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Direktionsbereich Klima

Differences between International Energy Agency (IEA) data and the reference approach in Switzerland's Greenhouse Gas Inventory

Aktenzeichen: BAFU-235.41-60813/3

Bern, 24.07.2024

Image: MS Copilot

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The FOEN is an agency of the Federal Department of the Environment, Transport, Energy and Communications (DETEC).

BAFU-D-14D83401/1389

Differences between International Energy Agency (IEA) data and the reference approach

In the past, reviewers have repeatedly asked for explanations of the apparent differences between the energy data held by the International Energy Agency (IEA) and the data reported in the Reference Approach. In order to clarify the pertaining issues, the reasons for the major differences are given below. Data for the year 2010 are used to illustrate the description, however, a more recent comparison with data for 2016 produced similar results.

For explanations of abbreviations see FOEN (2024).

1 General remarks

The net calorific values used by IEA differ from those used in the greenhouse gas inventory. In order to avoid differences caused by the conversion with different NCV, the comparison between IEA and the Reference Approach is made in kt.

Stock changes as reported by IEA are only including primary stocks (IEA 2005), while the reporting in the Reference Approach includes secondary and tertiary stocks. This results in a particularly large difference for gas oil, as retailers and end-consumers hold considerable amounts of heating fuel on stock. The IEA subsumes secondary and tertiary stock changes under statistical differences.

All data regarding liquid fuel consumption reported by the IEA includes fuel consumption in Liechtenstein (geographical coverage in IEA 2012). For reporting purposes under the UNFCCC, consumption of Liechtenstein is subtracted.

Data sources used for the comparison shown in Table 1 below are:

- Switzerland’s greenhouse gas inventory 1990–2011, submission of 15. April 2013, CRF Table1.A(b), (FOEN 2013).
- Energy statistics of OECD countries (2012 Edition), (IEA 2012).

2 Liquid fuels

The total amount of liquid fuel consumption as reported in the greenhouse gas inventory is 11'052 kt. There is a difference of 13 kt (0.1 %) between CRF and IEA. This difference is primarily caused by the different methodology used for aviation bunkers (see below).

3 Crude oil

Crude oil in the reference approach contains additives, while IEA lists them separately (data in italics in Table 1). The difference between CRF and IEA is smaller than 0.1 % if the sum of additives, refinery feedstocks and crude oil is considered.

4 Gasoline

The comparison is made for motor gasoline only. Aviation gasoline is included under aviation fuels. Gasoline reported by IEA includes gasoline used in Liechtenstein (LIE), which is subtracted for reporting under the UNFCCC. The difference between CRF and IEA is approximately 0.1 %, if the consumption of LIE is taken into account.

5 Aviation fuels

The different aviation fuels are aggregated in the greenhouse gas inventory. For comparison of IEA and reference approach, all aviation fuels are summed up. The difference between IEA and reference approach if considering the apparent final consumption is 12 kt (approximately 1 % of imports). This difference is largely due to a different methodology used to estimate international bunker. Aviation bunkers have to be reported monthly to the IEA. As the tier 3 approach used for the greenhouse gas

inventory is not available on a monthly basis, the international bunker fuel estimate of IEA consists of the total consumption at the two international airports in Zurich and Geneva, while all remaining fuel use is considered domestic. The reporting in the national greenhouse gas inventory is based on a much more detailed approach, where information on single flights is taken into account. Due to the different approach, the numbers are somewhat different. However, the order of magnitude is the same, and the information in the inventory is based on a higher-tier method and presumably more accurate.

6 Diesel oil and gas oil

The IEA numbers include diesel oil and gas oil used in Liechtenstein. Furthermore, stock changes are reported differently in the CRF and by the IEA. Secondary and tertiary stock changes are subsumed under statistical differences by the IEA, while they are included in the stock change reported in the reference approach. If the statistical differences are taken into account, the difference in the apparent consumption is less than 0.1 %.

7 Residual fuel oil

Data agree between IEA and greenhouse gas inventory. It seems as if there is a rounding error in the imported amounts, leading to an apparent difference of 1 kt. According to the foreign trade statistics, 33'693 t of residual fuel oil had been imported in 2010.

8 Bitumen

Bitumen is a main feedstock in the greenhouse gas inventory. Data between IEA and the reference approach compare well. Again, small differences are likely due to the use of rounded values, leading to apparent differences of the order of 1–2 kt.

9 Petroleum coke

There are considerable differences (26 kt) in the reported numbers for petroleum coke import. The reason for this apparent difference is that for IEA, all petroleum coke is reported together. In the greenhouse gas inventory submitted in 2013, however, only the petroleum coke used as a fuel was reported under petroleum coke, while calcined petroleum coke was reported together with “other oil” as feedstocks. This is largely a consequence of the treatment of fuels and feedstocks in the Swiss overall energy statistics (SFOE 2012).

10 Lubricants

There are small differences between IEA and the reference approach, as the data reported to the IEA comprises a slightly different set of customs tariff headings for lubricants to the one used for the Swiss overall energy statistics. The substances not reported under lubricants in the reference approach are reported under other oil.

11 Liquefied petroleum gas

The reporting of liquefied petroleum gas in the greenhouse gas inventory includes white spirit and lamp oil. As for petroleum coke, IEA numbers include fuels that are used as feedstocks, while in the reference approach, only liquefied petroleum gas, white spirit and lamp oil used as fuels are reported under liquefied petroleum gas. The difference in apparent consumption between IEA and the reference approach is 3 kt (0.03 % of total liquid fuel consumption).

12 Other oil products

In the greenhouse gas inventory, all other oil products are reported together, while IEA has a finer degree of disaggregation. As already mentioned above, the share of petroleum coke that is used as a feedstock is reported under other oil in the greenhouse gas inventory. Therefore, the difference between IEA and the reference approach corresponds largely to the difference in apparent consumption of petroleum coke.

13 Solid fuels

Solid fuels, mainly other bituminous coal and lignite, play only a minor role in Switzerland (246 kt) and are reported in good agreement.

14 Gaseous fuels

In the greenhouse gas inventory, the amount of gas reported under 1B2b Fugitive emissions is subtracted from the total gas import as reported by IEA, as this gas is not used for energy purposes. Taking this into account the difference is of the order of 2 TJ.

Table 1 Comparison of the IEA energy statistic with the Reference Approach for the year 2010. Numbers in italics are fuels that are reported in a finer disaggregation in the IEA energy statistic than in the Reference Approach. Numbers in bold aggregate the data to the level of disaggregation used in the Reference Approach.

CRF vs. IEA (2010)	Import		Export		Bunker		Stock change		Stat. Diff.	LIE	Consumption	
Gg	IEA	CRF	IEA	CRF	IEA	CRF	IEA	CRF	IEA	CRF	IEA	CRF
Liquid Fuels											**11'039**	**11'052**
Sum											**4'546**	**4'547**
Crude oil	4'488	4'546						1.0			4'488	4'547
Refinery feedstokcs	3.0						1.0		2.0		6.0	
Additives/blending components	51						-1.0		2.0		52	
Motor gasoline	1'850	1'838					-9.0	-6.0	4.0	15	**1'830**	**1'832**
Sum											**0.0**	**12**
Aviation gasoline	7.0						-2.0		-1.0		4.0	
Kerosene type jet fuel	1'354	1'362			-1'367	-1'352		2.0	6.0		-7.0	12
Other kerosene	3.0										3.0	
Gas/diesel oil	3'510	3'485	-21	-39	-10	-11	38	1'072	1'020	27	**4'510**	**4'507**
Fuel oil	33	34	-323	-316			-17	-17	7.0		**-300**	**-299**
White spirit & SBP	7.0								-1.0		**6.0**	
Bitumen	317	318	-2.0	-2.0							**315**	**316**
Lubricants	86	72	-38	-16					7.0		**55**	**56**
Petroleum coke	73	47									**73**	**47**
Sum											**10**	**34**
Naptha	1.0						5.0		-1.0		5.0	
Paraffin waxes	1.0										1.0	
Non-specified oil products / other oil	4.0	63		-23				-6.0			4.0	34
Solid fuels											**246**	**246**
Anthracite	7.0										7.0	
Other bituminous coal	123	152					*36*	*32*			159	184
Lignite	66	62					*-4.0*				62	62
Coke oven coke	18										18	
Gaseous Fuels											**126'014**	**126'016**
Natural gas (TJ, NCV)	126'014	125'627									126'014	125'627
Fugitive emissions (TJ, NCV)		389										389

15 Additional information regarding reporting of waste-derived fuels

During the UNFCCC in-country review in 2016, the ERT identified that the apparent consumption of non-biomass fraction of waste in the CRF Table1.A(b) was systematically smaller than the consumption reported to IEA. The difference stems from the assumptions made with regard to the fossil and renewable fractions. The SFOE, which is responsible for reporting to the IEA, allocates total wastes to 50 % fossil and 50 % renewable. For the greenhouse gas inventory, a more sophisticated method based on a detailed analysis of waste composition and measurements in the flue gas of waste incineration plants is used to estimate fossil and renewable fractions (see chp. 3.2.5.2.1 of Switzerland's NID 2024 (FOEN 2024)).

16 References

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17 Background information and calculations (internal data management system)

IEA CO2 Emission Data (/00002 #1)

FOEN-2013d Comparison IEA-reference approach.docx

Reference approach - IEA Energy balance 2016.xlsx

061110 Comparison IEA - CRF.pdf