015										

Cell: FY48

Comment: Rick Heede:

CAI compares entity emissions to the CDIAC / Global Carbon Project (www.globalcarbonproject.org) annual estimate of carbon dioxide emissions from fossil fuels and cement production. The CAI Carbon Majors methodology is based on the CDIAC methodology; see: Heede, Richard (2019) Carbon Majors: Accounting for carbon and methane emissions 1854-2010 Methods & Results Report, ISBN 978-3-659-57841-0, Omniscriptum, Riga, 148 pp.
 Reference of the full global carbon budget 2019: Pierre Friedlingstein, Matthew W. Jones, Michael O'Sullivan, Robbie M. Andrew, Judith Hauck, Glen P. Peters, Wouter Peters, Julia Pongratz, Stephen Sitch, Corinne Le Quéré, Dorothee C. E. Bakker, Josep G. Canadell, Philippe Ciais, Rob Jackson, Peter Anthoni, Leticia Barbero, Ana Bastos, Vladislav Bastrikov, Meike Becker, Laurent Bopp, Erik Buitenhuis, Naveen Chandra, Frédéric Chevallier, Louise P. Chini, Kim I. Currie, Richard A. Feely, Marion Gehlen, Dennis Gilfillan, Thanos Gkritzalis, Daniel S. Gol, Nicolas Gruber, Sören Gutekunst, Jan Harris, Vanessa Haverd, Richard A. Houghton, George Hurtt, Tatiana Ilyina, Atul K. Jain, Emilie Joetzjer, Jed O. Kaplan, Etsushi Kato, Kees Klein Goldewijk, Jan Ivar Korsbakken, Peter Landschützer, Siv K. Lauvset, Nathalie Lefèvre, Andrew Lenton, Sebastian Liener, Danica Lombardozzi, Gregg Marland, Patrick C. McGuire, Joe R. Melton, Nicolas Metz, David R. Munro, Julia E. M. S. Nabel, Shin-Ichiro Nakaoka, Craig Neill, Abdrahman M. Omar, Tsunee Ono, Anna Peregon, Denis Pierrot, Benjamin Poulter, Gregor Rehder, Laure Resplandy, Eddy Robertson, Christian Rödenbeck, Roland Séférian, Jörg Schwinger, Naomi Smith, Pieter P. Tans, Hanqin Tian, Bronte Tilbrook, Francesco N Tubiello, Guido R. van der Werf, Andrew J. Wiltshire, Sönke Zaehele. Global Carbon Budget 2019, Earth Syst. Sci. Data, 2019. <https://doi.org/10.5194/essd-11-1783-2019>
 See also: Gilfillan, D., Marland, G., Boden, T. and Andres, R.: Global, Regional, and National Fossil-Fuel CO2 Emissions.

Cell: FY54

Comment: Rick Heede:

This study's total fugitive and vented methane from oil and natural gas systems and coal mining are summed here and compared to CDIAC's estimate for 1860 to 1969 (Stern & Kaufmann, 1998). CAI uses revised data from EDGAR for 1970-2015, with extrapolation by CAI for 2016-2018 (based on growth of emissions from oil, gas, and coal production). There is a non-linearity at 1969/1970 btw datasets.
 Methane emissions may be revised if a more comprehensive and integrated dataset becomes available.
 Furthermore, the Stern & Kaufman does not estimate methane emissions from oil (only gas-related CH4). The most recent EDGAR Nov19 datasets aggregate methane emissions from the Oil & Gas sector. CAI disaggregates methane from oil and methane from gas on the basis of an earlier EDGAR dataset 1970-2008 that reports CH4 from oil and gas separately. CAI uses this average allocation of ~695% from gas and ~30.5% from oil to estimate methane emissions from both sectors. This, given the fluctuations of methane emissions -- the proportion from natural gas increases over time (from 50% in 1970 to 76% in 2008) -- this disaggregation is only approximate.

Stern, David I., & Robert K. Kaufmann (1998) "Annual Estimates of Global Anthropogenic Methane Emissions: 1860-1994," in Trends Online: A Compendium of Data on Global Change, Carbon Dioxide Information Analysis Center, Oak Ridge National Lab., U.S. DOE, Oak Ridge, Tenn., U.S.A. <http://cdiac.esd.ornl.gov/trends/meth/ch4.htm#flaring>

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