Norwegian Environment Agency

Greenhouse Gas Emissions 1990-2021

Annexes to NIR 2023

Report

M-2508 | 2023

Colophon

Title – Norwegian and English: Greenhouse Gas Emissions 1990-2021, Annexes to NIR 2023

Summary – sammendrag:
Annexes to National Inventory Report for Norway, 2023
Executive institution:
The Norwegian Environment Agency
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M-no:2508 **Year**: 2023

Publisher: The Norwegian Environment Agency
Emneord: Rapportering, klimagasser, anneks
Subject words: NIR, greenhouse gases, annexes
Front page photo: Marianne Gjørv

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National Inventory Report 2023 - Norway

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Annex I: Key Categories

Table AI.1 Summary of identified emission key categories. Excluding LULUCF.

IPCC Category Code	IPCC Category	Green-house gas	Identification criteria[1]	Method
1A1,1A2,1A4	Stationary combustion, Solid Fuels	CO_2	L1 T1 L2	Tier 2
1A1,1A2,1A4	Stationary combustion, Biomass	CH_4	L1 T1 L2 T2	Tier 2
1A1,1A2,1A4	Stationary combustion, Gaseous Fuels	CO_2	L1 T1 L2 T2	Tier 2
1A1,1A2,1A4	Stationary combustion, Gaseous Fuels	CH_4	L2 T2	Tier 2
1A1,1A2,1A4	Stationary combustion, Liquid Fuels	CO_2	L1 T1 L2 T2	Tier 2
1A1,1A2,1A4	Stationary combustion, Other Fuels	CO_2	L1 T1 L2 T2	Tier 2
1A3a	Civil Aviation	CO_2	L1 T1 L2	Tier 2
1A3b	Road Transportation	CO_2	L1 T1 L2 T2	Tier 1a
1A3d	Navigation	CO_2	L1 T1 L2 T2	Tier 2
1A3d	Navigation	CH_4	T1 L2 T2	Tier 2
1A4	Other Sectors, mobile combustion	CO_2	L1 T1 L2 T2	Tier 2
1A5b	Mobile	CO_2	L1 T1 T2	Tier 2
1B1a	Coal Mining	CH_4	L1 T1 L2 T2	Tier 1
1B2a	Oil (incl. oil refineries, gasoline distribution)	CO_2	L1 T1 L2 T2	Tier 2
1B2a	Oil (incl. oil refineries, gasoline distribution)	CH_4	L1 T1 L2 T2	Tier 2
1B2b	Natural Gas	CH_4	T2	Tier 2
1B2c	Venting and Flaring	CO_2	L1 T1 L2 T2	Tier 2
1B2c	Venting and Flaring	CH_4	L1 T1 L2 T2	Tier 2
2A1	Cement Production	CO_2	L1	Tier 3
2A2	Lime Production	CO_2	L1 T1	Tier 2
2B1	Ammonia Production	CO_2	L1 T1 L2	Tier 2
2B2	Nitric Acid Production	N_2O	L1 T1 L2 T2	Tier 2
2B5	Carbide Production	CO_2	L1 T1 T2	Tier 2
2B6	Titanium dioxide production	CO_2	L1	Tier 2
2B8	Petrochemical and carbon black production	CO_2	L1 T1 L2	Tier 2
2C2	Ferroalloys production	CO_2	L1 T1 L2	Tier 2/3
2C3	Aluminium production	CO_2	L1 T1 L2 T2	Tier 2/3
2C3	Aluminium production	PFCs	L1 T1 L2 T2	Tier 2
2C4	Magnesium production	SF_6	L1	Tier 2
2D1	Lubricant use	CO_2	T1	Tier 2
2D3	Other	CO_2	L1	Tier 2
2F	Product uses as substitutes for ODS	HFCs	L1 T1 L2 T2	Tier 2
2H2	Food and beverages industry	CO_2	T1	Tier 2
3A1	Enteric Fermentation - Cattle	CH_4	L1 T1 L2	Tier 2
3A2	Enteric Fermentation - sheep	CH_4	L1 L2	Tier 2
3B1	Manure Management – cattle	CH_4	L1 L2	Tier 2

3B	Manure Management	N_2O			L2		Tier 2
3Da1	Direct emissions from managed soils - Inorganic N fertilizers	N_2O	L1		L2		Tier 1
3Da2	Direct emissions from managed soils - Organic N fertilizer	N_2O	L1		L2	T2	Tier 1
3Da3	Direct emissions from managed soils - Urine and dung deposited by grazing animals	N_2O	L1		L2		Tier 1
3Da4	Direct emissions from managed soils - Crop residues	N_2O			L2		Tier 1
3Da6	Direct emissions from managed soils - Cultivation of organic soils	N_2O	L1		L2		Tier 1
3Db1	Indirect emissions from managed soils - Atmospheric deposition	N_2O			L2		Tier 1
3Db2	Indirect emissions from managed soils - Nitrogen leaching and run-off	N_2O			L2		Tier 1
3G	Liming	CO_2	L1	T1			Tier 1
5A1a	Managed Waste Disposal sites. Anaerobic.	CH_4	L1	T1	L2	T2	Tier 2
5B	Biological treatment of Solid Waste	CH_4				T2	Tier 1
5D1	Domestic Wastewater	CH_4	L1		L2		Tier 1

[1] *"L" refers to level and "T" to trend analyses. Numbers refer to approaches. "Q" refers to qualitative criteria.*
[2] *Animal category "Other" refers to all animal categories except cattle, sheep, and swine.*

The analyses have been performed for 1990 and 2021 GHG emission data. The main conclusion is that there are few differences in the result for 1990 compared with 2020. For the *Land use, Land-use Change and Forestry (LULUCF)* sector, Table AI-2 shows the results of the Approach 2 key category analysis performed as described in IPCC (2006).

Uncertainties of land use category area and C change estimates are largely based on standard sampling methodology as detailed in chapter 6.1.3.

Table AI.2 Summary of identified LULUCF key categories.

IPCC Category Code	IPCC Category	Green-house gas	Identification criteria[1]	Method
4(II)Crop	Cropland - drained organic soil - Organic soil CC + LC	CH_4	L2	Tier 1
4(II)Forest	Forest land drained organic soils - Drained organic soil	N_2O	L2	Tier 1
4.A.1	Forest remaining forest - Litter + dead wood + Mineral soil	CO_2	L1 T1 L2 T2	Tier 3
4.A.1	Forest remaining forest - Living biomass	CO_2	L1 T1 L2 T2	Tier 3
4.A.1	Forest remaining forest, drained organic soils - Organic soil	CO_2	L1 L2	Tier 1
4.A.2.1	Cropland to Forest – DW	CO_2	L2	Tier 1
4.A.2.1	Cropland to Forest - Living biomass	CO_2	L2 T2	Tier 1 & Tier 3
4.A.2.1	Cropland to Forest - Litter	CO_2	L2	Tier 1
4.A.2.2.ex	Extensive Grassland to Forest - DW	CO_2	L2 T2	Tier 1
4.A.2.2.ex	Extensive Grassland to Forest - Litter	CO_2	T1 L2 T2	Tier 1
4.A.2.2.in	Intensive Grassland to Forest - DW	CO_2	L2 T2	Tier 1
4.A.2.2.in	Intensive Grassland to Forest - Living biomass	CO_2	L2 T2	Tier 1 & Tier 3
4.A.2.2.in	Intensive Grassland to Forest - Litter	CO_2	L2 T2	Tier 1
4.A.2.3.u	Unmanaged Wetland to Forest - DW	CO_2	L2	Tier 1
4.A.2.3.u	Unmanaged Wetland to Forest - Living biomass	CO_2	T2	Tier 3
4.A.2.3.u	Unmanaged Wetland to Forest - Litter	CO_2	L2 T2	Tier 1
4.A.2.4	Settlements to Forest – DW	CO_2	L2 T2	Tier 1
4.A.2.4	Settlements to Forest – Litter	CO_2	L2 T2	Tier 1
4.B.1	Cropland remaining cropland - Organic soil	CO_2	L1 T1 L2 T2	Tier 1
4.B.2.1	Forest to Cropland – DOM	CO_2	T1 L2 T2	Tier 1
4.B.2.1	Forest to Cropland - Living biomass	CO_2	L2 T2	Tier 1 & Tier 3
4.B.2.1	Forest to Cropland - Organic soil	CO_2	L2	Tier 1
4.B.2.3	Unmanaged Wetland to Cropland - Organic soil	CO_2	T1 L2 T2	Tier 1
4.C.1.ex	Extensive Grassland remaining extensive grassland – Living biomass	CO_2	L1	Tier 2
4.C.1.in	Intensive Grassland remaining intensive grassland - Living biomass	CO_2	L2	Tier 2
4.C.1.in	Intensive Grassland remaining intensive grassland – Mineral soil	CO_2	T2	Tier 1
4.C.1.in	Intensive Grassland remaining intensive grassland – Organic soil	CO_2	L2	Tier 1

4.C.2.1.in	Forest to Intensive Grassland – DOM	CO_2	L1	T1	L2	T2	Tier 1
4.C.2.1.in	Forest to Intensive Grassland - Living biomass	CO_2		T1	L2	T2	Tier 1 & Tier 3
4.D.1.1	Wetland Peat extraction - Organic soil	CO_2			L2		Tier 2
4.D.1.3.m	Managed Wetlands remaining managed wetlands - Organic soil	CO_2			L2		Tier 1
4.D.2.3.m	Forest to Managed Wetland - DOM	CO_2			L2		Tier 1
4.D.2.3.m	Forest to Managed Wetland - Living biomass	CO_2			L2		Tier 3
4.E.1.1	Settlements remaining settlements - Organic soil	CO_2		T1	L2	T2	Tier 1
4.E.2.1.1	Forest to Settlement – DOM	CO_2	L1		L2	T2	Tier 1
4.E.2.1.1	Forest to Settlement - Living biomass	CO_2	L1		L2	T2	Tier 1 & Tier 3
4.E.2.1.1	Forest to Settlement - Mineral soil	CO_2			L2	T2	Tier 1
4.E.2.1.1	Forest to Settlement - Organic soil	CO_2			L2		Tier 1
4.E.2.2.1	Cropland to Settlement - Mineral soil	CO_2			L2	T2	Tier 1
4.E.2.2.1	Cropland to Settlement - Organic soil	CO_2			L2		Tier 1
4.E.2.4.1.u	Unmanaged Wetland to settlements - Organic soil	CO_2				T2	Tier 1
4.G	Harvested wood Products – HWP	CO_2		T1	L2	T2	Tier 2

[1] *"L" refers to level and "T" to trend analyses. Numbers refer to approaches. "Q" refers to qualitative criteria*

Summaries for all analyses are presented as an attached Excel file and PDF, Annex I Analyses.xlsx. There are four sets of analyses, for approaches 1 and 2 with and without LULUCF. For each set, three analyses are presented: Level 1990, level 2021, and trend. All tables are ranked by the assessment value for the 2021 level analysis.

Annex II: Uncertainty analysis

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1. Summary

The national greenhouse gas (GHG) emission inventory is compiled from estimates based on emission factors and activity data and direct measurements by plants. All these data and parameters will contribute to the overall inventory uncertainty. The uncertainties and probability distributions of the inventory input parameters have been assessed based on available data and expert judgements. Finally, the level and trend uncertainties of the national GHG emission inventory have been estimated using Monte Carlo simulation. The methods used in the analysis correspond to an IPCC Approach 2 method, as described in IPCC (2006). Analyses have been made both excluding and including the sector LULUCF (land use, land-use change and forestry).

The report *Uncertainties in the Norwegian Greenhouse Gas Emission Inventory* (Rypdal, Kristin & Zhang, L-C. 2000) includes more detailed documentation of the analysis method used in all analyses. Major updates of the uncertainty data were performed in 2006 and 2011 (Flugsrud & Hoem 2011). In 2020-2021 a project was performed to update and improve the uncertainty analysis/parameters applied for the base year and the uncertainty estimates for the latest year. More detailed information can be found in the NIR 2022 Annex II section 5; "Evaluation of the work with Saturday paper".
The results show that the uncertainty in the calculated greenhouse gas emissions for 2021 excluding LULUCF is ±3 per cent.

1.1 Level of the analysis

The uncertainty analysis is for most sources performed at the most detailed level of IPCC source categories (IPCC 2000). For some sources even a more detailed separation is made, e.g., where different pollutants from a source sector must be connected to different activity measures, to be able to consider dependencies between only parts of the source groups. Energy carriers have been grouped into five main types: solid, gaseous, liquid, waste, and bio energy. The placement into groups has been made using international definitions based on the type of the original energy carrier, e.g., refinery gas and fuel gas is placed in "liquid" and CO gas is placed in "solid".

Implementation of the 2006 IPCC guidelines (IPCC 2006) in the compilation of the inventory have affected the analysis through a higher level of detail in the source categories. Additional splitting of source categories, which has been done in previous analyses, is therefore now in most cases obsolete.

In Table AII-3, source category level used in the study is listed.

For some emission sources, activity data and emission factors are not available. Examples are estimates based on measurements, emissions reported by plants (in the cases when the plants have only reported emissions and not activity data and emission factor used), and emissions that are aggregated from sources with diverse methods (for example emissions from 2C7 Other metal production). These emissions have been assigned activity equal to 1, and emission factor to be equal to the estimated value. This is possible since the total uncertainty estimate is independent of scale for activity and emission factor[1].

Emissions from landfills, HFCs and some other sources have been transferred into the form of emission factor multiplied with activity rate, although the estimates are based on more complex estimation models (e.g., taking time lag into account and using several activity data and emission factors).

Table 6.2 from the IPCC good practice guidance is included in a separate attachment. This is a response to recommendations in previous ERT review reports. Column G is estimated as uncertainty for source category divided by total GHG emissions.

2. Uncertainties in input parameters

2.1 Emission estimates

In the analysis emission estimates for the different source categories (Table AII-5) for the base year and end year are taken from the Norwegian emission inventory.

The emission estimates used in the analysis comes from the national GHG emission inventory and is based on Norwegian measurements, literature data or statistical surveys. Some data are based on expert judgements.

2.2 Standard deviation and probability density

The probability densities used in this study have been divided into two types of model shapes:

1. Normal distribution
2. Lognormal distribution

1 We may state the activity in any given unit, as long as the emission factor is stated in the corresponding unit. Examples: tonnes and kg/tonne, Gg and kg/Gg, or, as in this case, unit value and total emissions in kg.

For low uncertainties lognormal distributions approach the normal distributions. For large uncertainties the normal distribution may lead to negative values. To avoid this, the normal distribution was used for uncertainties up to 30 percent, while lognormal distribution was used for higher uncertainties. Normal distribution was also used for carbon balances that were in principle a difference between larger gains and losses that likely were normally distributed with lower uncertainties. These carbon balances might take both positive and negative values.

The uncertainties and densities given in the following sections are based on information for the end year. However, they were also used for 1990 and for the trend analysis. In reality, due to improved methods, the quality of the end year inventory is higher than that of the 1990 data for several categories. Thus, the analysis may underestimate the uncertainty in 1990 emissions and in the trend. The CO_2 emissions are likely most affected by this problem.

2.3 Activity data

The assessed standard deviations and corresponding probability densities are summarised in Table AII-1.

Table AII-1 Summary of standard deviation and probability density of activity data.

IPCC Source category	Pollutant source	Standard deviation (2σ). per cent[1]	Density shape	Source/ comment
1A1, 1A2	Coal/coke – general	5	Normal	Expert judgement industry, (Tokheim 2006)
1A1B	Coal/coke – petroleum refining	1.1	Normal	Emission trading scheme: Klif (2011), Spread in data: Rypdal, K. and Zhang, L.-C. (2000)
1A2A	Coal/coke - iron and steel	4.1	Normal	Emission trading scheme (Klif 2011), Expert judgement industry, (Tokheim 2006)
1A2G	Coal/coke - other	0.8	Normal	Emission trading scheme (Klif 2011), Expert judgement industry, (Tokheim 2006)
1A4B	Coal/coke - residential	20	Normal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1A4C	Coal/coke - agriculture	30	Normal	Expert judgement, Statistics Norway
1A1, 1A2, 1A4	Wood	30	Lognormal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1A1A	Gas – public electricity and heat production	0.8	Normal	Emission trading scheme (Klif 2011), Expert judgement, Statistics Norway
1A2	Gas - general	4	Normal	IPCC 2006

1A1C	Gas - manufacture of solid fuels and other energy industries	0.2	Normal	Emission trading scheme (Klif 2011; NPD 2006)
1A2C	Gas - chemicals	1.7	Normal	Emission trading scheme (Klif 2011), Norwegian Petroleum Directorate, Statistics Norway (2000)
1A2D	Gas - pulp, paper, print	1.7	Normal	Emission trading scheme (Klif 2011), Norwegian Petroleum Directorate, Statistics Norway (2000)
1A4A	Gas - commercial/institutional	10	Normal	Expert judgement, Statistics Norway
1A4B, 1A4C	Gas - residential, agriculture/forestry/fishing	30	Normal	Expert judgement, Statistics Norway
1A1, 1A2	Oil - general	3	Normal	Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A1B	Oil - petroleum refining	1.1	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A1C	Oil – manufacture of solid fuels and other energy industries	1.8	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A2A	Oil - iron and steel	0.5	Normal	Emission trading scheme (Klif 2011),Rypdal, K. and Zhang, L.-C. (2000)
1A2C	Oil - chemicals	14.4	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A2D	Oil – pulp, paper, print	0.7	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A2G	Oil - other	2.6	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A4A	Oil - commercial/institutional	20	Normal	Expert judgement, Statistics Norway
1A4B	Oil - residential	9.5	Normal	Emission trading scheme (Klif 2011), Expert judgement, Statistics Norway
1A4C	Oil - agriculture/forestry	10	Normal	Expert judgement, Statistics Norway
1A1, 1A2	Waste – general	5	Normal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1A2E	Waste – Food processing beverages and tobacco	3		Expert judgement, Statistics Norway
1A2G	Waste - other manufacturing	3.2	Normal	Emission trading scheme (Klif 2011), Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1A4A	Waste - commercial/institutional	30	Lognormal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1A3A, 1A3E	Transport fuel - civil aviation, motorized equipment and pipeline	20	Normal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)

1A3B	Transport fuel - road	5	Normal	Expert judgement, Statistics Norway
1A3C	Transport fuel - railway	5	Normal	Expert judgement, Statistics Norway
1A3D	Transport fuel - navigation	20	Normal	Expert judgement, Statistics Norway
1A5A, 1A5B	Military fuel - stationary and mobile	5	Normal	Expert judgement, Statistics Norway
1B1A, 1B2B	Coal mining, extraction of natural gas	3	Normal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1B2A	Extraction of oil - transport, refining/storage	3	Normal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1B2A	Extraction of oil - distribution gasoline	5	Normal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1B2C	Venting	-	-	See emission factor
1B2C	Flaring	1.4	Normal	Emission trading scheme (Klif 2011), Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1B2C	Well testing	30	Normal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1C2	Injection and storage	5	Normal	Expert judgement, Norwegian Environmental Agency (2020)
2A1	Cement production	0.4	Normal	Emission trading scheme (Klif 2011)
2A2	Lime production	0.4	Normal	Emission trading scheme (Klif 2011)
2A3	Glass production	14.1	Normal	Emission trading scheme (Klif 2011)
2A4	Other mineral production	0.1	Normal	Emission trading scheme (Klif 2011)
2B1	Ammonia production	3	Normal	Expert judgement industry, (Yara 2006)
2B2	Nitric acid production	-	-	See emission factor
2B5	Carbide production - SiC	3	Normal	Expert judgement industry (Gobain & Exolon 2006)
2B5	Carbide production - CaC	3	Normal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
2B6	Titanium dioxide production	3		Expert judgement, Statistics Norway
2B8	Methanol and plastic production	9.0	Normal	Emission trading scheme (Klif 2011)
2C1	Iron and steel production	1.2	Normal	Expert judgement industry, (Tinfos 2006)
2C2	Ferroalloys production	-	-	See emission factor
2C3	Aluminium production	3	Normal	Expert judgement industry, (Hydro 2006a)
2C4	Mg production	-	-	See emission factor
2C6	Zn production	5	Normal	Expert judgement, Statistics Norway

2C7	Ni production, anode production	10	Normal	Expert judgement, Statistics Norway
2D1	Lubricant use	0.9	-	Expert judgement, Statistics Norway.
2D2	Paraffin wax use	30	Normal	Expert judgement, Statistics Norway
2D3	Other		-	See emission factor
2E1	Electronics industry – By-product emissions	-	-	See emission factor
2F	Product uses as substitutes for ODS	10	Normal	Expert judgement, Statistics Norway 2022.See emission factor
2G1	Electrical equipment	10	Normal	Expert judgement, Statistics Norway 2022.
2G2	SF6 and PFC from other product use	-	-	See emission factor
2G3	N_20 from product use	-	-	See emission factor
2H1	Pulp and paper	0.9	Normal	Emission trading scheme (Klif 2011)
2H2	Food and beverage industry	10	Normal	Expert judgement, Statistics Norway
3A	Enteric fermentation	5	Normal	Expert judgement, (Norway 2006a)
3Ba	Manure management - CH_4	5	Normal	Expert judgement, (Norway 2006a)
3Bb	Manure management - N_2O	24	Normal	Expert judgement[2], (Norway 2006a; Norway 2006b; Norway 2006c)
3Da1	Inorganic N fertilizer	5	Normal	Rypdal (1999)
3Da2	Organic N fertilizer	19	Normal	Rypdal, K. and Zhang, L.-C. (2000)
3Da3	Urine and dung deposited by grazing animals	22	Lognormal	Expert judgement[4], Statistics Norway
3Da4	Crop residue	30	Lognormal	Grønlund et al. (2014)[3]
3Da6	Cultivation of organic soils	Fac2	Lognormal	Expert judgement, Statistics Norway
3Db1	Atmospheric deposition	30	Normal	Expert judgement, Statistics Norway
3Db2	Nitrogen leaching and run-off	70	Lognormal	Expert judgement, Statistics Norway
3F	Emissions from field burning of agricultural residues	10	Normal	Expert judgement, Statistics Norway
3G	Liming	5	Normal	IPCC (2006)
3H	Urea application	5	Normal	IPCC (2006)
4	Land use, land use change and forestry	-	-	See emission factor
5A	Solid waste disposal	20	Normal	Expert judgement, Statistics Norway
5B1	Composting	20	Normal	Expert judgement, Statistics Norway

5B2	Anaerobic digestion - Biogas	20	Normal	Expert judgement, Statistics Norway
5C	Waste incineration	30	Normal	Expert judgement, Statistics Norway (2011)
5D1	Domestic wastewater	10	Normal	Expert judgement, Statistics Norway
5D2	Industrial wastewater	20	Normal	Expert judgement, Statistics Norway

[1] *Strongly skewed distributions are characterised as fac3 etc, indicating that 2σ is a factor 3 below and above the mean.*

[2] *Population 5% (Norway 2006a), Nex 15% (Norway 2006b), distribution AWMS 10% (Norway 2006c), distribution pasture/ storage 15% (Norway 2006b)*

[3] *Grønlund et al. (2014) angir usikkerhet for eng til ± 50% og andre vekster ±25%.*

[4] *Population 5% (Norway 2006a), Nex 15% (Norway 2006b)(Statistics Norway 2006b, distribution pasture/ storage 15% (Norway 2006b)*

2.4 Emission factors

The assigned values and probability densities are shown in Table AII-2.

Table AII-2 Summary of standard deviation and probability density of emission factors.

IPCC Source category	Pollutant source	Gas	(2σ). per cent[1]	Density shape	Source/ comment
1A1, 1A2B, 1A2D, 1A2E, 1A4	Coal/coke - general	CO_2	7	Normal	Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A1B	Coal/coke – petroleum refining	CO_2	0.9	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A2A	Coal/coke – iron and steel	CO_2	16.0	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A2G	Coal/coke - other	CO_2	2.0	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A2, 1A4	Gas - general	CO_2	3.5	Normal	IPCC (2006), expert judgement, Statistics Norway
1A1A	Gas – public electricity and heat prod	CO_2	0.6	Normal	Emission trading scheme (Klif 2011), Norwegian Petroleum Directorate, Statistics Norway (2000)
1A1C	Gas – Manufacture of solid fuels and other energy	CO_2	2.6	Normal	Emission trading scheme (Klif 2011), Norwegian Petroleum Directorate, Statistics Norway (2000)
1A2C	Gas - Chemicals	CO_2	1.6	Normal	Emission trading scheme (Klif 2011), Norwegian Petroleum Directorate, Statistics Norway (2000)
1A1, 1A2, 1A4	Oil - general	CO_2	3	Normal	Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A1B	Oil – petroleum refining	CO_2	0.9	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A2C	Oil - Chemicals	CO_2	1.1	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A2G	Oil - other	CO_2	2.8	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A4B	Oil - residential	CO_2	3.4	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A1, 1A4	Waste - general	CO_2	30	Normal	Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A2G	Waste - other	CO_2	25.2	Normal	Emission trading scheme (Klif 2011), Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A3A, 1A3B, 1A3C, 1A3D	Transport fuel	CO_2	3	Normal	Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A5A	Military fuel - stationary	CO_2	5	Normal	Expert judgement, Statistics Norway
1A5B	Military fuel - mobile	CO_2	10	Normal	Expert judgement, Statistics Norway

1A1, 1A2, 1A4	Coal/coke, wood, waste - general	CH_4	Fac2	Lognormal	Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A1B	Coal/coke – petroleum refining	CH_4	Fac2	Lognormal	Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A1, 1A2, 1A4, 1A5	Gas – general, military fuel – stationary and mobile	CH_4	Fac2	Lognormal	Expert judgement, Statistics Norway
1A1, 1A2, 1A4	Oil - general	CH_4	Fac2	Lognormal	Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
1A3A, 1A3C, 1A3D	Transport fuel	CH_4	25	normal	Spread in data. Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1A3B	Transport fuel	CH_4	45	Lognormal	Gustafsson (2005)
1A1, 1A2, 1A4, 1A5	Coal/coke, wood, gas, waste – general, military fuel – stationary	N_2O	Fac3	Lognormal	Expert judgement, Statistics Norway
1A5	military fuel – mobile	N_2O	Fac3	Lognormal	Expert judgement, Statistics Norway
1A1, 1A2, 1A4	Oil - general	N_2O	Fac3	Lognormal	Spread in data. Expert judgement. IPCC (1997a), Rypdal, K. and Zhang, L.-C. (2000)
1A1B	Coal/coke – petroleum refining	N_2O	Fac3	Lognormal	Spread in data. Expert judgement. IPCC (1997a), Rypdal, K. and Zhang, L.-C. (2000)
1A3A, 1A3C, 1A3D	Transport fuel	N_2O	25	Lognormal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1A3B	Transport fuel	N_2O	65	Lognormal	Gustafsson (2005)
1B1A, 1B2B	Coal mining, extraction of natural gas	CO_2	Fac2	Lognormal	Expert judgement, Statistics Norway
1B2A	Extraction of oil - transport, refining/storage, distribution gasoline	CO_2	40	Lognormal	Expert judgement, Statistics Norway
1B2C	Venting	CO_2	Fac2	Lognormal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1B2C	Flaring	CO_2	4.5	Normal	Emission trading scheme (Klif 2011), Rypdal, K. and Zhang, L.-C. (2000)
1B2C	Well testing	CO_2	7	Normal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1B1A, 1B2B, 1B2C	Coal mining, extraction of natural gas, venting	CH_4	Fac2	Lognormal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1B2A	Extraction of oil - transport, refining/storage	CH_4	40	Lognormal	Expert judgement, Statistics Norway
1B2C	Flaring, well testing	CH_4	Fac2	Lognormal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)

1B2C	Flaring, well testing	N_2O	Fac3	Lognormal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
1C2	Injection and storage	CO_2	0	Normal	Expert judgement, Norwegian Environmental Agency (2020)
2A1	Cement production	CO_2	0.6	Normal	Emission trading scheme (Klif 2011), IPCC (1997a)
2A2	Lime production	CO_2	0.5	Normal	Emission trading scheme (Klif 2011), Expert judgement, Statistics Norway
2A3	Glass production	CO_2	7	Normal	Expert judgement, Statistics Norway
2B1	Ammonia production	CO_2	7	Normal	Expert judgement industry, Yara (2006)
2B5	Carbide production	CO_2	10	Normal	Spread in data, Rypdal, K. and Zhang, L.-C. (2000)
2B6	Titanium dioxide production	CO_2	10	Normal	Expert judgement, Statistics Norway
2B8	Petrochemical and black carbon production	CO_2	0,74	Normal	Emission trading scheme (Klif 2011), Expert judgement, Statistics Norway
2B8	Petrochemical and black carbon production	CH_4	Fac2	Lognormal	Expert judgement, Statistics Norway
2B2	Nitric acid production	N_2O	7.0	Normal	Expert judgement industry, Yara (2006), Emission trading scheme (Klif 2011)
2C1	Iron and steel production	CO_2	1.3	Normal	Emission trading scheme (Klif 2011), Expert judgement industry, Tinfos (2006)
2C2	Ferroalloys production	CO_2	3	Normal	Expert judgement, SINTEF (2006)
2C3	Aluminium production	CO_2	10	Normal	International Aluminium Institute (IAI), Hydro (2006a)
2C6	Zn production	CO_2	5	Normal	Expert judgement, Statistics Norway
2C7	Mg production, Ni production, anodes	CO_2	10	Normal	Expert judgement, Statistics Norway
2C2	Ferroalloys production	CH_4	Fac2	Lognormal	Expert judgement, Statistics Norway
2C2	Ferroalloys production	N_2O	10	Normal	Expert judgement, Statistics Norway
2C3	Aluminium production	PFC	20	Normal	Expert judgement industry, Hydro (2006a)
2C4	SF_6 used in Al and Mg foundries	SF_6	0.25	Normal	Expert judgement industry, Hydro (2006b)
2D1	Lubricant use	CO_2	20	Normal	IPCC (2006) and expert judgement, Statistics Norway
2D2	Paraffin wax use	CO_2	10	Normal	Expert judgement, Statistics Norway
2D3	Non-energy products - other	CO_2	10	Normal	Expert judgement, Statistics Norway

2D3	Non-energy products - other	N_2O	15	Normal	Expert judgement, Statistics Norway
2E1	Electronics industry – By-products emission	SF_6	60	Lognormal	Expert judgement, Statistics Norway
2F	Product uses as substitutes for ODS	HFC/PFC	50	Lognormal	Apply to HFK. Expert judgement, Statistics Norway
2G1	Electrical equipment	SF_6	60	Lognormal	Expert judgement, Statistics Norway
2G2	Other product use	SF_6	60	Lognormal	Expert judgement, Statistics Norway
2G3	Product use	N_2O	15	Normal	Expert judgement, Statistics Norway
2H1	Pulp and paper	CO_2	10	Normal	Expert judgement, Statistics Norway
2H2	Food and beverage industry	CO_2	10	Normal	Expert judgement, Statistics Norway
3A1	Enteric fermentation – cattle	CH_4	18	Normal	Expert judgement, NMBU (2006); NMBU (2020)
3A2	Enteric fermentation - sheep	CH_4	25	Normal	Expert judgement, NMBU (2006)
3A3, 3A4	Enteric fermentation - swine and other animal	CH_4	40	Normal	IPCC (2006) and expert judgement by Statistics Norway
3Ba1, 3Ba3	Manure management – CH_4 – cattle and swine	CH_4	20	Normal	IPCC (2006)
3Ba2, 3Ba4	Manure management – CH_4 – sheep and other animal	CH_4	20	Normal	IPCC (2006)
3B	Manure management - N_2O	N_2O	Fac2	Lognormal	IPCC (2006)
3Da1-4	Direct soil emission	N_2O	Fac3	Lognormal	IPCC (2006)
3Da6	Direct soil emission – Cultivation of organic soils	N_2O	37	Lognormal	IPCC (2014)
3Db1	Atmospheric Deposition	N_2O	Fac5	Lognormal	IPCC (2006)
3Db2	Nitrogen Leaching and Run-off	N_2O	Fac7	Lognormal	IPCC (2006)
3F1	Agricultural residue burning	CH_4	Fac2	Lognormal	Expert judgement, Statistics Norway
3F1	Agricultural residue burning	N_2O	Fac3	Lognormal	Expert judgement, Statistics Norway
3G	Liming	CO_2	10	Normal	Expert judgement, Statistics Norway
3H	Urea application	CO_2	10	Normal	Expert judgement, Statistics Norway
4(I)	Forest - inorganic	N_2O	201	log normal	IPCC (2006) and expert judgement, Statistics Norway
4(I)	Settlements - organic	N_2O	201	log normal	IPCC (2006) and expert judgement, Statistics Norway

4(II)	Cropland - drained organic soil	CH_4	102	log normal	IPCC (2014), and sample varianceIPCC (2014) Wetlands supplement, and sample variance
4(II)	Forest land drained organic soils	CH_4	85	normal	IIPCC (2014), and sample varianceExpert judgement, NIBIO 2022IIPCC (2014), and sample variance
4(II)	Grassland - drained organic soils	CH_4	91	normal	IPCC (2014), and sample varianceIPCC (2014) Wetlands supplement, and sample variance
4(II)	Wetland Peat extraction	CH_4	128	log normal	IPCC (2014) and expert judgement, NIBIOIPCC (2014) and expert judgement, NIBIO
4(II)	Wetland - drained organic soils	CH_4	85	normal	IPCC (2014), and sample varianceIPCC (2014), and sample variance
4(II)	Settlement - drained organic soils	CH_4	61	normal	IPCC (2014), and sample varianceIPCC (2014), and sample variance
4(II)	Forest land drained organic soil	N_2O	120	log normal	IPCC (2014), and sample varianceIPCC (2014), and and expert judgement, NIBIOsample variance
4(II)	Wetland Peat extraction	N_2O	151	log normal	IPCC (2014) and expert judgement, NIBIOIPCC (2014) and expert judgement, NIBIO
4(II)	Wetland - drained organic soils	N_2O	124	log normal	IPCC (2014), and sample varianceIPCC (2014), and sample variance
4(II)	Settlement - drained organic soils	N_2O	52	normal	IPCC (2014), and sample varianceIPCC (2014), and sample variance
4(III)	Direct N_2O from N mineralization/immobilization	N_2O	224	log normal	IPCC (2006), expert judgement, NIBIO
4(IV)	Atmospheric deposition - Indirect N_2O from managed soils	N_2O	450	log normal	IPCC (2006) and expert judgement, NIBIO
4(IV)	Leaching runoff - Indirect N_2O from managed soils	N_2O	300	log normal	IPCC (2006) and expert judgement, NIBIO
4(V)	Forest land – Wild fires	CH_4	75	normal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
4(V)	Forest land – Wild fires	N_2O	75	normal	Expert judgement, Rypdal, K. and Zhang, L.-C. (2000)
4A1	Forest remaining forest Litter + dead wood + mineral soil	CO_2	23	normal	Sample variance, expert judgement, NIBIO 2022.
4A1	Forest remaining forest Living biomass	CO_2	23	normal	Sample variance
4A1	Forest remaining forest, drained organic soil	CO_2	27	normal	IPCC (2014), and sample varianceIPCC (2014), and

					sample varianceExpert judgement, NIBIO 2022
4A2	Cropland to Forest DW	CO_2	212	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4A2	Cropland to Forest Litter	CO_2	212	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4A2	Cropland to Forest Living biomass	CO_2	103	log normal	IPCC (2019), and sample variance
4A2	Cropland to Forest Mineral soil	CO_2	161	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4A2	Cropland to Forest Organic soil	CO_2	143	log normal	IPCC (2014), and sample varianceIPCC (2014) Wetlands supplements.
4A2	Extensive Grassland to Forest DW	CO_2	201	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4A2	Extensive Grassland to Forest Litter	CO_2	201	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4A2	Extensive Grassland to Forest Living biomass	CO_2	119	log normal	IPCC (2019), and sample variance
4A2	Intensive Grassland to Forest Mineral soil	CO_2	450	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4A2	Intensive Grassland to Forest DW	CO_2	212	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4A2	Intensive Grassland to Forest Litter	CO_2	212	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4A2	Intensive Grassland to Forest Living biomass	CO_2	176	log normal	IPCC (2019) and sample varianceIPCC (2019) and Expert judgement, NIBIO
4A2	Settlement to Forest DW	CO_2	201	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4A2	Settlement to Forest Litter	CO_2	201	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4A2	Settlement to Forest Living biomass	CO_2	60	normal	Sample variance
4A2	Settlement to Forest Mineral soil	CO_2	201	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022
4A2	Unmanaged Wetland to Forest DW	CO_2	212	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022
4A2	Unmanaged Wetland to Forest Litter	CO_2	212	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022

4A2	Unmanaged Wetland to Forest Living biomass	CO_2	111	log normal	Sample variance
4A2	Unmanaged Wetland to Forest Organic soil	CO_2	81	normal	IPCC (2014) Wetlands supplementIPCC (2014) Wetlands supplement
4A2	Managed Wetland to Forest Organic soil	CO_2	76	normal	IPCC (2019) and Expert judgement, NIBIO
4A2	Managed Wetland to Forest DW	CO_2	224	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022
4A2	Managed Wetland to Forest Litter	CO_2	224	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022
4A2	Managed Wetland to Forest Living biomass	CO_2	158	log normal	Sample variance and expert judgement, NIBIO
4B1	Cropland remaining cropland Living biomass	CO_2	46	normal	IPCC (2019)
4B1	Cropland remaining cropland Mineral soil	CO_2	50	normal	Expert judgement, NIBIO
4B1	Cropland remaining cropland Organic soil	CO_2	30	normal	IPCC (2014), and sample varianceIPCC (2014) Wetlands supplement
4B2	Forest to Cropland DOM	CO_2	201	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4B2	Forest to Cropland Living biomass	CO_2	93	normal	Sample variance
4B2	Forest to Cropland Mineral soil	CO_2	157	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4B2	Forest to Cropland Organic soil	CO_2	142	log normal	IPCC (2014), and sample varianceIPCC (2014)
4B2	Extensive Grassland to Cropland Mineral soil	CO_2	300	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4B2	Extensive Grassland to Cropland Living biomass	CO_2	212	log normal	IPCC (2006) and IPCC (2019)
4B2	Intensive Grassland to Cropland Mineral soil	CO_2	224	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4B2	Intensive Grassland to Cropland Living biomass	CO_2	121	log normal	IPCC (2019), and sample variance
4B2	Intensive Grassland to Cropland Organic soil	CO_2	201	log normal	IPCC (2014), and sample varianceIPCC (2014) Wetlands supplement
4B2	Settlement to Cropland Living biomass	CO_2	160	log normal	IPCC (2019), and sample varianceIPCC (2019)
4B2	Settlement to Cropland Mineral soil	CO_2	450	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022

4B2	Managed Wetland to Cropland Living biomass	CO_2	140	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022
4B2	Managed Wetland to Cropland Organic soil	CO_2	99	normal	IPCC (2014), and sample varianceIPCC (2014)
4B2	Unmanaged Wetland to Cropland Organic soil	CO_2	162	log normal	IPCC (2014), and sample varianceIPCC (2014)
4C1	Extensive Grassland remaining extensive grassland Living biomass	CO_2	21	normal	Sample variance
4C1	Intensive Grassland remaining intensive grassland Living biomass	CO_2	51	normal	Sample variance
4C1	Intensive Grassland remaining intensive grassland Mineral soil	CO_2	92	normal	IPCC (2006)
4C1	Intensive Grassland remaining intensive grassland Organic soil	CO_2	93	normal	IPCC (2014), and sample varianceIPCC (2014) Wetlands supplement
4C2	Forest to intensive Grassland DOM	CO_2	201	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4C2	Forest to intensive Grassland Living biomass	CO_2	300	log normal	IPCC (2019), and sample variance
4C2	Forest to intensive Grassland Mineral soil	CO_2	450	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4C2	Unmanaged Wetland to intensive Grassland Living biomass	CO_2	212	log normal	IPCC (2019), and sample varianceSample variance, and IPCC (2006)
4C2	Unmanaged Wetland to intensive Grassland Organic soil	CO_2	131	log normal	IPCC (2014), and sample varianceIPCC (2014)
4C2	Settlement to extensive Grassland - Living biomass	CO_2	212	log normal	IPCC (2019), and sample varianceSample variance, and IPCC (2006)
4C2	Settlement to extensive Grassland - Mineral soil	CO_2	300	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022
4C2	Settlement to intensive Grassland – Living biomass	CO_2	176	log normal	IPCC (2019), and sample variance
4C2	Settlement to intensive Grassland - Mineral soil	CO_2	235	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022
4D1	Wetland Peat extraction - on+off-site Organic soil	CO_2	110	log normal	IPCC (2014), expert judgement, NIBIOIPCC (2014), expert judgement, NIBIO
4D1	Unmanaged Wetlands remaining unmanaged wetlands, living biomass	CO_2	37	normal	Sample variance

4D1	Managed Wetlands remaining managed wetlands Organic soil	CO_2	45	normal	Sample variance
4D1	Managed Wetlands remaining managed wetlands Living biomass	CO_2	90	normal	Sample variance
4D2	Forest to managed Wetland DOM	CO_2	235	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022
4D2	Forest to managed Wetland Living biomass	CO_2	194	log normal	Sample variance
4D2	Forest to managed Wetland Organic soil	CO_2	201	log normal	IPCC (2014), and sample varianceIPCC (2014)
4D2	Extensive Grassland to managed Wetland Living biomass	CO_2	160	log normal	Sample variance, and IPCC (2006)Sample variance, and IPCC (2006)
4E1	Settlements remaining settlements Organic soil	CO_2	59	normal	IPCC (2014), and sample varianceIPCC (2014) Wetlands supplement
4E2	Cropland to Settlement Living biomass	CO_2	87	normal	Sample variance, and IPCC (2006); IPCC (2019)
4E2	Cropland to Settlement Mineral soil	CO_2	450	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022
4E2	Cropland to Settlement Organic soil	CO_2	102	log normal	IPCC (2014), and sample variance
4E2	Forest to Settlement DOM	CO_2	201	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2021
4E2	Forest to Settlement Living biomass	CO_2	62	normal	Sample variance
4E2	Forest to Settlement Mineral soil	CO_2	201	log normal	IPCC (2019), sample variance and expert judgement, NIBIO 2022
4E2	Forest to Settlement Organic soil	CO_2	75	normal	IPCC (2014), and sample variance
4E2	Extensive Grassland to Settlement Living biomass	CO_2	124	log normal	IPCC (2006), sample varianceIPCC (2006)
4E2	Extensive Grassland to Settlement Mineral soil	CO_2	212	log normal	IPCC (2019), Expert judgement, NIBIO
4E2	Intensive Grassland to Settlement Living biomass	CO_2	107	log normal	IPCC (2006), sample varianceIPCC (2006)
4E2	Intensive Grassland to Settlement Mineral soil	CO_2	201	log normal	IPCC (2019), expert judgement, NIBIO

4E2	Unmanaged Wetland to Settlement Living biomass	CO_2	148	log normal	Sample variance
4E2	Unmanaged Wetland to Settlement Mineral soil	CO_2	235	log normal	IPCC (2019), Expert judgement, NIBIO
4E2	Unmanaged Wetland to Settlement Organic soil	CO_2	138	log normal	IPCC (2014), and sample varianceIPCC (2014) Wetlands supplement
4G	Harvested wood Products HWP	CO_2	50	normal	IPCC (2014) IPCC (2014)
5A	Solid waste disposal	CH_4	30	Log normal	SFT (2006)
5B1	Composting – municipal solid waste	CH_4	Fac3	Log normal	IPCC (2006)
5B1	Home composting	N_2O	Fac3	Log normal	IPCC (2006)
5B2	Anaerobic digestion at biogas facilities	N_2O	Fac3	Log normal	IPCC (2006)
5C	Waste incineration	CO_2	30	normal	Expert judgement, Statistics Norway
5C	Waste incineration	CH_4	Fac2	Log normal	Expert judgement, Statistics Norway
5C	Waste incineration	N_2O	Fac3	Log normal	Expert judgement, Statistics Norway
5D	Wastewater treatment and discharge	CH_4	30	normal	IPCC (2006)
5D	Wastewater treatment and discharge	N_2O	50	normal	IPCC (2006) Expert judgement, Statistics Norway 2022

[1] *Strongly skewed distributions are characterised as fac2, fac3, fac5 and fac10, indicating that 2σ is respectively a factor 2, 3, 5 and 10 below and above the mean.*

[2] *BOD/ person 30%, Bo 30% (IPCC 2000) and MCF 25%. Dependencies between parameters*

2.5 Dependencies between parameters

Some of the input parameters (emission factors and activity data) are for various reasons not independent, that means that their values are dependent (or correlated). The problem of dependencies may be solved by appropriate aggregation of the data or explicitly by modelling. In this work we have partly designed the dataset to reduce the problem with dependencies as well as introduced a number of dependence assumptions into the model.

The determination of dependencies is sometimes a difficult task and requires some understanding of the data set and the assumptions it is based on. Initial estimates with

variable assumptions have shown that the assumptions on dependencies generally have little effect on the final conclusions on uncertainties. The assumptions of dependencies of data between years are, however, crucial for the determination of trend uncertainty (Rypdal, K. & Zhang, L.-C. 2000).

2.6 Dependencies between activity data

The activity data are in principle independent. However, the same activity data may be used to estimate more than one source category (e.g., in the agriculture sector). Also, the same activity data are used for estimating emissions of more than one pollutant (especially in the case of energy emissions).

The cases when activity data are assumed dependent in the statistical modelling are:

- The consumption of oil products in each sector. The sum of all oil products has a lower uncertainty than the consumption in each sector. In practice, this is treated by assuming that sectors are independent, and then by scaling all uncertainties so that total uncertainty equals a specified value.
- Where the same activity data are used to estimate emissions of more than one pollutant
- The number of domestic animals. The same population data are used for estimation of a) methane from enteric fermentation, b) methane and nitrous oxide from manure management and c) nitrous oxide from agricultural soils
- For estimation of N_2O from manure management, N_2O from manure spreading and N_2O from animal production (pasture) the following dependency estimation has been used for the activity data:
  - 70% of emissions dependent on cattle population
  - 30% of emissions dependent on sheep population
- For estimation of N_2O from indirect soil emissions the following dependency estimation has been used for the activity data:
  - 23% of emissions dependent on cattle population
  - 10% of emissions dependent on sheep population
  - 67% of emissions dependent on amount of synthetic fertilizer used

2.7 Dependencies between emission factors

Where emission factors have been assumed equal, we have treated them as dependent in the analysis.

The following assumptions have been made:

- The CO_2 emission factors for each fuel type are dependent

- The methane and nitrous oxide emission factors from combustion are dependent where they have been assumed equal in the emission inventory model
- In a few cases the emission factors of different pollutants are correlated. That is in cases when CO_2 is oxidised from methane (oil extraction, loading and coal mining).
- For all direct emissions of N_2O from agricultural soils, except for N_2O from cultivation of organic soil, the same emission factor is being used, and the sources are dependent.
- There is a dependency between the emission factor used for calculating emissions from cropland liming and other liming.

There are also likely dependencies between other sources in LULUCF, but we have no estimates for the uncertainty in activity data, and anyhow the uncertainty in the emission factors is so large that even if the activity data is given an uncertainty, it will have a minimal effect on the total uncertainty estimate for the source.

2.8 Dependencies between data in base year and end year

The estimates made for the base year and end year will to a large extent be based on the same data and assumptions.

2.8.1 Activity data

The activity data are determined independently in the two years and are in principle not dependent. Correlation could be considered in cases where activity data cannot be updated annually or where updates are based on extrapolations or interpolations of data for another year.

This implies that we have assumed that errors in activity data are random, hence that systematic method errors are insignificant. It is, however, likely that there is a certain correlation between the activity data as they have been determined using the same methods.

2.8.2 Emission factors

Most of the emission factors are assumed unchanged from the base year to the end year. Those that are not all based on the same assumptions. This implies that all the emission factors are fully correlated between the two years.

This means that we have assumed that the emission factors assumed unchanged actually are unchanged from the base to end year. In reality it is expected that most emission factors are changing, but the degree of change is usually not known.

2.9 The statistical modelling

Uncertainty analysis based on probabilistic analysis implies that uncertainties in model inputs are used to propagate uncertainties in model outputs. The result of the uncertainty estimation gives us the range and likelihood of various output values (Alison C. Cullen & Frey 1999).

Having generated a data set according to the specified parametric simultaneous distribution of the data described in Table AII-1 and Table AII-2, we may calculate any desired output defined as a function of the data. This gives us one simulated random realisation of this output, according to its marginal distribution derived from the underlying simultaneous distribution of the data. Independent repetition of the simulation gives an independent sample of the desired output according to its marginal distribution. The size of the sample is given by the number of repeated simulations and has nothing to do with the size of the original data set. Based on such an independent and identically distributed sample, we may use the sample mean as an estimate of the mean of the output; we may also use the sample standard deviation as an estimate of the standard deviation of the output.

2.10 Results of the Approach 2 Uncertainty analysis

Results for the uncertainties in the total emissions and trends for the GHG inventory, excluding and including the LULUCF sector are given in Chapter 1.7.

3. Source category level used in the analysis

Source category level used in the analysis is listed in Table AII-3.

Table AII-3 Source category level used in the analysis.

IPCC	Source Category	Pollutant source
1A1A_VT1	Public electricity and heat prod	Coal/coke combustion
1A1A_VT2	Public electricity and heat prod	Wood combustion
1A1A_VT3	Public electricity and heat prod	Gas combustion
1A1A_VT6	Public electricity and heat prod	Oil combustion
1A1A_VT7	Public electricity and heat prod	Waste combustion
1A1B_VT1	Petroleum refining	Coal/coke combustion
1A1B_VT6	Petroleum refining	Oil combustion
1A1C_VT3	Manufacture of solid fuels and other energy	Gas combustion
1A1C_VT6	Manufacture of solid fuels and other energy	Oil combustion
1A2A_VT1	Iron and steel	Coal/coke combustion
1A2A_VT2	Iron and steel	Wood combustion
1A2A_VT3	Iron and steel	Gas combustion
1A2A_VT6	Iron and steel	Oil combustion
1A2B_VT1	Non-ferrous metal	Coal/coke combustion
1A2B_VT2	Non-ferrous metal	Wood combustion
1A2B_VT3	Non-ferrous metal	Gas combustion
1A2B_VT6	Non-ferrous metal	Oil combustion
1A2C_VT1	Chemicals	Coal/coke combustion
1A2C_VT2	Chemicals	Wood combustion
1A2C_VT3	Chemicals	Gas combustion
1A2C_VT6	Chemicals	Oil combustion
1A2C_VT7	Chemicals	Waste combustion
1A2D_VT1	Pulp, paper, print	Coal/coke combustion
1A2D_VT2	Pulp, paper, print	Wood combustion
1A2D_VT3	Pulp, paper, print	Gas combustion
1A2D_VT6	Pulp, paper, print	Oil combustion
1A2D_VT7	Pulp, paper, print	Waste combustion
1A2E_VT1	Food processing, beverages, tobacco	Coal/coke combustion
1A2E_VT2	Food processing, beverages, tobacco	Wood combustion
1A2E_VT3	Food processing, beverages, tobacco	Gas combustion
1A2E_VT6	Food processing, beverages, tobacco	Oil combustion
1A2E_VT7	Food processing, beverages, tobacco	Waste combustion
1A2G_VT1	Other manufacturing	Coal/coke combustion
1A2G_VT2	Other manufacturing	Wood combustion
1A2G_VT3	Other manufacturing	Gas combustion
1A2G_VT6	Other manufacturing	Oil combustion
1A2G_VT7	Other manufacturing	Waste combustion
1A3A	Transport fuel - civil aviation	

1A3B	Transport fuel - road transportation	
1A3C	Transport fuel – railway	
1A3D	Transport fuel – navigation	
1A4A_VT2	Transport fuel - motorized equipment and pipeline	
1A4A_VT3	Commercial/institutional	Wood combustion
1A4A_VT6	Commercial/institutional	Gas combustion
1A4A_VT7	Commercial/institutional	Oil combustion
1A4B_VT1	Commercial/institutional	Waste combustion
1A4B_VT2	Residential	Coal/coke combustion
1A4B_VT3	Residential	Wood combustion
1A4B_VT6	Residential	Gas combustion
1A4C_VT1	Residential	Oil combustion
1A4C_VT2	Agriculture/forestry/fishing	Coal/coke combustion
1A4C_VT3	Agriculture/forestry/fishing	Wood combustion
1A4C_VT6	Agriculture/forestry/fishing	Gas combustion
1A5A	Agriculture/forestry/fishing	Oil combustion
1A5B	Military	Military fuel - stationary
1B1A	Military	Military fuel - mobile
1B2A_x	Coal mining, Extraction of natural gas	
1B2A_y	Extraction of oil – transport	
1B2A_z	Extraction of oil - refining/storage	
1B2B	Extraction of oil - distribution gasoline	
1B2C_x	Coal mining, Extraction of natural gas	
1B2C_y	Venting	
1B2C_z	Well testing	
1C2	Injection and storage	
2A1	Flaring	
2A2	Cement production	
2A3	Lime production	
2A4	Glass production	
2B1	Other mineral production	
2B2	Ammonia production	
2B5	Nitric acid production	
2B6	Silicone and calcium carbide production	
2B8	Titanium dioxide production	
2B10	Petrochemical and black carbon production	
2C1	Iron and steel production	
2C2	Ferroalloys production	
2C3	Aluminium production	
2C4	Magnesium production	
2C6	Zinc production	

2C7	Ni production, anodes	
2D1	Lubricant use	
2D2	Paraffin wax use	
2D3	Other non-energy use of energy products	
2E1	Electronics industry – by-product emissions	
2F	Product uses as substitutes for ODS	
2G1	Electrical equipment	
2G2	SF_6 from other product use	
2G3	N_2O from product uses	
2H1	Pulp and paper	
2H2	Food and beverage industry	
3A1	Enteric fermentation – cattle	
3A2	Enteric fermentation – sheep	
3A3	Enteric fermentation – swine	
3A4	Enteric fermentation - other animal	
3B1	Manure management - CH_4 -cattle	
3B2	Manure management - CH_4 – sheep	
3B3	Manure management - CH_4- swine	
3B4	Manure management - CH_4 - other animal	
3B	Manure management - N_2O - solid storage	
3D11	Direct soil emission - Inorganic fertilizer	
3D12	Direct soil emission - Organic fertilizer	
3D13	Direct soil emission- Urine and dung by grazing animals	
3D14	Direct soil emission- Crop residue	
3D15	loss/gain soil organic matter	
3D21	Indirect soil emission- Deposition	
3D22	Indirect soil emission - leakage	
3F1	Field Burning of Agricultural Residue – cereals	
3G	Liming	
3H	Urea application	
4A1	Forest remaining forest - Litter + dead wood + Mineral soil	
4A1	Forest remaining forest - Living biomass	
4A1	Forest remaining forest, drained organic soils - Organic soil	
4A2	Cropland to Forest – DOM	
4A2	Cropland to Forest – Litter	
4A2	Cropland to Forest - Living biomass	
4A2	Cropland to Forest - Mineral soil	
4A2	Cropland to Forest - Organic soil	
4A2	Extensive grassland to forest- DOM	
4A2	Extensive grassland to forest- Litter	
4A2	Extensive grassland to forest- Living biomass	

4A2	Intensive grassland to forest- DOM	
4A2	Intensive grassland to forest- Litter	
4A2	Intensive grassland to forest- Living biomass	
4A2	Intensive grassland to forest- mineral soil	
4A2	Settlement to Forest – DOM	
4A2	Settlement to Forest – Litter	
4A2	Settlement to Forest - Living biomass	
4A2	Settlement to Forest - Mineral soil	
4A2	Unmanaged Wetland to Forest – DOM	
4A2	Unmanaged Wetland to Forest – Litter	
4A2	Unmanaged Wetland to Forest - Living biomass	
4A2	Unmanaged Wetland to Forest - Organic soil	
4A2	Managed Wetland to Forest – DOM	
4A2	Managed Wetland to Forest - Litter	
4A2	Managed Wetland to Forest - Living biomass	
4A2	Managed Wetland to Forest - Organic soil	
4B1	Cropland remaining cropland - Living biomass	
4B1	Cropland remaining cropland - Mineral soil	
4B1	Cropland remaining cropland - Organic soil	
4B2	Forest to Cropland – DOM	
4B2	Forest to Cropland - Living biomass	
4B2	Forest to Cropland - Mineral soil	
4B2	Forest to Cropland - Organic soil	
4B2	Extensive Grassland to Cropland - Mineral soil	
4B2	Extensive Grassland to Cropland - Living biomass	
4B2	Intensive Grassland to Cropland - Mineral soil	
4B2	Intensive Grassland to Cropland - Living biomass	
4B2	Intensive Grassland to Cropland - Organic soil	
4B2	Settlement to Cropland - Living biomass	
4B2	Settlement to Cropland - Mineral soil	
4B2	Managed Wetland to Cropland - Organic soil	
4B2	Unmanaged Wetland to Cropland - Organic soil	
4C1	Extensive Grassland remaining extensive grassland - Living biomass	
4C1	Intensive Grassland remaining extensive grassland - Living biomass	

4C1	Intensive Grassland remaining intensive grassland - Mineral soil	
4C1	Intensive Grassland remaining intensive grassland – Organic soil	
4C2	Forest to intensive Grassland – DOM	
4C2	Forest to intensive Grassland - Living biomass	
4C2	Forest to intensive Grassland - Mineral soil	
4C2	Settlement to extensive Grassland – Mineral soil	
4C2	Settlement to extensive Grassland - Living biomass	
4C2	Settlement to intensive Grassland - Mineral soil	
4C2	Settlement to intensive Grassland - Living biomass	
4C2	Unmanaged Wetland to intensive Grassland - Living biomass	
4C2	Unmanaged Wetland to intensive Grassland - Organic soil	
4D1	Wetland Peat extraction - on+off-site - Organic soil	
4D1	Unmanaged Wetlands remaining unmanaged wetlands, - Living biomass	
4D1	Managed Wetlands remaining managed wetlands, -Living biomass	
4D1	Managed Wetlands remaining managed wetlands – organic soils	
4D2	Forest to managed Wetland – DOM	
4D2	Forest to managed Wetland - Living biomass	
4D2	Forest to managed Wetland - Organic soil	
4D2	Extensive Grassland to managed Wetland - Living biomass	
4E1	Settlements remaining settlements - Organic soil	
4E2	Cropland to Settlement - Living biomass	
4E2	Cropland to Settlement - Mineral soil	
4E2	Cropland to Settlement – Organic soil	
4E2	Forest to Settlement – DOM	
4E2	Forest to Settlement - Living biomass	
4E2	Forest to Settlement - Mineral soil	
4E2	Forest to Settlement - Organic soil	
4E2	Extensive Grassland to Settlement - Living biomass	
4E2	Extensive Grassland to Settlement - Mineral soil	

4E2	Intensive Grassland to Settlement - Living biomass	
4E2	Intensive Grassland to Settlement - Mineral soil	
4E2	Unmanaged Wetland to Settlement - Living biomass	
4E2	Unmanaged Wetland to Settlement - Mineral soil	
4E2	Unmanaged Wetland to Settlement - Organic soil	
4G	Harvested wood Products – HWP	
4(II)	Cropland - drained organic soil - Organic soil CC + LC	
4(II)	Forest land drained organic soils - Drained organic soil	
4(II)	Grassland - drained organic soils - Organic soil GG + LG	
4(II)	Wetland Peat extraction - Organic soil	
4(II)	Settlement - drained organic soils - Drained organic soil	
4(V)	Forest land - Biomass burning	
4(I)	Direct N_2O from inorganic N inputs - Inorganic N inputs	
4(I)	Direct N_2O from organic N inputs - Organic N inputs	
4(II)	Forest rem forest- drained organic soils (SSB) Drained organic soil	
4(II)	Wetland drained organic soils Organic soil	
4(III)	Direct N_2O from N mineralization/immobilization - Mineralization/immobilization	
4(IV)	Indirect N_2O from Managed soils - atm dep - Atmospheric deposition	
4(IV)	Indirect N_2O from Managed soils - leaching runoff - Leaching, runoff	
4(V)	Forest land - Biomass burning	
5A	Solid waste disposal	
5B1	Composting – municipal solid waste	
5B2	Anaerobic digestion at biogas facilities	
5C	Waste incineration	
5D1	Domestic wastewater	
5D2	Industrial wastewater	

4. Approach 2 uncertainty reporting

The Approach 2 uncertainty reporting is attached as an Excel file, Annex II Table 6.2.xlsx.

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Annex III: Energy balance sheets

This annex presents the energy balance that forms the basis for the emissions from energy combustion (source category 1A), as well as for the reference approach. The data are also available from Statistics Norway (https://www.ssb.no/en/energi-og-industri/statistikker/energibalanse/aar-endelige).

Footnotes to the tables:

[1]) *Gasoline* and *road diesel* data are excluding biofuels.

Energy balance (PJ) 1990	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	4 959,3	8,5	.	993,3	3 430,7	8,5	39,9	.	.	.	.	.	.	.	.	.	.	35,5	.	-	3,7	2,1	437,0	.
2 Imports	281,4	20,0	15,0	.	69,1	.	58,4	22,0	3,8	0,6	5,6	8,2	14,5	6,2	1,2	24,1	30,8	0,8	.	.	.	.	1,2	.
3 Exports	4 278,1	7,1	0,1	925,1	2 897,3	8,5	55,9	79,9	15,6	-	22,7	33,0	58,6	24,9	16,4	39,5	34,8	0,1	.	.	.	.	58,5	.
4 International bunkers	39,2	.	.	.	.	.	.	.	8,8	.	.	.	17,0	.	0,4	12,9	.	.	.	.	.	.	.	.
4.1 International marine bunkers	30,4	.	.	.	.	.	.	.	.	.	.	.	17,0	.	0,4	12,9	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	8,8	.	.	.	.	.	.	.	8,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-62,7	-0,4	-	.	-62,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	860,8	21,0	14,9	68,2	540,2	-	42,3	-57,9	-20,7	0,6	-17,1	-24,8	-61,1	-18,8	-15,7	-28,3	-4,0	36,3	.	-	3,7	2,1	379,7	.
7 Transformation processes	-2,7	-0,6	-0,1	.	-539,0	.	-4,9	166,3	35,6	10,4	39,4	57,5	98,9	42,1	13,6	32,3	45,3	-1,1	.	.	-1,6	-2,1	0,4	5,1
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	-2,5	.	.	.	-539,0	.	9,9	163,9	35,6	10,4	39,4	57,5	98,9	42,2	13,6	32,3	32,8	.	.	.	.	.	.	.
7.3 In thermal power plants	0,3	.	.	.	.	.	.	.	.	.	.	.	.	-0,1	.	-	.	-0,9	.	.	.	.	1,3	.
7.4 In combined heat and power plants	-0,5	-0,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-0,8	-1,0	0,3	1,5
7.5 In district heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-0,1	.	-	.	-0,1	.	.	-0,8	-1,1	-1,3	3,6
7.6 Other transformation processes	-	.	-	.	.	.	-14,9	2,4	.	.	.	.	.	.	.	.	12,5	.	.	.	.	.	.	.
8 Energy industries own use	128,4	.	.	89,9	.	.	.	.	.	-	0,1	.	5,8	0,1	0,1	0,1	25,3	.	.	.	.	.	7,0	.
8.1 Crude petroleum and natural gass production	96,1	.	.	89,9	.	.	.	.	.	-	0,1	.	5,8	0,1	.	.	.	.	.	.	.	.	0,3	.
8.2 Coal mines	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.3 Oil refineries	27,1	.	.	.	.	.	.	.	.	.	-	.	.	-	0,1	0,1	25,3	.	.	.	.	.	1,6	.
8.4 Pumping storage power plants	1,2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1,2	.
8.5 Hydropower plants	3,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,6	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
9 Distribution losses	30,1	.	0,2	.	.	.	.	.	.	.	.	.	.	.	.	.	3,1	.	.	-	.	.	24,7	2,0
10 Final consumption (11+12)	718,3	21,2	14,0	.	.	.	37,5	78,5	13,0	7,4	19,8	26,5	31,7	32,8	4,3	14,4	29,7	34,5	.	-	1,7	.	348,0	3,1
11 Non energy consumption	53,7	2,0	.	.	.	.	33,6	.	.	.	.	.	.	.	.	.	18,1	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	38,3	.	.	.	.	.	33,6	.	.	.	.	.	.	.	.	.	4,7	.	.	.	.	.	.	.
11.2 In other production	15,4	2,0	.	.	.	.	-	.	.	.	.	.	.	.	.	.	13,4	.	.	.	.	.	.	.
12 Final energy consumption	664,6	19,2	14,0	.	.	.	3,9	78,5	13,0	7,4	19,8	26,5	31,7	32,8	4,3	14,4	11,6	34,5	.	-	1,7	.	348,0	3,1
12.1 Manufacturing, constr. and non-fuel mining	262,9	18,9	13,9	.	.	.	3,8	.	.	0,1	7,6	.	.	11,8	1,5	13,4	11,6	14,1	.	.	1,6	.	163,9	0,7
12.1.1 Iron and steel	53,2	11,6	11,3	.	.	.	-	.	.	.	-	.	.	0,2	.	0,8	.	-	.	.	.	.	29,2	-
12.1.2 Chemical and petrochemical	42,3	3,1	1,9	.	.	.	2,2	.	.	.	0,1	.	.	0,8	-	2,4	10,6	0,2	.	.	0,3	.	20,4	0,3
12.1.3 Non-ferrous metals	65,0	.	0,4	.	.	.	0,2	.	.	.	0,1	.	.	1,4	0,7	1,0	0,6	.	.	.	.	.	60,5	.
12.1.4 Non-metalic minerals	11,9	3,9	0,3	.	.	.	0,2	.	.	-	0,3	.	.	1,2	0,1	1,7	0,4	.	.	.	1,0	.	2,8	.
12.1.5 Transport equipment	3,2	.	.	.	.	.	0,1	.	.	-	0,1	.	.	0,4	0,1	0,1	.	.	.	.	.	.	2,4	0,1
12.1.6 Machinery	6,6	.	-	.	.	.	0,2	.	.	-	0,1	.	.	1,0	0,1	0,1	.	.	.	.	.	.	5,1	.
12.1.7 Mining and quarrying	4,8	.	.	.	.	.	-	.	.	-	0,5	.	.	0,7	-	0,8	.	.	.	.	0,1	.	2,5	.
12.1.8 Food and tobacco	15,9	0,1	-	.	.	.	0,1	.	.	-	1,0	.	.	2,7	0,3	3,1	.	.	.	.	.	.	8,2	0,3
12.1.9 Paper, pulp and print	38,4	0,2	.	.	.	.	0,1	.	.	-	0,4	.	.	1,1	0,1	2,4	.	9,4	.	.	0,2	.	24,5	.
12.1.10 Wood and wood products	8,4	.	.	.	.	.	-	.	.	-	0,2	.	.	0,3	-	0,6	.	4,4	.	.	.	.	2,8	.
12.1.11 Textile and leather	1,0	.	.	.	.	.	-	.	.	-	-	.	.	0,2	-	0,2	.	-	.	.	.	.	0,6	.
12.1.12 Construction	8,5	.	.	.	.	.	0,5	.	.	0,1	4,9	.	.	1,1	-	.	.	.	.	.	.	.	1,9	.
12.1.13 Other industries	3,8	.	-	.	.	.	-	.	.	-	-	.	.	0,6	0,1	0,1	.	0,1	.	.	.	.	2,8	-
12.2 Transport	142,7	.	.	.	.	.	.	78,5	9,4	.	2,1	26,4	22,3	.	1,7	0,6	.	.	.	.	.	.	1,8	.
12.2.1 Road	102,7	.	.	.	.	.	.	76,3	.	.	.	26,4	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	3,1	.	.	.	.	.	.	-	.	.	1,3	.	.	.	.	.	.	.	.	.	.	.	1,8	.
12.2.3 Domestic aviation	9,5	.	.	.	.	.	.	0,1	9,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	27,3	.	.	.	.	.	.	2,1	-	.	0,8	-	22,3	.	1,7	0,6	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	259,0	0,3	0,1	.	.	.	0,1	-	3,6	7,3	10,2	0,1	9,4	21,0	1,1	0,4	.	20,4	.	-	0,1	.	182,3	2,4
12.3.1 Agriculture and forestry	9,7	0,1	.	.	.	.	.	-	.	0,1	4,8	0,1	-	1,9	0,1	0,1	.	.	.	.	.	.	2,4	-
12.3.2 Fishing	10,4	.	.	.	.	.	.	-	.	-	0,1	-	9,4	0,2	0,6	0,1	.	.	.	.	.	.	.	.
12.3.3 Commerce and public services	93,4	-	.	.	.	.	-	.	3,6	0,9	5,3	.	.	10,9	0,3	0,2	.	.	.	-	0,1	.	70,8	1,4
12.3.4 Households	145,5	0,2	0,1	.	.	.	0,1	.	.	6,3	.	.	.	8,1	0,2	-	.	20,4	.	.	.	.	109,1	1,0
13 Statistical difference (6+7-8-9-10)	-19,2	-0,7	0,6	-21,7	1,2	-	-0,1	29,8	1,9	3,6	2,3	6,1	0,3	-9,6	-6,5	-10,5	-16,8	0,7	.	-	0,4	-	-0,2	-
Memo01: Gas flared off on oil fields, terminals and landfills	22,4	.	.	22,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 1991	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	5 437,9	9,3	.	1 019,5	3 910,8	8,0	54,1	.	.	.	.	.	.	.	.	.	.	33,6	.	0,1	3,0	1,3	398,1	.
2 Imports	275,4	16,9	13,8	.	68,6	.	58,1	20,0	5,3	1,0	5,0	7,3	12,9	5,5	3,6	18,5	26,4	0,6	.	.	.	.	11,8	.
3 Exports	4 753,5	7,6	0,2	932,5	3 459,2	8,0	47,6	57,9	13,7	-	20,9	30,4	53,9	22,9	9,1	35,3	32,5	-	.	.	.	.	21,8	.
4 International bunkers	34,6	.	.	.	.	.	.	.	8,0	.	.	.	16,1	.	0,5	9,9	.	.	.	.	.	.	.	.
4.1 International marine bunkers	26,6	.	.	.	.	.	.	.	.	.	.	.	16,1	.	0,5	9,9	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	8,0	.	.	.	.	.	.	.	8,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	11,1	0,6	-	.	10,8	.	-	-0,1	-	-	-	-	-	-	.	-	-0,1	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	936,4	19,1	13,7	87,0	531,0	-	64,7	-37,9	-16,4	0,9	-15,9	-23,1	-57,1	-17,4	-6,1	-26,7	-6,2	34,2	.	0,1	3,0	1,3	388,1	.
7 Transformation processes	9,9	-0,7	-0,2	.	-510,2	.	-5,3	154,3	26,6	7,8	39,4	57,6	98,8	42,1	13,5	42,3	42,0	-1,1	.	.	-1,2	-1,3	0,2	5,6
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	8,9	.	.	.	-510,2	.	9,4	152,1	26,6	7,8	39,4	57,6	98,8	42,2	13,6	42,3	29,6	.	.	.	.	.	.	.
7.3 In thermal power plants	0,2	.	.	.	.	.	.	.	.	.	.	.	.	-0,1	.	-	.	-0,9	.	.	.	.	1,2	.
7.4 In combined heat and power plants	-	-0,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-0,6	-0,7	0,4	1,7
7.5 In district heating plants	0,9	.	.	.	.	.	.	.	.	.	.	.	.	-	-0,2	-	.	-0,1	.	.	-0,6	-0,7	-1,3	3,9
7.6 Other transformation processes	-0,1	.	-0,1	.	.	.	-14,7	2,3	.	.	.	.	.	.	.	.	12,4	.	.	.	.	.	.	.
8 Energy industries own use	132,8	.	.	94,9	.	.	.	.	.	-	0,1	.	6,8	0,1	0,1	-	23,0	.	.	.	.	.	7,8	.
8.1 Crude petroleum and natural gass production	102,2	.	.	94,9	.	.	.	.	.	-	0,1	.	6,8	0,1	.	.	.	.	.	.	.	.	0,4	.
8.2 Coal mines	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.3 Oil refineries	24,7	.	.	.	.	.	.	.	.	.	-	.	.	0,1	0,1	-	23,0	.	.	.	.	.	1,6	.
8.4 Pumping storage power plants	2,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,3	.
8.5 Hydropower plants	3,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,3	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
9 Distribution losses	29,5	.	0,4	.	.	.	.	.	.	.	.	.	.	.	.	.	2,9	.	.	0,1	.	.	24,1	1,9
10 Final consumption (11+12)	706,2	18,3	13,0	.	.	.	33,4	76,5	12,9	6,9	20,0	27,1	28,8	28,4	5,4	13,5	28,5	32,6	.	-	1,4	.	355,9	3,7
11 Non energy consumption	46,2	1,8	.	.	.	.	27,1	0,1	.	0,1	.	.	.	.	.	.	17,1	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	31,2	.	.	.	.	.	27,1	0,1	.	.	.	.	.	.	.	.	4,0	.	.	.	.	.	.	.
11.2 In other production	15,0	1,8	.	.	.	.	-	-	.	0,1	.	.	.	.	.	.	13,1	.	.	.	.	.	.	.
12 Final energy consumption	660,0	16,5	13,0	.	.	.	6,3	76,3	12,9	6,7	20,0	27,1	28,8	28,4	5,4	13,5	11,4	32,6	.	-	1,4	.	355,9	3,7
12.1 Manufacturing, constr. and non-fuel mining	257,4	16,2	13,0	.	.	.	6,2	.	.	0,1	7,4	.	.	9,7	1,9	12,8	11,4	14,2	.	.	1,4	.	162,4	0,8
12.1.1 Iron and steel	47,6	9,5	10,9	.	.	.	-	.	.	.	-	.	.	0,1	.	0,3	.	-	.	.	.	.	26,8	-
12.1.2 Chemical and petrochemical	42,6	2,7	1,6	.	.	.	4,5	.	.	.	-	.	.	0,6	-	2,6	10,6	0,1	.	.	0,3	.	19,2	0,3
12.1.3 Non-ferrous metals	65,9	.	0,3	.	.	.	0,2	.	.	.	0,1	.	.	1,3	1,0	0,9	0,6	.	.	.	.	.	61,5	.
12.1.4 Non-metalic minerals	11,3	3,4	0,3	.	.	.	0,4	.	.	-	0,2	.	.	0,9	0,2	2,0	0,2	.	.	.	0,8	.	2,9	-
12.1.5 Transport equipment	3,2	.	.	.	.	.	0,1	.	.	-	0,1	.	.	0,4	-	0,2	.	.	.	.	.	.	2,5	-
12.1.6 Machinery	6,5	.	-	.	.	.	0,2	.	.	-	-	.	.	0,8	0,1	0,1	.	.	.	.	.	.	5,1	-
12.1.7 Mining and quarrying	4,8	.	.	.	.	.	-	.	.	-	0,6	.	.	0,8	.	0,7	.	.	.	.	0,1	.	2,6	.
12.1.8 Food and tobacco	16,0	0,1	.	.	.	.	0,1	.	.	-	1,0	.	.	2,6	0,3	2,7	.	.	.	.	.	.	8,8	0,3
12.1.9 Paper, pulp and print	37,8	0,4	.	.	.	.	0,1	.	.	-	0,1	.	.	0,1	0,1	2,9	.	9,6	.	.	0,2	.	24,3	-
12.1.10 Wood and wood products	8,0	.	.	.	.	.	-	.	.	-	0,2	.	.	0,3	-	0,4	.	4,4	.	.	.	.	2,7	-
12.1.11 Textile and leather	1,1	.	.	.	.	.	-	.	.	-	-	.	.	0,2	-	0,1	.	.	.	.	.	.	0,7	-
12.1.12 Construction	8,6	.	.	.	.	.	0,5	.	.	0,1	5,2	.	.	1,0	-	.	.	.	.	.	.	.	1,9	.
12.1.13 Other industries	4,0	.	.	.	.	.	-	.	.	-	-	.	.	0,5	-	0,1	.	0,1	.	.	.	.	3,2	-
12.2 Transport	139,2	.	.	.	.	.	.	76,3	9,6	.	2,2	26,9	19,8	.	2,1	0,4	.	.	.	.	.	.	1,8	.
12.2.1 Road	101,0	.	.	.	.	.	.	74,1	.	.	.	26,9	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	3,2	.	.	.	.	.	.	-	.	.	1,4	.	.	.	.	.	.	.	.	.	.	.	1,8	.
12.2.3 Domestic aviation	9,8	.	.	.	.	.	.	0,1	9,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	25,2	.	.	.	.	.	.	2,1	-	.	0,8	-	19,8	.	2,1	0,4	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	263,4	0,3	-	.	.	.	0,1	-	3,2	6,6	10,4	0,1	9,0	18,8	1,5	0,3	.	18,4	.	-	-	.	191,7	2,9
12.3.1 Agriculture and forestry	9,3	0,2	.	.	.	.	.	-	.	0,1	4,7	0,1	-	1,7	0,1	-	.	.	.	.	.	.	2,4	-
12.3.2 Fishing	10,1	.	.	.	.	.	.	-	.	-	0,1	-	9,0	0,1	0,7	0,1	.	.	.	.	.	.	.	0,1
12.3.3 Commerce and public services	93,6	-	.	.	.	.	-	.	3,2	0,8	5,6	.	.	9,8	0,4	0,1	.	.	.	-	-	.	71,9	1,7
12.3.4 Households	150,3	0,2	-	.	.	.	0,1	.	.	5,8	.	.	.	7,1	0,3	-	.	18,4	.	.	.	.	117,4	1,1
13 Statistical difference (6+7-8-9-10)	77,4	0,1	-	-7,8	20,8	-	25,9	39,9	-2,7	1,8	3,4	7,4	6,0	-4,0	1,9	2,1	-18,5	0,6	.	-	0,4	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	14,0	.	.	14,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

6 Total energy supply (1+2-3-4+5)	894,9	18,4	13,8	104,6	572,9	-	56,2	-66,5	-17,6	0,7	-19,9	-28,9	-68,2	-21,9	-17,8	-43,6	-15,7	33,1	.	0,3	3,6	1,4	390,0
7 Transformation processes	3,8	-0,8	-0,1	.	-571,9	.	-3,8	176,3	33,7	9,8	42,4	61,5	109,2	43,8	14,8	38,6	48,3	-1,2	.	.	-1,3	-1,4	0,2
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	2,9	.	.	.	-571,9	.	10,0	174,2	33,7	9,8	42,4	61,5	109,2	43,9	14,8	38,6	36,6	.	.	.	.	.	.
7.3 In thermal power plants	0,2	.	.	.	.	.	.	.	.	.	.	.	.	-0,1	.	-	.	-1,0	.	.	.	.	1,3
7.4 In combined heat and power plants	-0,1	-0,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	-0,6	-0,7	0,3
7.5 In district heating plants	0,9	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	.	-0,1	.	.	-0,7	-0,8	-1,4
7.6 Other transformation processes	-0,1	.	-0,1	.	.	.	-13,8	2,1	.	.	.	.	.	.	.	.	11,7	.	.	.	.	.	.
8 Energy industries own use	144,9	.	.	101,5	.	.	.	.	.	-	0,1	.	6,6	0,1	-	-	28,6	.	.	.	.	.	7,9
8.1 Crude petroleum and natural gass production	108,7	.	.	101,5	.	.	.	.	.	-	0,1	.	6,6	-	.	.	.	.	.	.	.	.	0,5
8.2 Coal mines	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1
8.3 Oil refineries	30,4	.	.	.	.	.	.	.	.	.	-	.	.	-	-	-	28,6	.	.	.	.	.	1,7
8.4 Pumping storage power plants	2,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,0
8.5 Hydropower plants	3,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,4
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1
9 Distribution losses	30,0	.	0,2	.	.	.	.	.	.	.	.	.	.	.	.	.	3,3	.	.	0,2	.	.	24,5
10 Final consumption (11+12)	706,6	18,4	13,1	.	.	.	34,0	74,6	13,4	6,7	21,3	29,2	30,5	25,9	6,0	11,9	27,5	31,2	.	0,1	1,9	.	357,1
11 Non energy consumption	47,2	1,7	.	.	.	.	28,8	.	.	.	.	.	.	.	.	.	16,7	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	32,9	.	.	.	.	.	28,8	.	.	.	.	.	.	.	.	.	4,1	.	.	.	.	.	.
11.2 In other production	14,3	1,7	.	.	.	.	-	.	.	.	.	.	.	.	.	.	12,6	.	.	.	.	.	.
12 Final energy consumption	659,4	16,8	13,1	.	.	.	5,2	74,6	13,4	6,7	21,3	29,2	30,5	25,9	6,0	11,9	10,8	31,2	.	0,1	1,9	.	357,1
12.1 Manufacturing, constr. and non-fuel mining	252,8	16,5	13,1	.	.	.	5,0	.	.	0,1	8,5	.	.	10,0	1,2	11,1	10,8	13,1	.	.	1,9	.	160,7
12.1.1 Iron and steel	47,3	10,0	10,7	.	.	.	-	.	.	-	-	.	.	0,1	.	0,5	.	-	.	.	.	.	25,9
12.1.2 Chemical and petrochemical	39,0	2,5	1,7	.	.	.	2,2	.	.	.	0,1	.	.	0,8	-	1,7	9,9	.	.	.	0,5	.	19,2
12.1.3 Non-ferrous metals	62,9	.	0,4	.	.	.	0,3	.	.	-	-	.	.	1,3	0,5	0,7	0,6	.	.	.	.	.	59,1
12.1.4 Non-metalic minerals	12,9	3,8	0,3	.	.	.	1,0	.	.	-	0,2	.	.	0,9	0,2	1,7	0,3	.	.	.	1,1	.	3,5
12.1.5 Transport equipment	3,8	.	.	.	.	.	0,2	.	.	.	-	.	.	0,5	-	0,1	.	.	.	.	.	.	2,8
12.1.6 Machinery	7,0	.	-	.	.	.	0,3	.	.	-	-	.	.	0,9	-	-	.	.	.	.	.	.	5,8
12.1.7 Mining and quarrying	4,5	.	.	.	.	.	-	.	.	-	0,4	.	.	0,8	-	0,7	.	.	.	.	0,1	.	2,4
12.1.8 Food and tobacco	19,5	-	.	.	.	.	0,2	.	.	-	2,1	.	.	2,9	0,4	3,0	.	.	.	.	.	.	10,4
12.1.9 Paper, pulp and print	35,4	0,2	.	.	.	.	0,1	.	.	-	0,1	.	.	0,1	0,1	2,4	.	8,8	.	.	0,2	.	23,4
12.1.10 Wood and wood products	7,5	.	.	.	.	.	-	.	.	-	0,2	.	.	0,3	-	0,2	.	4,3	.	.	.	.	2,7
12.1.11 Textile and leather	1,1	.	.	.	.	.	-	.	.	-	-	.	.	0,2	-	0,1	.	.	.	.	.	.	0,8
12.1.12 Construction	8,3	.	.	.	.	.	0,5	.	.	0,1	5,3	.	.	0,8	-	.	.	.	.	.	.	.	1,5
12.1.13 Other industries	3,7	.	.	.	.	.	-	.	.	-	-	.	.	0,5	-	-	.	-	.	.	.	.	3,1
12.2 Transport	142,2	.	.	.	.	.	.	74,6	10,0	.	2,3	29,1	21,2	.	2,9	0,5	.	.	.	.	.	.	1,8
12.2.1 Road	101,4	.	.	.	.	.	.	72,3	.	.	.	29,1	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	3,2	.	.	.	.	.	.	-	.	.	1,5	.	.	.	.	.	.	.	.	.	.	.	1,8
12.2.3 Domestic aviation	10,1	.	.	.	.	.	.	0,1	10,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	27,5	.	.	.	.	.	.	2,1	-	.	0,8	-	21,2	.	2,9	0,5	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	264,5	0,2	-	.	.	.	0,2	-	3,4	6,6	10,5	0,1	9,4	15,9	1,9	0,3	.	18,0	.	0,1	0,1	.	194,7
12.3.1 Agriculture and forestry	9,1	0,1	.	.	.	.	.	-	.	0,1	4,6	0,1	-	1,4	0,2	0,1	.	.	.	.	0,1	.	2,4
12.3.2 Fishing	10,7	.	.	.	.	.	.	-	.	-	0,1	-	9,4	0,1	1,0	0,1	.	.	.	.	.	.	.
12.3.3 Commerce and public services	95,6	-	.	.	.	.	0,1	.	3,4	0,8	5,8	.	.	8,2	0,4	0,1	.	.	.	0,1	-	.	74,7
12.3.4 Households	149,0	0,1	-	.	.	.	0,1	.	.	5,7	.	.	.	6,1	0,4	-	.	18,0	.	.	.	.	117,5
13 Statistical difference (6+7-8-9-10)	16,6	-0,8	0,4	3,1	1,1	-	18,5	35,3	2,7	3,8	1,1	3,4	3,9	-4,0	-9,0	-17,0	-26,8	0,8	.	-	0,3	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	11,9	.	.	11,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 1993	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	6 336,5	7,5	.	1 019,4	4 753,2	10,9	73,4	.	.	.	.	.	.	.	.	.	.	35,6	.	0,4	3,8	1,6	430,7	.
2 Imports	253,7	20,1	13,2	.	56,5	.	56,1	18,5	1,2	1,4	3,3	4,8	8,6	3,7	1,8	35,4	25,7	1,2	.	.	.	.	2,1	.
3 Exports	5 594,0	6,4	0,1	908,1	4 216,2	10,8	67,7	81,3	17,1	0,2	24,0	34,8	61,9	26,3	13,7	59,7	34,9	-	.	.	.	.	30,5	.
4 International bunkers	37,0	.	.	.	.	.	.	.	8,7	.	.	.	17,6	.	0,7	9,9	.	.	.	.	.	.	.	.
4.1 International marine bunkers	28,3	.	.	.	.	.	.	.	.	.	.	.	17,6	.	0,7	9,9	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	8,7	.	.	.	.	.	.	.	8,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-26,0	1,8	-0,7	.	-28,0	.	-	0,2	0,1	-	-	-	-0,1	-	.	-	0,6	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	933,2	23,1	12,5	111,3	565,4	-	61,8	-62,6	-24,5	1,3	-20,7	-30,0	-71,0	-22,7	-12,7	-34,4	-8,6	36,8	.	0,4	3,8	1,6	402,2	.
7 Transformation processes	7,1	-0,7	-0,1	.	-569,8	.	-4,2	173,2	34,0	9,9	43,5	63,0	112,0	45,2	11,7	37,0	50,5	-1,2	.	.	-1,5	-1,6	0,4	5,8
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	6,2	.	.	.	-569,8	.	10,6	170,8	34,0	9,9	43,5	63,0	112,0	45,3	11,7	37,0	38,1	.	.	.	.	.	.	.
7.3 In thermal power plants	0,2	.	.	.	.	.	.	.	.	.	.	.	.	-0,1	.	-	.	-1,0	.	.	.	.	1,3	.
7.4 In combined heat and power plants	-	-0,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	-0,7	-0,8	0,4	1,9
7.5 In district heating plants	0,8	.	.	.	.	.	.	.	.	.	.	.	.	-	-	-	.	-0,1	.	.	-0,8	-0,8	-1,3	3,9
7.6 Other transformation processes	-0,1	.	-0,1	.	.	.	-14,8	2,4	.	.	.	.	.	.	.	.	12,4	.	.	.	.	.	.	.
8 Energy industries own use	151,3	.	.	107,5	.	.	0,5	.	.	-	0,1	.	6,4	0,1	-	-	28,9	.	.	.	.	.	7,8	.
8.1 Crude petroleum and natural gass production	114,7	.	.	107,5	.	.	.	.	.	-	0,1	.	6,4	-	.	.	.	.	.	.	.	.	0,7	.
8.2 Coal mines	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.3 Oil refineries	31,3	.	.	.	.	.	0,5	.	.	.	-	.	.	-	-	-	28,9	.	.	.	.	.	1,8	.
8.4 Pumping storage power plants	2,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,0	.
8.5 Hydropower plants	2,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,9	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	0,1	.
9 Distribution losses	34,4	.	0,3	.	.	.	.	.	.	.	.	.	.	.	.	.	3,5	.	.	0,2	.	.	28,7	1,8
10 Final consumption (11+12)	726,8	20,8	13,2	.	.	.	39,3	73,8	12,3	6,9	23,3	32,3	32,5	25,4	6,1	12,8	28,1	34,5	.	0,1	1,8	.	359,5	4,0
11 Non energy consumption	53,3	2,2	.	.	.	.	33,5	-	.	0,2	.	.	.	0,1	-	0,6	16,6	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	37,6	.	.	.	.	.	33,4	.	.	-	.	.	.	-	.	.	4,1	.	.	.	.	.	.	.
11.2 In other production	15,7	2,2	.	.	.	.	0,1	-	.	0,2	.	.	.	0,1	-	0,6	12,5	.	.	.	.	.	.	.
12 Final energy consumption	673,5	18,5	13,2	.	.	.	5,8	73,8	12,3	6,7	23,3	32,3	32,5	25,3	6,1	12,2	11,5	34,5	.	0,1	1,8	.	359,5	4,0
12.1 Manufacturing, constr. and non-fuel mining	257,9	18,3	13,2	.	.	.	5,6	.	.	0,1	8,7	.	.	9,8	1,4	11,5	11,5	13,8	.	.	1,8	.	161,3	0,9
12.1.1 Iron and steel	40,9	8,6	10,2	.	.	.	-	.	.	-	-	.	.	0,1	.	0,5	.	-	.	.	.	.	21,5	-
12.1.2 Chemical and petrochemical	46,3	4,5	2,3	.	.	.	2,8	.	.	-	0,1	.	.	0,7	0,2	1,5	10,6	.	.	.	0,3	.	22,8	0,5
12.1.3 Non-ferrous metals	64,2	.	0,3	.	.	.	0,4	.	.	-	-	.	.	1,1	0,5	0,8	0,6	.	.	.	.	.	60,4	.
12.1.4 Non-metalic minerals	13,9	5,0	0,3	.	.	.	1,0	.	.	-	0,2	.	.	0,9	0,1	1,7	0,3	.	.	.	1,0	.	3,5	.
12.1.5 Transport equipment	3,6	.	.	.	.	.	0,1	.	.	-	0,1	.	.	0,5	-	0,1	.	-	.	.	.	.	2,8	0,1
12.1.6 Machinery	4,5	.	-	.	.	.	0,1	.	.	-	0,1	.	.	1,0	-	0,1	.	.	.	.	0,2	.	3,0	.
12.1.7 Mining and quarrying	4,5	.	.	.	.	.	-	.	.	-	0,6	.	.	0,7	.	0,7	.	.	.	.	0,1	.	2,5	.
12.1.8 Food and tobacco	18,6	.	.	.	.	.	0,4	.	.	-	0,6	.	.	2,8	0,5	2,9	.	.	.	.	.	.	11,0	0,3
12.1.9 Paper, pulp and print	39,2	0,2	.	.	.	.	0,3	.	.	-	-	.	.	0,1	0,1	3,0	.	9,0	.	.	0,1	.	26,3	.
12.1.10 Wood and wood products	8,3	.	.	.	.	.	-	.	.	-	0,2	.	.	0,3	-	0,1	.	4,8	.	.	.	.	2,9	.
12.1.11 Textile and leather	1,1	.	.	.	.	.	-	.	.	-	-	.	.	0,2	.	0,1	.	.	.	.	.	.	0,7	.
12.1.12 Construction	9,5	.	.	.	.	.	0,5	.	.	0,1	6,7	.	.	0,8	-	.	.	.	.	.	.	.	1,4	.
12.1.13 Other industries	3,2	-	-	.	.	.	-	.	.	-	-	.	.	0,6	-	0,1	.	-	.	.	.	.	2,4	-
12.2 Transport	146,3	.	.	.	.	.	.	73,8	9,9	.	2,7	32,2	22,7	.	2,8	0,4	.	.	.	.	.	.	1,8	.
12.2.1 Road	103,7	.	.	.	.	.	.	71,5	.	.	.	32,2	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	3,7	.	.	.	.	.	.	-	.	.	1,8	.	.	.	.	.	.	.	.	.	.	.	1,8	.
12.2.3 Domestic aviation	10,0	.	.	.	.	.	.	0,1	9,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	28,9	.	.	.	.	.	.	2,1	-	.	0,9	-	22,7	.	2,8	0,4	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	269,4	0,2	-	.	.	.	0,2	-	2,4	6,6	11,9	0,2	9,8	15,6	1,9	0,3	.	20,6	.	0,1	-	.	196,4	3,2
12.3.1 Agriculture and forestry	11,9	0,1	.	.	.	.	.	-	.	0,1	4,6	0,2	-	1,4	0,2	-	.	.	.	.	.	.	5,4	-
12.3.2 Fishing	11,4	.	.	.	.	.	.	-	.	-	0,1	-	9,8	0,1	1,0	0,1	.	.	.	.	.	.	0,2	.
12.3.3 Commerce and public services	94,0	-	.	.	.	.	0,1	.	2,4	0,8	7,2	.	.	8,1	0,4	0,1	.	.	.	0,1	-	.	72,7	2,1
12.3.4 Households	152,1	0,1	-	.	.	.	0,1	.	.	5,8	.	.	.	6,0	0,4	-	.	20,6	.	.	.	.	118,0	1,0
13 Statistical difference (6+7-8-9-10)	27,3	1,6	-1,1	3,8	-4,4	-	17,8	36,8	-2,8	4,3	-0,6	0,7	2,2	-3,0	-7,1	-10,1	-18,6	1,2	.	-	0,5	-	6,2	-
Memo01: Gas flared off on oil fields, terminals and landfills	14,0	.	.	14,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 1994	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	7 023,8	8,5	.	1 122,1	5 315,6	12,0	115,6	.	.	.	.	.	.	.	.	.	.	37,8	.	0,5	4,1	1,8	405,7	.
2 Imports	275,5	22,3	15,4	.	44,7	.	54,1	25,3	5,5	0,5	3,1	4,5	8,0	3,4	2,2	39,4	27,9	1,7	.	.	.	.	17,4	.
3 Exports	6 294,7	5,0	.	1 019,7	4 753,8	11,7	107,2	83,6	17,8	-	26,1	37,9	67,3	28,6	19,4	52,9	45,6	-	.	.	.	.	17,9	.
4 International bunkers	36,0	.	.	.	.	.	.	.	8,4	.	.	.	17,7	.	0,9	8,9	.	.	.	.	.	.	.	.
4.1 International marine bunkers	27,5	.	.	.	.	.	.	.	.	.	.	.	17,7	.	0,9	8,9	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	8,4	.	.	.	.	.	.	.	8,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-20,6	-0,1	0,2	.	-9,3	.	0,2	0,4	-	-	-1,7	-2,4	-4,4	-1,9	.	-1,2	-0,4	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	947,9	25,7	15,7	102,4	597,1	0,3	62,7	-57,9	-20,7	0,5	-24,7	-35,8	-81,4	-27,2	-18,2	-23,7	-18,1	39,6	.	0,5	4,1	1,8	405,2	.
7 Transformation processes	11,6	-0,8	-0,2	.	-593,1	.	-1,4	175,7	37,0	10,8	45,4	65,8	116,9	47,4	15,7	40,1	50,4	-1,3	.	.	-1,7	-1,8	0,9	5,8
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	11,2	.	.	.	-593,1	.	13,7	173,3	37,0	10,8	45,4	65,8	116,9	47,9	15,7	40,1	37,6	.	.	.	.	.	.	.
7.3 In thermal power plants	0,3	.	.	.	.	.	.	.	.	.	.	.	.	-	.	-	.	-1,2	.	.	.	.	1,5	.
7.4 In combined heat and power plants	-0,4	-0,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-0,8	-0,9	0,4	1,7
7.5 In district heating plants	0,8	.	.	.	.	.	.	.	.	.	.	.	.	-0,4	-	-	.	-0,1	.	.	-0,9	-0,9	-1,0	4,1
7.6 Other transformation processes	-0,1	.	-0,1	.	.	.	-15,1	2,3	.	.	.	.	.	.	.	.	12,8	.	.	.	.	.	.	.
8 Energy industries own use	164,2	.	.	116,4	.	.	0,8	.	.	-	0,1	.	7,5	0,1	-	-	28,3	.	.	.	.	.	11,0	.
8.1 Crude petroleum and natural gass production	125,0	.	.	116,4	.	.	.	.	.	-	0,1	.	7,5	-	.	.	.	.	.	.	.	.	1,0	.
8.2 Coal mines	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.3 Oil refineries	31,0	.	.	.	.	.	0,8	.	.	.	-	.	.	-	-	-	28,3	.	.	.	.	.	1,9	.
8.4 Pumping storage power plants	5,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5,3	.
8.5 Hydropower plants	2,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,7	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
8.9 District heating plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
9 Distribution losses	34,0	.	0,4	.	.	.	.	.	.	.	.	.	.	.	.	.	3,4	.	.	0,3	.	.	28,4	1,6
10 Final consumption (11+12)	751,4	24,0	14,2	0,1	.	.	40,7	73,1	15,7	7,2	22,5	31,6	31,5	26,7	7,4	17,7	29,9	36,6	.	0,3	2,0	.	366,1	4,1
11 Non energy consumption	54,9	2,4	.	.	.	.	33,5	-	.	0,2	.	.	.	0,1	-	0,5	18,1	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	38,1	.	.	.	.	.	33,5	.	.	-	.	.	.	-	.	.	4,5	.	.	.	.	.	.	.
11.2 In other production	16,8	2,4	.	.	.	.	0,1	-	.	0,2	.	.	.	0,1	-	0,5	13,6	.	.	.	.	.	.	.
12 Final energy consumption	696,5	21,6	14,2	0,1	.	.	7,2	73,1	15,7	7,0	22,5	31,6	31,5	26,6	7,4	17,2	11,7	36,6	.	0,3	2,0	.	366,1	4,1
12.1 Manufacturing, constr. and non-fuel mining	275,7	21,4	14,2	0,1	.	.	6,8	.	.	0,1	8,6	.	.	11,7	1,4	16,6	11,7	14,6	.	.	2,0	.	165,2	1,3
12.1.1 Iron and steel	47,0	10,5	11,6	.	.	.	-	.	.	-	-	.	.	0,1	.	0,3	.	.	.	.	.	.	24,5	-
12.1.2 Chemical and petrochemical	47,5	5,0	2,0	-	.	.	3,2	.	.	-	-	.	.	0,9	0,3	2,3	11,0	.	.	.	0,3	.	22,1	0,3
12.1.3 Non-ferrous metals	65,6	-	0,3	0,1	.	.	0,4	.	.	-	-	.	.	1,3	0,4	0,8	0,6	-	.	.	0,1	.	61,6	.
12.1.4 Non-metalic minerals	15,0	5,6	0,3	.	.	.	1,1	.	.	-	0,2	.	.	1,0	-	1,6	0,2	-	.	.	1,0	.	3,9	0,1
12.1.5 Transport equipment	4,0	.	.	.	.	.	0,2	.	.	-	0,1	.	.	0,5	-	0,1	.	.	.	.	.	.	2,9	0,1
12.1.6 Machinery	8,0	.	-	.	.	.	0,3	.	.	-	0,1	.	.	1,2	-	0,1	.	-	.	.	0,3	.	5,7	0,2
12.1.7 Mining and quarrying	4,7	.	.	.	.	.	-	.	.	-	0,7	.	.	0,8	.	0,7	.	.	.	.	0,1	.	2,4	.
12.1.8 Food and tobacco	18,3	.	.	.	.	.	0,7	.	.	-	0,7	.	.	3,6	0,6	2,7	.	.	.	.	.	.	9,7	0,3
12.1.9 Paper, pulp and print	41,8	0,3	.	.	.	.	0,3	.	.	-	0,1	.	.	0,2	-	7,3	.	9,6	.	.	0,2	.	23,8	-
12.1.10 Wood and wood products	8,8	.	.	.	.	.	-	.	.	.	0,3	.	.	0,3	.	0,1	.	4,9	.	.	.	.	3,2	0,1
12.1.11 Textile and leather	1,3	.	.	.	.	.	-	.	.	.	-	.	.	0,3	.	0,2	.	.	.	.	.	.	0,8	-
12.1.12 Construction	9,4	.	.	.	.	.	0,5	.	.	0,1	6,5	.	.	0,7	-	.	.	.	.	.	.	.	1,6	.
12.1.13 Other industries	4,2	-	-	.	.	.	0,1	.	.	-	-	.	.	0,6	-	0,1	.	-	.	.	.	.	3,3	0,1
12.2 Transport	145,7	.	.	.	.	.	.	73,1	11,1	.	2,7	31,5	21,6	.	3,6	0,4	.	.	.	.	.	.	1,8	.
12.2.1 Road	102,3	.	.	.	.	.	.	70,8	.	.	.	31,5	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	3,6	.	.	.	.	.	.	-	.	.	1,8	.	.	.	.	.	.	.	.	.	.	.	1,8	.
12.2.3 Domestic aviation	11,3	.	.	.	.	.	.	0,1	11,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	28,6	.	.	.	.	.	.	2,2	-	.	0,9	-	21,6	.	3,6	0,4	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	275,1	0,2	-	-	.	.	0,4	-	4,6	6,9	11,3	0,2	9,8	15,0	2,4	0,2	.	22,0	.	0,3	-	.	199,1	2,8
12.3.1 Agriculture and forestry	11,5	-	.	.	.	.	.	-	.	0,1	4,1	0,2	-	1,2	0,2	-	.	.	.	.	.	.	5,5	-
12.3.2 Fishing	11,6	.	.	.	.	.	.	-	.	-	0,1	-	9,8	0,1	1,3	0,1	.	.	.	.	.	.	0,3	.
12.3.3 Commerce and public services	94,0	-	.	-	.	.	0,2	.	4,6	1,4	7,0	.	.	7,2	0,5	0,1	.	.	.	0,3	-	.	70,8	1,9
12.3.4 Households	157,9	0,1	-	.	.	.	0,1	.	.	5,3	.	.	.	6,4	0,4	-	.	22,0	.	.	.	.	122,5	0,9
13 Statistical difference (6+7-8-9-10)	9,5	0,9	0,8	-14,1	4,0	0,3	19,8	44,7	0,6	4,1	-1,9	-1,6	-3,4	-6,5	-9,9	-1,3	-29,3	1,6	.	-	0,5	-	0,2	0,1
Memo01: Gas flared off on oil fields, terminals and landfills	14,9	.	.	14,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 1995	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	7 521,2	8,2	.	1 163,6	5 715,7	11,9	135,8	.	.	.	.	.	.	.	.	.	.	38,1	.	0,6	4,3	2,0	441,0	.
2 Imports	286,1	26,1	14,9	.	59,6	.	52,7	30,6	3,5	0,5	4,5	6,5	11,6	4,9	0,7	27,5	32,3	2,0	.	.	.	.	8,3	.
3 Exports	6 765,9	5,1	.	1 038,3	5 216,6	11,6	134,4	62,0	14,2	-	21,0	30,4	54,0	23,0	25,7	53,0	44,3	-	.	.	.	.	32,3	.
4 International bunkers	37,9	.	.	.	.	.	.	.	7,7	.	.	.	15,1	.	1,0	14,0	.	.	.	.	.	.	.	.
4.1 International marine bunkers	30,2	.	.	.	.	.	.	.	.	.	.	.	15,1	.	1,0	14,0	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	7,7	.	.	.	.	.	.	.	7,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-9,2	-0,7	-0,6	.	-6,3	.	-0,6	-1,7	-	-	-0,1	-0,2	-0,3	-0,1	.	0,9	0,7	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	994,3	28,6	14,2	125,3	552,3	0,3	53,5	-33,1	-18,4	0,5	-16,6	-24,1	-57,9	-18,2	-26,0	-38,7	-11,4	40,1	.	0,6	4,3	2,0	417,0	.
7 Transformation processes	3,7	-0,8	-0,2	.	-541,9	.	1,5	152,1	33,0	9,6	41,2	59,7	106,0	36,1	14,3	49,9	42,1	-1,5	.	-	-1,8	-2,0	0,5	6,0
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	3,9	.	.	.	-541,9	.	13,0	150,3	33,0	9,6	41,2	59,7	106,0	36,4	14,3	49,9	32,4	.	.	.	.	.	.	.
7.3 In thermal power plants	0,2	.	.	.	.	.	.	.	.	.	-	.	.	-	.	-	.	-1,3	.	.	.	.	1,5	.
7.4 In combined heat and power plants	-0,5	-0,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-0,9	-1,0	0,4	1,8
7.5 In district heating plants	0,3	.	.	.	.	.	.	.	.	.	.	.	.	-0,3	.	.	.	-0,2	.	-	-0,9	-1,0	-1,4	4,1
7.6 Other transformation processes	-0,1	.	-0,1	.	.	.	-11,5	1,8	.	.	.	.	.	.	.	.	9,7	.	.	.	.	.	.	.
8 Energy industries own use	160,6	.	.	118,0	.	.	.	.	.	-	0,1	.	7,6	0,1	-	-	24,8	.	.	.	.	.	10,0	.
8.1 Crude petroleum and natural gass production	126,8	.	.	118,0	.	.	.	.	.	-	0,1	.	7,6	-	.	.	.	.	.	.	.	.	1,1	.
8.2 Coal mines	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.3 Oil refineries	26,6	.	.	.	.	.	.	.	.	.	-	.	.	-	-	-	24,8	.	.	.	.	.	1,8	.
8.4 Pumping storage power plants	4,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4,9	.
8.5 Hydropower plants	2,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,1	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	-	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	-	.
9 Distribution losses	31,1	.	0,4	.	.	.	.	.	.	.	.	.	.	.	.	.	2,7	.	.	0,3	.	.	26,1	1,5
10 Final consumption (11+12)	787,9	26,6	15,0	0,8	.	.	41,9	71,7	16,1	7,2	24,2	34,6	38,6	26,4	7,7	15,4	44,9	36,7	.	0,3	2,2	.	373,2	4,4
11 Non energy consumption	73,2	3,1	.	.	.	.	33,4	-	.	0,2	.	.	.	0,1	-	0,6	35,8	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	38,0	.	.	.	.	.	33,3	.	.	-	.	.	.	-	.	.	4,6	.	.	.	.	.	.	.
11.2 In other production	35,2	3,1	.	.	.	.	0,1	-	.	0,2	.	.	.	0,1	-	0,6	31,1	.	.	.	.	.	.	.
12 Final energy consumption	714,7	23,5	15,0	0,8	.	.	8,5	71,7	16,1	7,0	24,2	34,6	38,6	26,3	7,7	14,8	9,1	36,7	.	0,3	2,2	.	373,2	4,4
12.1 Manufacturing, constr. and non-fuel mining	282,3	23,3	15,0	0,8	.	.	8,2	.	.	0,1	9,8	.	.	10,5	1,7	14,2	9,1	15,3	.	.	2,2	.	170,8	1,4
12.1.1 Iron and steel	50,9	12,3	12,2	.	.	.	-	.	.	-	-	.	.	-	.	0,2	.	.	.	.	.	.	26,1	-
12.1.2 Chemical and petrochemical	46,9	5,2	2,0	0,2	.	.	4,3	.	.	-	0,1	.	.	0,8	0,2	1,9	8,3	.	.	.	0,3	.	23,5	0,3
12.1.3 Non-ferrous metals	66,2	.	0,4	0,5	.	.	0,3	.	.	-	0,1	.	.	1,1	0,4	0,9	0,5	.	.	.	0,1	.	61,9	.
12.1.4 Non-metalic minerals	15,6	5,6	0,4	.	.	.	1,2	.	.	-	0,2	.	.	1,1	-	1,5	0,3	-	.	.	1,3	.	3,7	0,2
12.1.5 Transport equipment	4,0	.	.	.	.	.	0,4	.	.	-	-	.	.	0,5	-	0,1	.	.	.	.	.	.	2,9	0,1
12.1.6 Machinery	8,3	.	-	.	.	.	0,4	.	.	-	0,1	.	.	1,0	-	-	-	-	.	.	0,3	.	6,1	0,3
12.1.7 Mining and quarrying	3,9	.	.	.	.	.	-	.	.	-	0,8	.	.	0,6	.	0,5	.	.	.	.	0,1	.	1,8	.
12.1.8 Food and tobacco	17,9	.	.	0,1	.	.	0,7	.	.	-	0,6	.	.	3,1	1,0	1,7	.	.	.	.	.	.	10,4	0,3
12.1.9 Paper, pulp and print	44,0	0,3	.	.	.	.	0,4	.	.	-	0,1	.	.	0,3	-	6,8	.	10,2	.	.	0,2	.	25,6	-
12.1.10 Wood and wood products	8,9	.	.	.	.	.	-	.	.	-	0,3	.	.	0,3	.	0,2	.	5,0	.	.	.	.	3,0	0,1
12.1.11 Textile and leather	1,2	.	.	.	.	.	-	.	.	.	-	.	.	0,3	.	0,1	.	.	.	.	.	.	0,8	-
12.1.12 Construction	10,4	.	.	.	.	.	0,5	.	.	0,1	7,4	.	.	0,8	-	.	.	.	.	.	.	.	1,6	.
12.1.13 Other industries	4,2	-	-	.	.	.	-	.	.	-	-	.	.	0,5	-	0,1	.	-	.	.	.	.	3,2	0,1
12.2 Transport	155,5	.	.	.	.	.	.	71,7	12,0	.	2,3	34,3	29,2	.	3,7	0,5	.	.	.	.	.	.	1,9	.
12.2.1 Road	103,7	.	.	.	.	.	.	69,4	.	.	.	34,3	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	3,3	.	.	.	.	.	.	-	.	.	1,4	.	.	.	.	.	.	.	.	.	.	.	1,9	.
12.2.3 Domestic aviation	12,1	.	.	.	.	.	.	0,1	12,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	36,4	.	.	.	.	.	.	2,2	-	.	0,9	-	29,2	.	3,7	0,5	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	276,9	0,1	-	-	.	.	0,3	-	4,1	6,9	12,1	0,3	9,4	15,8	2,4	0,2	.	21,4	.	0,3	-	.	200,5	3,0
12.3.1 Agriculture and forestry	10,6	-	.	.	.	.	.	-	.	0,1	4,0	0,2	-	1,2	0,2	-	.	.	.	.	.	.	4,8	-
12.3.2 Fishing	10,4	.	.	.	.	.	.	-	.	-	0,1	-	8,4	0,1	1,3	0,1	.	.	.	.	.	.	0,3	.
12.3.3 Commerce and public services	95,3	-	.	-	.	.	0,2	-	4,1	1,0	8,0	0,1	1,0	7,4	0,4	0,1	.	.	.	0,3	-	.	70,7	1,9
12.3.4 Households	160,7	0,1	-	.	.	.	0,1	.	.	5,7	.	.	.	7,1	0,4	-	.	21,4	.	.	.	.	124,7	1,0
13 Statistical difference (6+7-8-9-10)	18,0	1,2	-1,4	6,6	10,5	0,3	13,0	47,3	-1,5	2,9	0,3	1,0	1,8	-8,6	-19,5	-4,2	-41,7	1,9	.	-	0,4	-	7,7	-
Memo01: Gas flared off on oil fields, terminals and landfills	16,8	.	.	16,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 1996	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 546,2	6,5	.	1 522,1	6 437,4	12,7	146,3	.	.	.	.	.	.	.	.	.	.	39,6	.	0,7	4,1	1,9	375,0	.
2 Imports	317,4	23,4	17,0	.	56,4	.	49,8	21,4	3,6	1,9	3,6	5,1	9,1	4,7	3,5	40,2	28,7	1,6	.	.	.	.	47,6	.
3 Exports	7 813,2	4,4	0,3	1 412,8	5 858,8	12,1	145,5	88,1	19,2	-	21,3	30,2	54,1	27,6	18,6	59,9	44,9	0,2	.	.	.	.	15,3	.
4 International bunkers	43,0	.	.	.	.	.	.	.	9,1	.	.	.	16,2	.	1,1	16,6	.	.	.	.	.	.	.	.
4.1 International marine bunkers	33,9	.	.	.	.	.	.	.	.	.	.	.	16,2	.	1,1	16,6	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	9,1	.	.	.	.	.	.	.	9,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-26,9	0,8	-0,9	.	-24,9	.	0,4	0,1	0,2	0,1	0,5	0,7	1,2	0,6	-2,6	-	-3,0	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	980,5	26,2	15,8	109,3	610,1	0,6	50,9	-66,6	-24,5	1,9	-17,3	-24,4	-59,9	-22,4	-18,8	-36,4	-19,2	41,0	.	0,7	4,1	1,9	407,3	.
7 Transformation processes	11,9	-0,8	-0,1	.	-601,3	.	1,3	171,7	41,9	13,3	44,7	63,3	113,3	47,1	17,7	48,5	48,9	-1,4	.	-	-1,8	-1,9	1,5	6,3
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	12,0	.	.	.	-601,3	.	14,1	169,7	41,9	13,3	44,7	63,3	113,3	47,9	18,6	48,5	38,2	.	.	.	.	.	.	.
7.3 In thermal power plants	0,4	.	.	.	.	.	.	.	.	.	-	.	.	-0,1	.	.	.	-1,2	.	.	.	.	1,6	.
7.4 In combined heat and power plants	-0,4	-0,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-0,8	-0,9	0,4	1,8
7.5 In district heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-0,8	-0,9	.	.	-0,3	.	-	-0,9	-1,0	-0,5	4,5
7.6 Other transformation processes	-0,1	.	-0,1	.	.	.	-12,8	2,1	.	.	.	.	.	.	.	.	10,7	.	.	.	.	.	.	.
8 Energy industries own use	172,4	.	.	126,5	.	.	.	.	.	-	0,1	.	9,2	0,1	.	-	28,6	.	.	.	.	.	7,7	.
8.1 Crude petroleum and natural gass production	138,1	.	.	126,5	.	.	.	.	.	-	0,1	.	9,2	0,1	.	.	.	.	.	.	.	.	2,2	.
8.2 Coal mines	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.3 Oil refineries	30,5	.	.	.	.	.	.	.	.	.	-	.	.	-	.	-	28,6	.	.	.	.	.	1,8	.
8.4 Pumping storage power plants	1,5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1,5	.
8.5 Hydropower plants	2,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,1	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	-	.
8.9 District heating plants	-	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	-	.
9 Distribution losses	32,0	.	0,4	.	.	.	.	.	.	.	.	.	.	.	.	.	3,2	.	.	0,4	.	.	26,5	1,5
10 Final consumption (11+12)	810,7	26,1	15,2	1,1	.	.	41,6	74,5	16,5	8,4	26,1	37,0	40,5	33,9	9,5	18,3	45,7	38,3	.	0,3	1,9	.	370,9	4,8
11 Non energy consumption	73,3	2,6	.	.	.	.	33,9	-	.	0,2	.	.	.	0,1	-	0,6	35,8	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	38,8	.	.	.	.	.	33,8	.	.	-	.	.	.	-	.	.	4,9	.	.	.	.	.	.	.
11.2 In other production	34,5	2,6	.	.	.	.	0,1	-	.	0,2	.	.	.	0,1	-	0,6	30,9	.	.	.	.	.	.	.
12 Final energy consumption	737,4	23,5	15,2	1,1	.	.	7,7	74,4	16,5	8,2	26,1	37,0	40,5	33,8	9,5	17,6	9,9	38,3	.	0,3	1,9	.	370,9	4,8
12.1 Manufacturing, constr. and non-fuel mining	278,1	23,4	15,2	1,1	.	.	7,4	.	.	0,2	10,9	.	.	13,2	1,7	16,6	9,9	15,4	.	.	1,9	.	160,0	1,1
12.1.1 Iron and steel	49,7	12,3	12,3	.	.	.	-	.	.	.	-	.	.	0,2	.	0,3	.	.	.	.	.	.	24,5	-
12.1.2 Chemical and petrochemical	46,5	5,2	2,1	0,2	.	.	3,6	.	.	-	-	.	.	0,9	0,3	2,5	9,1	-	.	.	0,1	.	22,4	0,3
12.1.3 Non-ferrous metals	61,3	.	0,3	0,7	.	.	0,5	.	.	-	0,1	.	.	1,1	0,3	0,9	0,6	.	.	.	.	.	56,7	.
12.1.4 Non-metalic minerals	15,8	5,5	0,5	.	.	.	1,3	.	.	-	0,1	.	.	1,7	0,2	1,1	0,2	-	.	.	1,2	.	4,0	0,1
12.1.5 Transport equipment	4,1	.	.	.	.	.	0,2	.	.	-	-	.	.	0,5	-	0,1	.	0,1	.	.	.	.	3,1	0,1
12.1.6 Machinery	7,3	.	-	.	.	.	0,3	.	.	-	0,1	.	.	1,1	-	-	-	-	.	.	0,4	.	5,1	0,2
12.1.7 Mining and quarrying	3,8	.	.	.	.	.	-	.	.	-	0,6	.	.	0,6	.	0,5	.	.	.	.	0,1	.	2,0	.
12.1.8 Food and tobacco	17,2	.	.	0,2	.	.	0,5	.	.	-	0,6	.	.	4,2	0,9	1,6	.	.	.	.	.	.	8,7	0,3
12.1.9 Paper, pulp and print	44,9	0,3	.	.	.	.	0,3	.	.	.	0,1	.	.	0,6	-	8,8	.	9,7	.	.	0,2	.	24,9	-
12.1.10 Wood and wood products	8,9	.	.	.	.	.	-	.	.	-	0,2	.	.	0,4	.	0,4	.	5,3	.	.	.	.	2,5	0,1
12.1.11 Textile and leather	1,4	.	.	.	.	.	-	.	.	-	-	.	.	0,4	.	0,2	.	-	.	.	.	.	0,7	-
12.1.12 Construction	13,0	.	.	.	.	.	0,6	.	.	0,1	9,1	.	.	0,8	.	.	.	.	.	.	.	.	2,5	.
12.1.13 Other industries	4,3	-	-	.	.	.	-	.	.	-	-	.	.	0,7	-	0,1	.	0,4	.	.	.	.	3,0	0,1
12.2 Transport	162,7	.	.	-	.	.	.	74,3	13,3	.	1,9	36,8	29,5	.	4,4	0,6	.	.	.	.	.	.	1,8	.
12.2.1 Road	108,8	.	.	-	.	.	.	72,0	.	.	.	36,8	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	2,7	.	.	.	.	.	.	-	.	.	0,9	.	.	.	.	.	.	.	.	.	.	.	1,8	.
12.2.3 Domestic aviation	13,4	.	.	.	.	.	.	0,1	13,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	37,7	.	.	.	.	.	.	2,2	-	.	1,0	-	29,5	.	4,4	0,6	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	296,7	0,1	-	-	.	.	0,3	0,1	3,2	8,0	13,4	0,2	11,0	20,6	3,3	0,4	.	22,8	.	0,3	-	.	209,1	3,7
12.3.1 Agriculture and forestry	10,6	-	.	.	.	.	.	-	.	0,1	4,0	0,2	-	1,7	0,3	0,1	.	.	.	.	.	.	4,2	-
12.3.2 Fishing	12,0	.	.	.	.	.	.	-	.	-	0,2	-	9,7	0,1	1,5	0,2	.	.	.	.	.	.	0,3	.
12.3.3 Commerce and public services	105,8	-	.	-	.	.	0,2	0,1	3,2	1,2	9,2	-	1,3	9,2	0,9	0,1	.	.	.	0,3	-	.	77,5	2,5
12.3.4 Households	168,2	0,1	-	.	.	.	0,2	.	.	6,6	.	.	.	9,6	0,7	-	.	22,8	.	.	.	.	127,0	1,2
13 Statistical difference (6+7-8-9-10)	-23,1	-0,6	-	-18,3	8,8	0,6	10,6	30,6	0,9	6,7	1,2	1,8	3,6	-9,2	-10,6	-6,2	-47,9	1,3	.	-	0,4	-	3,2	-
Memo01: Gas flared off on oil fields, terminals and landfills	19,4	.	.	19,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 1997	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 822,5	10,9	.	1 706,9	6 498,2	11,5	146,6	.	.	.	.	.	.	.	.	.	.	41,7	.	0,8	4,8	1,9	399,4	.
2 Imports	326,7	24,2	14,3	.	66,0	.	50,8	27,2	1,2	4,4	3,2	4,6	9,0	3,3	3,0	51,9	30,2	2,1	.	.	.	.	31,3	.
3 Exports	8 072,5	5,2	0,1	1 552,7	5 965,9	11,1	154,1	83,1	12,9	0,2	21,2	30,9	60,6	22,3	23,7	66,4	44,4	0,1	.	.	.	.	17,5	.
4 International bunkers	51,3	.	.	.	.	.	.	.	10,2	.	.	.	20,7	.	1,1	19,2	.	.	.	.	.	.	.	.
4.1 International marine bunkers	41,1	.	.	.	.	.	.	.	.	.	.	.	20,7	.	1,1	19,2	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	10,2	.	.	.	.	.	.	.	10,2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-0,9	-1,9	0,9	.	9,0	.	0,2	-0,2	-2,4	-0,7	-0,7	-1,0	-1,9	-0,7	-1,1	-0,2	-0,3	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 024,5	28,0	15,1	154,2	607,2	0,4	43,5	-56,0	-24,3	3,5	-18,7	-27,2	-74,1	-19,7	-23,0	-34,0	-14,6	43,7	.	0,8	4,8	1,9	413,2	.
7 Transformation processes	4,9	-0,7	-0,1	-	-596,9	.	1,7	175,9	33,2	9,1	45,9	66,8	131,2	46,4	7,7	31,4	50,7	-1,3	.	-	-1,7	-1,9	1,1	6,4
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	4,2	.	.	.	-596,9	.	15,7	173,6	33,2	9,1	45,9	66,8	131,2	46,7	8,6	31,4	38,9	.	.	.	.	.	.	.
7.3 In thermal power plants	0,3	.	.	.	.	.	.	.	.	.	-	.	.	-	.	-	.	-1,0	.	.	.	.	1,4	.
7.4 In combined heat and power plants	-0,1	-0,7	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	-0,8	-0,8	0,3	1,9
7.5 In district heating plants	0,6	.	.	-	.	.	.	.	.	.	.	.	.	-0,3	-0,9	.	.	-0,3	.	-	-1,0	-1,0	-0,6	4,6
7.6 Other transformation processes	-	.	-	.	.	.	-14,0	2,3	.	.	.	.	.	.	.	.	11,7	.	.	.	.	.	.	.
8 Energy industries own use	182,8	.	.	129,5	.	.	.	.	.	-	0,1	.	9,9	0,1	.	-	29,8	.	.	.	.	.	13,4	.
8.1 Crude petroleum and natural gass production	143,0	.	.	129,5	.	.	.	.	.	-	0,1	.	9,9	-	.	.	.	.	.	.	.	.	3,3	.
8.2 Coal mines	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.3 Oil refineries	31,5	.	.	.	.	.	.	.	.	.	-	.	.	.	.	-	29,8	.	.	.	.	.	1,8	.
8.4 Pumping storage power plants	6,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6,0	.
8.5 Hydropower plants	2,2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,2	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	-	.
8.9 District heating plants	-	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	-	.
9 Distribution losses	33,0	.	0,3	0,3	.	.	.	.	.	.	.	.	.	.	.	.	3,4	.	.	0,5	.	.	26,8	1,7
10 Final consumption (11+12)	823,9	25,9	15,6	13,1	.	.	43,8	73,2	16,9	7,8	26,0	38,0	44,0	27,4	7,9	15,4	47,1	40,5	.	0,3	2,6	.	373,6	4,8
11 Non energy consumption	84,4	2,9	.	8,2	.	.	36,0	-	.	0,3	.	.	.	0,1	-	0,6	36,2	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	48,9	.	.	8,2	.	.	35,9	.	.	-	.	.	.	-	.	.	4,7	.	.	.	.	.	.	.
11.2 In other production	35,5	2,9	.	-	.	.	0,1	-	.	0,2	.	.	.	0,1	-	0,6	31,5	.	.	.	.	.	.	.
12 Final energy consumption	739,5	22,9	15,6	4,9	.	.	7,8	73,2	16,9	7,5	26,0	38,0	44,0	27,2	7,9	14,8	10,8	40,5	.	0,3	2,6	.	373,6	4,8
12.1 Manufacturing, constr. and non-fuel mining	283,0	22,8	15,6	4,8	.	.	7,5	.	.	0,1	10,6	.	.	11,9	1,1	13,3	10,8	16,8	.	.	2,6	.	164,1	1,0
12.1.1 Iron and steel	48,5	11,5	12,5	.	.	.	-	.	.	.	-	.	.	0,2	.	0,1	.	.	.	.	-	.	24,1	-
12.1.2 Chemical and petrochemical	51,8	5,0	2,2	3,9	.	.	3,3	.	.	-	-	.	.	0,8	0,1	2,9	10,0	-	.	.	0,4	.	22,8	0,3
12.1.3 Non-ferrous metals	65,9	.	0,3	0,6	.	.	1,0	.	.	-	-	.	.	1,0	0,2	0,6	0,7	.	.	.	.	.	61,5	-
12.1.4 Non-metalic minerals	15,5	6,0	0,5	.	.	.	1,3	.	.	-	0,1	.	.	2,1	0,1	0,7	0,2	-	.	.	1,5	.	2,9	-
12.1.5 Transport equipment	4,2	.	.	-	.	.	0,3	.	.	-	-	.	.	0,5	-	0,1	.	0,1	.	.	.	.	3,2	-
12.1.6 Machinery	7,4	.	.	.	.	.	0,2	.	.	-	0,1	.	.	1,0	-	-	-	-	.	.	0,4	.	5,5	0,2
12.1.7 Mining and quarrying	3,1	.	.	.	.	.	-	.	.	-	0,6	.	.	0,6	.	0,2	.	.	.	.	0,1	.	1,8	.
12.1.8 Food and tobacco	17,0	.	.	0,3	.	.	0,5	.	.	-	0,5	.	.	3,5	0,7	1,7	.	.	.	.	.	.	9,5	0,4
12.1.9 Paper, pulp and print	42,3	0,3	.	.	.	.	0,2	.	.	-	-	.	.	0,3	.	6,6	.	10,5	.	.	0,1	.	24,2	-
12.1.10 Wood and wood products	9,3	.	.	.	.	.	-	.	.	-	0,2	.	.	0,3	-	0,2	.	6,0	.	.	.	.	2,5	-
12.1.11 Textile and leather	1,3	.	.	.	.	.	-	.	.	-	-	.	.	0,4	.	0,1	.	-	.	.	.	.	0,8	-
12.1.12 Construction	12,5	.	.	-	.	.	0,6	.	.	0,1	8,9	.	.	0,7	.	.	.	.	.	.	.	.	2,3	.
12.1.13 Other industries	4,0	-	-	.	.	.	-	.	.	-	-	.	.	0,6	-	0,1	.	0,2	.	.	.	.	3,0	-
12.2 Transport	166,2	.	.	-	.	.	.	73,1	13,7	.	2,0	37,8	32,6	.	4,1	1,0	.	.	.	.	.	.	1,8	.
12.2.1 Road	108,7	.	.	-	.	.	.	70,8	.	.	.	37,8	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	2,8	.	.	.	.	.	.	-	.	.	1,0	.	.	.	.	.	.	.	.	.	.	.	1,8	.
12.2.3 Domestic aviation	13,8	.	.	.	.	.	.	0,1	13,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	40,9	.	.	.	.	.	.	2,2	-	.	1,0	-	32,6	.	4,1	1,0	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	290,4	0,1	-	0,1	.	.	0,3	-	3,3	7,3	13,5	0,2	11,4	15,3	2,6	0,5	.	23,8	.	0,3	-	.	207,7	3,9
12.3.1 Agriculture and forestry	9,6	-	.	.	.	.	.	-	.	0,1	3,8	0,2	-	1,2	0,2	0,1	.	.	.	.	-	.	3,9	0,1
12.3.2 Fishing	12,5	.	.	.	.	.	.	-	.	-	0,2	-	10,3	0,1	1,4	0,2	.	.	.	.	.	.	0,4	.
12.3.3 Commerce and public services	106,8	-	.	0,1	.	.	0,1	-	3,3	1,1	9,5	-	1,2	6,5	0,6	0,2	.	.	.	0,3	-	.	81,0	2,8
12.3.4 Households	161,5	0,1	-	.	.	.	0,2	.	.	6,1	.	.	.	7,6	0,4	.	.	23,8	.	.	.	.	122,3	1,0
13 Statistical difference (6+7-8-9-10)	-10,6	1,5	-0,9	11,3	10,3	0,4	1,4	46,7	-8,1	4,9	1,1	1,6	3,1	-0,7	-23,1	-18,1	-44,1	1,9	.	-	0,4	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	17,2	.	.	17,2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 1998	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 566,5	9,2	.	1 734,7	6 205,0	10,5	141,8	.	.	.	.	.	.	.	.	.	.	38,0	.	1,0	5,4	2,3	418,6	.
2 Imports	312,5	27,2	16,4	.	81,7	.	29,5	20,7	8,2	2,4	3,0	4,4	8,6	2,9	2,3	40,1	33,3	3,0	.	.	.	.	29,0	.
3 Exports	7 753,4	8,2	0,3	1 555,2	5 682,5	10,1	115,8	85,3	9,6	-	21,7	32,6	63,3	21,0	23,5	58,0	50,4	0,1	.	.	.	.	15,9	.
4 International bunkers	51,9	.	.	.	.	.	.	.	10,9	.	.	.	21,8	.	1,0	18,1	.	.	.	.	.	.	.	.
4.1 International marine bunkers	41,0	.	.	.	.	.	.	.	.	.	.	.	21,8	.	1,0	18,1	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	10,9	.	.	.	.	.	.	.	10,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	34,7	0,5	-	.	29,2	.	-0,1	1,5	1,0	0,3	-	-	-	-	-	2,0	0,4	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 108,4	28,7	16,1	179,5	633,4	0,5	55,4	-63,1	-11,3	2,6	-18,8	-28,2	-76,5	-18,1	-22,2	-34,0	-16,8	40,8	.	1,0	5,4	2,3	431,7	.
7 Transformation processes	4,4	-0,7	-0,1	-	-598,2	.	0,9	143,6	28,9	7,2	41,3	61,9	120,1	38,5	30,9	47,7	79,4	-1,5	.	-	-1,9	-2,0	1,9	6,6
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	3,6	.	.	.	-598,2	.	15,1	141,1	28,9	7,2	41,3	61,9	120,1	39,8	31,0	47,7	67,6	.	.	.	.	.	.	.
7.3 In thermal power plants	1,1	.	.	.	.	.	.	.	.	.	-	.	.	.	.	-	.	-1,1	.	.	.	.	2,2	.
7.4 In combined heat and power plants	-0,5	-0,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-0,9	-1,0	0,3	1,7
7.5 In district heating plants	0,3	.	.	-	.	.	.	.	.	.	.	.	.	-1,4	-0,1	-	.	-0,4	.	-	-1,0	-1,1	-0,6	4,9
7.6 Other transformation processes	-	.	-	.	.	.	-14,2	2,4	.	.	.	.	.	.	.	.	11,8	.	.	.	.	.	.	.
8 Energy industries own use	176,2	.	.	123,9	.	.	0,9	.	.	-	0,1	.	11,0	0,1	.	.	29,3	.	.	.	.	.	10,9	.
8.1 Crude petroleum and natural gass production	138,5	.	.	123,9	.	.	.	.	.	-	0,1	.	11,0	-	.	.	.	.	.	.	.	.	3,5	.
8.2 Coal mines	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.3 Oil refineries	32,0	.	.	.	.	.	0,9	.	.	.	.	.	.	.	.	.	29,3	.	.	.	.	.	1,9	.
8.4 Pumping storage power plants	3,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,0	.
8.5 Hydropower plants	2,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,4	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	-	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
9 Distribution losses	35,0	.	0,7	0,8	.	.	.	.	.	.	.	.	.	.	.	.	3,2	.	.	0,7	.	.	27,9	1,5
10 Final consumption (11+12)	850,3	28,6	16,2	21,1	.	.	40,2	74,0	16,5	7,2	27,4	40,5	45,8	24,7	8,8	14,2	45,5	36,7	.	0,3	3,0	0,2	394,4	5,1
11 Non energy consumption	88,4	4,0	.	15,3	.	.	33,3	-	.	0,3	.	.	.	0,1	-	0,6	34,7	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	53,7	.	.	15,3	.	.	33,2	.	.	-	.	.	.	-	.	.	5,1	.	.	.	.	.	.	.
11.2 In other production	34,7	4,0	.	-	.	.	0,1	-	.	0,2	.	.	.	0,1	-	0,6	29,6	.	.	.	.	.	.	.
12 Final energy consumption	761,9	24,5	16,2	5,8	.	.	6,8	74,0	16,5	6,9	27,4	40,5	45,8	24,6	8,8	13,6	10,8	36,7	.	0,3	3,0	0,2	394,4	5,1
12.1 Manufacturing, constr. and non-fuel mining	295,6	24,4	16,1	5,7	.	.	6,4	.	.	0,1	11,2	.	.	12,2	1,1	12,7	10,8	14,1	.	.	3,0	0,2	176,6	0,9
12.1.1 Iron and steel	54,3	12,8	13,3	.	.	.	-	.	.	-	-	.	.	0,2	.	-	.	.	.	.	0,1	.	27,8	-
12.1.2 Chemical and petrochemical	54,2	5,8	1,8	4,7	.	.	2,1	.	.	.	-	.	.	1,0	.	2,9	9,9	0,1	.	.	0,4	.	25,2	0,3
12.1.3 Non-ferrous metals	72,0	-	0,4	0,6	.	.	0,8	.	.	-	0,1	.	.	0,9	0,2	0,5	0,7	.	.	.	.	.	67,7	-
12.1.4 Non-metalic minerals	14,9	5,6	0,6	.	.	.	1,6	.	.	-	0,2	.	.	1,7	-	-	0,3	0,1	.	.	1,7	-	3,1	-
12.1.5 Transport equipment	4,0	.	.	-	.	.	0,2	.	.	-	0,1	.	.	0,5	.	-	.	.	.	.	.	.	3,1	-
12.1.6 Machinery	7,3	.	.	-	.	.	0,2	.	.	-	0,2	.	.	0,9	-	-	-	-	.	.	0,4	.	5,4	0,1
12.1.7 Mining and quarrying	3,5	.	.	.	.	.	-	.	.	-	0,8	.	.	0,6	.	0,1	.	.	.	.	0,1	.	1,8	.
12.1.8 Food and tobacco	18,9	.	.	0,4	.	.	0,6	.	.	-	0,6	.	.	4,1	0,7	2,1	.	.	.	.	.	.	10,2	0,3
12.1.9 Paper, pulp and print	41,0	0,2	.	.	.	.	0,3	.	.	-	-	.	.	0,2	0,1	6,4	.	9,6	.	.	0,4	0,2	23,7	-
12.1.10 Wood and wood products	7,3	.	.	.	.	.	-	.	.	-	0,2	.	.	0,4	.	0,4	.	3,8	.	.	.	.	2,5	-
12.1.11 Textile and leather	1,3	.	.	-	.	.	-	.	.	-	-	.	.	0,3	-	0,1	.	.	.	.	.	.	0,8	-
12.1.12 Construction	12,3	.	.	-	.	.	0,7	.	.	0,1	8,7	.	.	0,8	.	.	.	.	.	.	.	.	2,0	.
12.1.13 Other industries	4,5	0,1	-	.	.	.	-	.	.	-	-	.	.	0,6	-	0,1	.	0,5	.	.	.	.	3,2	-
12.2 Transport	170,5	.	.	-	.	.	.	73,9	14,0	.	2,0	40,2	33,3	.	4,7	0,5	.	.	.	.	.	.	1,9	.
12.2.1 Road	111,9	.	.	-	.	.	.	71,6	.	.	.	40,2	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	2,8	.	.	.	.	.	.	-	.	.	0,9	.	.	.	.	.	.	.	.	.	.	.	1,9	.
12.2.3 Domestic aviation	14,1	.	.	.	.	.	.	0,1	14,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	41,7	.	.	.	.	.	.	2,2	-	.	1,0	-	33,3	.	4,7	0,5	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	295,8	0,1	-	0,1	.	.	0,4	-	2,5	6,8	14,2	0,2	12,5	12,4	3,0	0,3	.	22,6	.	0,3	-	.	215,8	4,3
12.3.1 Agriculture and forestry	12,6	.	.	.	.	.	0,1	-	.	0,1	4,1	0,2	-	1,3	0,1	0,1	.	.	.	.	.	.	6,5	-
12.3.2 Fishing	14,0	.	.	.	.	.	.	-	.	-	0,2	-	11,4	0,1	1,8	-	.	.	.	.	.	.	0,5	.
12.3.3 Commerce and public services	107,0	-	.	0,1	.	.	0,1	-	2,5	1,0	10,0	-	1,1	5,1	0,7	0,1	.	.	.	0,3	-	.	82,6	3,1
12.3.4 Households	162,2	0,1	-	.	.	.	0,2	.	.	5,6	.	.	.	5,9	0,4	0,1	.	22,6	.	.	.	.	126,2	1,1
13 Statistical difference (6+7-8-9-10)	50,9	-0,5	-1,0	33,8	35,2	0,5	15,3	6,5	1,1	2,6	-5,0	-6,8	-13,1	-4,5	-0,1	-0,5	-15,5	2,6	.	-	0,5	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	18,3	.	.	18,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 1999	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 732,3	11,4	.	1 869,7	6 193,6	8,5	161,8	.	.	.	.	.	.	.	.	.	.	39,8	.	1,4	4,8	2,5	438,9	.
2 Imports	310,4	25,7	14,9	.	88,9	.	27,0	15,0	9,3	2,9	1,8	3,7	6,3	2,2	2,7	47,2	36,1	2,0	.	.	.	.	24,7	.
3 Exports	7 805,3	8,1	0,2	1 695,0	5 580,0	8,3	115,7	83,5	8,6	-	15,4	32,0	54,4	18,8	29,5	66,5	57,6	-	.	.	.	.	31,6	.
4 International bunkers	50,9	.	.	.	.	.	.	.	12,6	.	.	.	20,5	.	1,8	16,1	.	.	.	.	.	.	.	.
4.1 International marine bunkers	38,4	.	.	.	.	.	.	.	.	.	.	.	20,5	.	1,8	16,1	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	12,6	.	.	.	.	.	.	.	12,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	4,2	0,5	0,2	.	1,5	.	-0,1	-0,6	-1,2	-0,3	0,6	1,3	2,3	0,8	1,5	-1,1	-1,4	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 190,7	29,5	15,0	174,7	704,0	0,2	73,0	-69,2	-13,0	2,6	-13,0	-27,0	-66,3	-15,9	-27,1	-36,4	-22,9	41,8	.	1,4	4,8	2,5	432,0	.
7 Transformation processes	8,6	-0,7	-0,1	-0,1	-606,7	-3,1	4,1	143,2	28,7	6,1	34,6	72,0	122,2	40,7	41,3	37,7	84,6	-1,6	.	-0,1	-2,0	-2,2	2,9	7,1
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	7,2	.	.	.	-606,7	-3,1	17,8	140,6	28,7	6,1	34,6	72,0	122,2	42,3	41,5	37,7	73,5	.	.	.	.	.	.	.
7.3 In thermal power plants	1,6	.	.	.	.	.	.	.	.	.	.	.	.	-0,1	.	-	.	-1,3	.	.	.	.	3,0	.
7.4 In combined heat and power plants	-0,6	-0,7	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	-0,1	-0,9	-1,0	0,4	1,8
7.5 In district heating plants	0,5	.	.	-0,1	.	.	-	.	.	.	.	.	.	-1,5	-0,2	-	.	-0,4	.	-	-1,1	-1,1	-0,4	5,3
7.6 Other transformation processes	-	.	-	.	.	.	-13,8	2,6	.	.	.	.	.	.	.	.	11,1	.	.	.	.	.	.	.
8 Energy industries own use	173,8	.	.	119,4	.	.	1,0	.	.	-	0,1	.	11,4	0,1	.	.	29,6	.	.	.	.	.	12,2	-
8.1 Crude petroleum and natural gass production	135,4	.	.	119,4	.	.	.	.	.	-	0,1	.	11,4	-	.	.	.	.	.	.	.	.	4,4	.
8.2 Coal mines	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-
8.3 Oil refineries	32,5	.	.	.	.	.	1,0	.	.	.	.	.	.	.	.	.	29,6	.	.	.	.	.	1,8	.
8.4 Pumping storage power plants	2,2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,2	.
8.5 Hydropower plants	3,5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,5	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	-	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
9 Distribution losses	34,1	.	0,7	0,7	.	.	.	.	.	.	.	.	.	.	.	.	3,4	.	.	0,9	.	.	26,8	1,6
10 Final consumption (11+12)	856,3	27,6	14,2	23,9	.	.	36,9	73,5	19,1	7,0	23,0	46,8	47,5	25,9	10,7	13,2	44,1	38,6	.	0,4	2,3	0,4	395,6	5,6
11 Non energy consumption	85,0	2,6	.	16,8	.	.	31,0	-	.	0,3	.	.	.	0,1	-	0,6	33,6	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	52,1	.	.	16,8	.	.	30,9	.	.	0,1	.	.	.	-	.	.	4,3	.	.	.	.	.	.	.
11.2 In other production	32,9	2,6	.	-	.	.	0,1	-	.	0,2	.	.	.	0,1	-	0,6	29,3	.	.	.	.	.	.	.
12 Final energy consumption	771,3	25,0	14,2	7,2	.	.	5,9	73,5	19,1	6,7	23,0	46,8	47,5	25,8	10,7	12,6	10,5	38,6	.	0,4	2,3	0,4	395,6	5,6
12.1 Manufacturing, constr. and non-fuel mining	293,8	24,9	14,1	7,0	.	.	5,4	.	.	0,1	11,2	.	.	10,4	1,4	12,2	10,5	15,5	.	-	2,3	0,4	177,4	0,8
12.1.1 Iron and steel	53,5	13,6	12,0	.	.	.	-	.	.	.	-	.	.	0,3	.	-	.	.	.	.	-	.	27,5	-
12.1.2 Chemical and petrochemical	53,1	6,1	1,2	6,2	.	.	1,1	.	.	-	0,1	.	.	0,8	0,1	3,1	9,6	.	.	.	0,4	.	24,3	0,3
12.1.3 Non-ferrous metals	72,4	0,1	0,5	0,5	.	.	0,8	.	.	-	0,1	.	.	0,8	0,2	0,9	0,5	.	.	.	.	.	68,0	-
12.1.4 Non-metalic minerals	13,6	5,1	0,5	.	.	.	1,4	.	.	-	0,2	.	.	1,2	.	-	0,4	0,1	.	.	1,3	-	3,3	-
12.1.5 Transport equipment	3,8	.	.	-	.	.	0,2	.	.	-	0,1	.	.	0,4	.	-	.	-	.	.	.	.	3,0	-
12.1.6 Machinery	7,4	.	.	-	.	.	0,3	.	.	-	0,2	.	.	0,9	-	-	-	-	.	.	0,1	.	5,8	0,1
12.1.7 Mining and quarrying	3,0	.	.	.	.	.	-	.	.	-	0,9	.	.	0,3	.	0,1	.	.	.	.	0,1	.	1,6	-
12.1.8 Food and tobacco	18,8	.	.	0,3	.	.	0,5	.	.	-	0,7	.	.	3,3	0,9	1,9	.	.	.	.	.	.	11,0	0,3
12.1.9 Paper, pulp and print	42,3	-	.	.	.	.	0,4	.	.	-	0,1	.	.	0,2	-	5,8	.	10,6	.	-	0,5	0,4	24,5	-
12.1.10 Wood and wood products	7,9	.	.	.	.	.	-	.	.	-	0,2	.	.	0,2	0,1	0,3	.	4,5	.	.	.	.	2,5	0,1
12.1.11 Textile and leather	1,1	.	.	.	.	.	-	.	.	-	-	.	.	0,2	.	0,1	.	-	.	.	.	.	0,7	-
12.1.12 Construction	12,5	.	.	-	.	.	0,6	.	.	0,1	8,7	.	.	1,1	.	.	.	.	.	.	.	.	2,0	.
12.1.13 Other industries	4,3	-	-	.	.	.	-	.	.	-	-	.	.	0,6	-	-	.	0,3	.	.	.	.	3,2	.
12.2 Transport	179,6	.	.	-	.	.	.	73,4	16,0	.	2,0	46,5	33,9	.	5,8	0,2	.	.	.	.	.	.	1,8	.
12.2.1 Road	117,6	.	.	-	.	.	.	71,1	.	.	.	46,5	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	2,7	.	.	.	.	.	.	-	.	.	0,9	.	.	.	.	.	.	.	.	.	.	.	1,8	.
12.2.3 Domestic aviation	16,2	.	.	.	.	.	.	0,1	16,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	43,1	.	.	.	.	.	.	2,2	-	.	1,1	-	33,9	.	5,8	0,2	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	297,9	0,1	-	0,1	.	.	0,4	-	3,1	6,6	9,8	0,3	13,6	15,4	3,5	0,1	.	23,1	.	0,4	-	.	216,4	4,7
12.3.1 Agriculture and forestry	12,5	-	.	.	.	.	0,1	-	.	0,1	3,9	0,2	-	1,3	0,2	0,1	.	.	.	.	.	.	6,6	-
12.3.2 Fishing	15,3	.	.	.	.	.	.	-	.	-	0,2	-	12,6	0,1	1,9	-	.	.	.	.	.	.	0,5	.
12.3.3 Commerce and public services	106,4	-	.	0,1	.	.	0,1	-	3,1	1,0	5,7	0,1	1,1	7,1	0,9	-	.	.	.	0,4	-	.	83,1	3,5
12.3.4 Households	163,8	0,1	-	.	.	.	0,2	.	.	5,5	.	.	.	6,9	0,5	-	.	23,1	.	.	.	.	126,2	1,2
13 Statistical difference (6+7-8-9-10)	134,8	1,2	-	30,6	97,4	-2,9	39,2	0,5	-3,4	1,7	-1,5	-1,8	-3,0	-1,2	3,5	-11,9	-15,5	1,6	.	-	0,4	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	28,0	.	.	28,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2000	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	9 358,0	17,8	.	1 952,6	6 650,8	16,4	159,9	.	.	.	.	.	.	.	.	.	.	39,4	.	1,3	5,2	2,4	512,4	.
2 Imports	261,3	25,8	15,5	.	42,5	.	28,2	16,6	7,5	1,5	2,9	6,6	10,4	2,9	5,2	52,0	36,8	1,5	.	.	.	.	5,3	.
3 Exports	8 257,3	16,1	0,1	1 764,2	5 932,9	8,4	84,4	91,2	8,9	-	15,8	35,7	56,2	15,6	25,8	62,6	65,3	0,1	.	.	.	.	73,9	.
4 International bunkers	49,5	.	.	.	.	.	.	.	12,1	.	.	.	20,7	.	1,3	15,4	.	.	.	.	.	.	.	.
4.1 International marine bunkers	37,4	.	.	.	.	.	.	.	.	.	.	.	20,7	.	1,3	15,4	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	12,1	.	.	.	.	.	.	.	12,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-28,8	0,6	0,5	.	-31,9	-0,6	-7,6	0,9	1,6	0,3	0,4	0,9	1,5	0,4	0,3	2,1	1,7	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 283,6	28,1	15,9	188,4	728,5	7,5	96,0	-73,7	-11,9	1,8	-12,5	-28,2	-65,0	-12,3	-21,5	-23,9	-26,9	40,7	.	1,3	5,2	2,4	443,8	.
7 Transformation processes	9,6	-0,7	-0,1	-0,1	-603,3	-26,0	3,3	152,2	37,3	7,8	34,9	78,8	124,0	33,7	32,4	33,2	99,5	-1,6	.	-0,2	-2,0	-2,2	1,6	6,9
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	8,8	.	.	.	-603,3	-26,0	16,5	150,0	37,3	7,8	34,9	78,8	124,0	34,5	32,4	33,2	88,5	.	.	.	.	.	.	.
7.3 In thermal power plants	1,4	.	.	.	.	.	.	.	.	.	.	.	.	-0,1	.	-	.	-1,2	.	.	.	.	2,7	.
7.4 In combined heat and power plants	-0,8	-0,7	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	-0,2	-1,0	-1,1	0,4	1,7
7.5 In district heating plants	0,2	.	.	-0,1	.	.	-	.	.	.	.	.	.	-0,7	-	-	.	-0,4	.	-	-1,1	-1,1	-1,5	5,2
7.6 Other transformation processes	-	.	-	.	.	.	-13,2	2,2	.	.	.	.	.	.	.	.	11,0	.	.	.	.	.	.	.
8 Energy industries own use	191,5	.	.	139,0	.	.	1,5	.	.	-	0,1	.	11,6	-	.	.	28,0	.	.	.	.	.	11,3	-
8.1 Crude petroleum and natural gass production	155,2	.	.	139,0	.	.	.	.	.	-	0,1	.	11,6	-	.	.	.	.	.	.	.	.	4,5	.
8.2 Coal mines	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	-
8.3 Oil refineries	31,3	.	.	.	.	.	1,5	.	.	.	.	.	.	.	.	.	28,0	.	.	.	.	.	1,8	.
8.4 Pumping storage power plants	2,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,4	.
8.5 Hydropower plants	2,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,4	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	.	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
9 Distribution losses	43,6	.	0,5	1,3	.	.	.	.	.	.	.	.	.	.	.	.	3,2	.	.	0,8	.	.	36,3	1,5
10 Final consumption (11+12)	831,3	27,1	16,0	24,8	.	.	40,1	71,3	15,3	5,5	20,8	46,5	41,1	19,7	8,9	8,5	41,4	38,0	.	0,4	2,8	0,2	397,5	5,4
11 Non energy consumption	84,6	2,9	.	17,5	.	.	32,2	-	.	0,3	.	.	.	0,1	-	0,6	31,0	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	54,0	.	.	17,5	.	.	32,1	.	.	0,1	.	.	.	-	.	.	4,3	.	.	.	.	.	.	.
11.2 In other production	30,6	2,9	.	-	.	.	0,1	-	.	0,2	.	.	.	0,1	-	0,6	26,7	.	.	.	.	.	.	.
12 Final energy consumption	746,7	24,2	16,0	7,4	.	.	8,0	71,3	15,3	5,2	20,8	46,5	41,1	19,6	8,9	7,9	10,4	38,0	.	0,4	2,8	0,2	397,5	5,4
12.1 Manufacturing, constr. and non-fuel mining	297,2	24,1	16,0	7,1	.	.	7,4	.	.	0,1	10,1	.	.	9,8	1,5	7,8	10,4	14,2	.	-	2,8	0,2	184,9	0,8
12.1.1 Iron and steel	55,1	13,1	13,4	.	.	.	0,1	.	.	-	0,1	.	.	0,4	.	-	.	.	.	.	-	.	28,0	-
12.1.2 Chemical and petrochemical	56,3	6,3	1,6	6,1	.	.	2,9	.	.	-	0,1	.	.	0,9	0,1	1,9	9,4	.	.	.	0,4	.	26,4	0,3
12.1.3 Non-ferrous metals	74,0	0,1	0,5	0,7	.	.	0,9	.	.	-	0,1	.	.	0,9	0,2	0,9	0,6	.	.	.	.	.	69,1	-
12.1.4 Non-metalic minerals	13,8	4,6	0,5	.	.	.	1,5	.	.	-	0,2	.	.	1,2	.	.	0,4	0,2	.	.	1,8	0,1	3,3	-
12.1.5 Transport equipment	3,5	.	.	-	.	.	0,2	.	.	-	0,1	.	.	0,3	-	-	.	-	.	.	.	.	2,9	-
12.1.6 Machinery	7,2	-	.	-	.	.	0,4	.	.	-	0,2	.	.	0,9	-	-	.	-	.	.	0,1	.	5,6	0,1
12.1.7 Mining and quarrying	3,3	.	.	.	.	.	-	.	.	-	0,9	.	.	0,3	.	0,1	.	.	.	.	0,1	.	1,8	-
12.1.8 Food and tobacco	18,0	.	.	0,3	.	.	0,4	.	.	-	0,7	.	.	2,8	1,2	1,1	.	.	.	.	.	.	11,3	0,3
12.1.9 Paper, pulp and print	42,5	.	.	0,1	.	.	0,3	.	.	-	0,1	.	.	0,1	-	3,6	.	10,6	.	-	0,4	0,1	27,2	-
12.1.10 Wood and wood products	6,9	.	.	-	.	.	-	.	.	-	0,2	.	.	0,2	-	0,1	.	3,2	.	.	.	.	3,0	0,1
12.1.11 Textile and leather	1,1	.	.	.	.	.	-	.	.	-	-	.	.	0,2	-	0,1	.	-	.	.	.	.	0,8	-
12.1.12 Construction	11,2	.	.	.	.	.	0,7	.	.	-	7,4	.	.	0,9	.	.	.	.	.	.	.	.	2,1	.
12.1.13 Other industries	4,4	-	-	.	.	.	0,1	.	.	-	0,1	.	.	0,6	-	-	.	0,2	.	.	.	.	3,4	-
12.2 Transport	168,8	.	.	-	.	.	.	71,3	14,7	.	1,9	46,3	27,6	.	5,0	-	.	.	.	.	.	.	2,0	.
12.2.1 Road	115,3	.	.	-	.	.	.	69,0	.	.	.	46,3	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	2,8	.	.	.	.	.	.	.	.	.	0,8	.	.	.	.	.	.	.	.	.	.	.	2,0	.
12.2.3 Domestic aviation	14,8	.	.	.	.	.	.	0,1	14,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	35,9	.	.	.	.	.	.	2,2	-	.	1,1	-	27,6	.	5,0	-	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	280,7	0,1	-	0,2	.	.	0,6	-	0,6	5,1	8,8	0,2	13,5	9,8	2,4	-	.	23,8	.	0,4	-	.	210,6	4,6
12.3.1 Agriculture and forestry	12,2	-	.	.	.	.	0,1	-	.	0,1	3,9	0,2	-	0,7	0,1	-	.	.	.	.	.	.	7,1	-
12.3.2 Fishing	14,8	.	.	.	.	.	.	-	.	-	0,1	-	12,6	0,1	1,6	-	.	.	.	.	.	.	0,5	.
12.3.3 Commerce and public services	95,0	-	.	0,2	.	.	0,1	-	0,6	0,8	4,8	-	1,0	4,6	0,5	-	.	.	.	0,4	-	.	78,3	3,7
12.3.4 Households	158,7	0,1	-	-	.	.	0,3	.	.	4,3	.	.	.	4,4	0,3	.	.	23,8	.	.	.	.	124,7	0,9
13 Statistical difference (6+7-8-9-10)	226,5	0,3	-0,7	23,1	125,2	-18,5	57,7	7,2	10,2	4,1	1,6	4,1	6,2	1,7	2,0	0,8	-	1,2	.	-	0,3	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	29,2	.	.	29,2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2001	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	9 536,3	50,2	.	2 102,5	6 637,0	27,9	232,0	.	.	.	.	.	.	.	.	.	.	41,7	.	1,4	5,3	2,5	435,8	.
2 Imports	282,8	23,2	13,7	.	42,3	.	18,4	17,9	9,1	0,9	4,1	9,6	13,7	4,3	7,8	46,1	30,3	2,6	.	.	.	.	38,7	.
3 Exports	8 615,8	42,1	-	1 828,3	6 198,1	17,4	167,7	100,5	4,2	-	13,8	32,3	45,8	14,5	23,1	49,1	52,9	0,1	.	.	.	.	25,8	.
4 International bunkers	47,6	.	.	.	.	.	.	.	11,0	.	.	.	20,8	.	0,8	15,0	.	.	.	.	.	.	.	.
4.1 International marine bunkers	36,6	.	.	.	.	.	.	.	.	.	.	.	20,8	.	0,8	15,0	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	11,0	.	.	.	.	.	.	.	11,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	79,9	-5,7	0,2	.	76,4	0,4	1,2	-0,2	2,6	0,6	0,2	0,6	0,8	0,3	-	2,3	0,2	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 235,6	25,7	13,8	274,1	557,6	10,9	84,0	-82,8	-3,4	1,5	-9,5	-22,1	-52,1	-9,9	-16,1	-15,8	-22,3	44,2	.	1,4	5,3	2,5	448,6	.
7 Transformation processes	-8,9	-0,7	-0,1	-0,1	-589,5	-9,2	2,5	145,8	23,3	5,4	31,8	74,2	105,1	32,2	34,8	26,7	106,0	-2,1	.	-0,2	-2,1	-2,2	1,2	8,3
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	-9,8	.	.	.	-589,5	-9,2	17,1	143,5	23,3	5,4	31,8	74,2	105,1	33,2	34,9	26,7	93,7	.	.	.	.	.	.	.
7.3 In thermal power plants	1,6	.	.	.	.	.	.	.	.	.	.	.	.	-0,3	.	.	.	-1,2	.	.	.	.	3,0	.
7.4 In combined heat and power plants	-0,8	-0,7	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	-0,2	-0,9	-1,0	0,3	1,7
7.5 In district heating plants	0,2	.	.	-0,1	.	.	-	.	.	.	.	.	.	-0,7	-0,1	.	.	-0,9	.	-	-1,1	-1,2	-2,1	6,5
7.6 Other transformation processes	-	.	-	.	.	.	-14,6	2,3	.	.	.	.	.	.	.	.	12,3	.	.	.	.	.	.	.
8 Energy industries own use	202,0	.	.	152,9	.	.	1,4	.	.	-	0,1	.	11,2	0,1	.	.	24,8	.	.	.	.	.	11,4	-
8.1 Crude petroleum and natural gass production	168,6	.	.	152,9	.	.	.	.	.	-	0,1	.	11,2	-	.	.	.	.	.	.	.	.	4,4	.
8.2 Coal mines	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	-
8.3 Oil refineries	27,8	.	.	.	.	.	1,4	.	.	.	.	.	.	.	.	.	24,8	.	.	.	.	.	1,6	.
8.4 Pumping storage power plants	2,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,9	.
8.5 Hydropower plants	2,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,4	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	.	.
8.9 District heating plants	0,2	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.	.	.	.	.	.	.	.	0,1	-
9 Distribution losses	42,7	.	0,5	0,5	.	.	.	.	.	.	.	.	.	.	.	.	3,6	.	.	0,7	.	.	35,9	1,5
10 Final consumption (11+12)	866,6	24,0	13,9	28,3	.	.	57,0	74,0	15,9	6,0	22,3	50,8	40,0	21,7	8,6	11,0	40,3	40,1	.	0,5	2,9	0,3	402,3	6,7
11 Non energy consumption	102,1	2,6	.	20,8	.	.	48,8	-	.	0,3	.	.	.	0,1	-	0,6	28,9	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	74,0	.	.	20,8	.	.	48,7	.	.	0,1	.	.	.	-	.	.	4,4	.	.	.	.	.	.	.
11.2 In other production	28,2	2,6	.	-	.	.	0,1	-	.	0,2	.	.	.	0,1	-	0,6	24,6	.	.	.	.	.	.	.
12 Final energy consumption	764,4	21,4	13,9	7,5	.	.	8,2	74,0	15,9	5,8	22,3	50,8	40,0	21,6	8,6	10,4	11,3	40,1	.	0,5	2,9	0,3	402,3	6,7
12.1 Manufacturing, constr. and non-fuel mining	288,9	21,3	13,8	7,0	.	.	7,5	.	.	0,1	10,9	.	.	9,5	1,0	10,2	11,3	15,2	.	-	2,8	0,3	177,3	0,8
12.1.1 Iron and steel	48,5	10,9	11,4	.	.	.	-	.	.	.	0,1	.	.	0,5	.	.	.	0,2	.	.	.	.	25,3	-
12.1.2 Chemical and petrochemical	55,4	5,8	1,5	5,3	.	.	3,2	.	.	-	0,2	.	.	0,8	0,1	1,9	10,5	.	.	.	0,4	.	25,5	0,3
12.1.3 Non-ferrous metals	73,6	0,1	0,5	1,1	.	.	0,8	.	.	.	0,1	.	.	0,6	0,2	0,9	0,6	.	.	.	.	.	68,8	.
12.1.4 Non-metalic minerals	13,1	4,5	0,5	.	.	.	1,5	.	.	-	0,3	.	.	0,9	-	-	0,2	0,1	.	.	1,9	0,2	3,0	-
12.1.5 Transport equipment	3,5	.	.	-	.	.	0,1	.	.	-	0,1	.	.	0,5	-	.	.	-	.	.	-	.	2,8	-
12.1.6 Machinery	6,8	.	-	-	.	.	0,4	.	.	-	0,1	.	.	0,8	-	-	.	-	.	.	0,1	.	5,3	-
12.1.7 Mining and quarrying	3,7	.	.	-	.	.	-	.	.	-	1,4	.	.	0,3	.	0,2	.	-	.	.	-	.	1,7	-
12.1.8 Food and tobacco	17,1	.	.	0,2	.	.	0,4	.	.	-	0,2	.	.	2,7	0,7	1,3	.	.	.	.	-	.	11,2	0,3
12.1.9 Paper, pulp and print	42,6	.	.	0,4	.	.	0,3	.	.	-	0,1	.	.	0,2	.	5,5	.	11,7	.	-	0,4	0,1	23,9	-
12.1.10 Wood and wood products	6,9	.	.	.	.	.	-	.	.	-	0,4	.	.	0,2	.	0,3	.	3,1	.	.	-	.	2,7	0,1
12.1.11 Textile and leather	1,0	.	.	.	.	.	-	.	.	-	-	.	.	0,2	.	0,1	.	-	.	.	.	.	0,7	-
12.1.12 Construction	12,5	.	.	.	.	.	0,6	.	.	0,1	7,8	.	.	1,0	.	.	.	.	.	.	.	.	3,0	.
12.1.13 Other industries	4,3	-	-	.	.	.	-	.	.	-	0,1	.	.	0,7	-	-	.	0,2	.	.	-	.	3,3	-
12.2 Transport	173,6	.	.	0,1	.	.	.	73,9	14,8	.	1,9	50,5	25,5	.	4,7	0,2	.	.	.	.	.	.	2,0	.
12.2.1 Road	122,2	.	.	0,1	.	.	.	71,6	.	.	.	50,5	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	2,8	.	.	.	.	.	.	.	.	.	0,8	.	.	.	.	.	.	.	.	.	.	.	2,0	.
12.2.3 Domestic aviation	14,9	.	.	.	.	.	.	0,1	14,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	33,8	.	.	.	.	.	.	2,2	-	.	1,1	-	25,5	.	4,7	0,2	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	301,9	-	-	0,4	.	.	0,7	-	1,1	5,6	9,5	0,3	14,5	12,2	2,9	-	.	24,9	.	0,5	0,1	.	223,0	6,0
12.3.1 Agriculture and forestry	13,4	-	.	.	.	.	0,1	-	.	0,2	4,5	0,2	-	0,7	0,1	-	.	.	.	.	.	.	7,5	-
12.3.2 Fishing	15,1	.	.	.	.	.	.	-	.	-	0,1	-	12,6	0,1	1,8	-	.	.	.	.	.	.	0,5	.
12.3.3 Commerce and public services	108,7	-	.	0,3	.	.	0,3	-	1,1	2,1	4,9	0,1	1,9	6,0	0,6	-	.	.	.	0,5	0,1	.	85,8	4,8
12.3.4 Households	164,7	-	-	0,1	.	.	0,3	.	.	3,3	.	.	.	5,4	0,4	.	.	24,9	.	.	.	.	129,2	1,2
13 Statistical difference (6+7-8-9-10)	115,2	1,0	-0,7	92,3	-32,0	1,7	28,1	-11,0	4,0	0,8	-	1,3	1,9	0,5	10,2	-	15,0	2,0	.	-	0,3	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	23,3	.	.	23,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2002	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	9 824,7	59,9	.	2 514,2	6 449,3	32,2	248,6	.	.	.	.	.	.	.	.	.	.	43,8	.	1,3	5,2	2,4	467,7	.
2 Imports	247,6	18,4	10,5	.	26,8	.	23,7	19,3	11,4	1,2	4,0	9,6	12,5	4,6	5,7	43,2	34,8	2,6	.	.	.	.	19,2	.
3 Exports	8 886,8	57,6	.	2 318,4	5 926,4	21,4	190,5	92,4	2,5	2,5	10,6	25,6	33,4	12,1	23,6	62,8	52,9	-	.	.	.	.	54,2	.
4 International bunkers	40,1	.	.	.	.	.	.	.	9,7	.	.	.	19,2	.	0,8	10,4	.	.	.	.	.	.	.	.
4.1 International marine bunkers	30,4	.	.	.	.	.	.	.	.	.	.	.	19,2	.	0,8	10,4	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	9,7	.	.	.	.	.	.	.	9,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-1,5	2,3	0,5	.	-0,2	0,1	2,2	-1,7	-1,8	0,4	-1,8	0,5	0,1	0,8	0,3	-2,2	-1,0	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 143,9	23,0	11,1	195,8	549,5	10,9	83,9	-74,7	-2,5	-0,9	-8,4	-15,5	-39,9	-6,8	-18,4	-32,1	-19,1	46,3	.	1,3	5,2	2,4	432,7	.
7 Transformation processes	4,4	-0,7	-0,1	-0,1	-501,6	-30,9	-1,1	130,4	19,2	5,8	29,4	71,0	92,6	32,1	32,3	28,7	93,5	-2,2	.	-	-2,0	-2,1	1,3	8,9
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	3,2	.	.	.	-501,6	-30,9	13,4	128,2	19,2	5,8	29,4	71,0	92,6	33,6	32,4	28,8	81,2	.	.	.	.	.	.	.
7.3 In thermal power plants	1,4	.	.	.	.	.	.	.	.	.	.	.	.	-0,3	.	.	.	-1,0	.	.	.	.	2,6	.
7.4 In combined heat and power plants	-0,4	-0,7	.	-	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	-1,0	-1,1	0,4	2,0
7.5 In district heating plants	0,3	.	.	-0,1	.	.	-	.	.	.	.	.	.	-1,2	-0,1	-0,1	.	-1,2	.	-	-1,0	-1,1	-1,7	6,9
7.6 Other transformation processes	-	.	-	.	.	.	-14,5	2,2	.	.	.	.	.	.	.	.	12,3	.	.	.	.	.	.	.
8 Energy industries own use	207,7	.	.	159,4	.	.	0,9	.	.	-	0,1	.	10,2	0,1	-	.	26,1	.	.	.	.	.	10,7	-
8.1 Crude petroleum and natural gass production	174,3	.	.	159,4	.	.	.	.	.	-	0,1	.	10,2	0,1	.	.	.	.	.	.	.	.	4,5	.
8.2 Coal mines	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	-
8.3 Oil refineries	28,6	.	.	.	.	.	0,9	.	.	.	-	.	.	.	-	.	26,1	.	.	.	.	.	1,5	.
8.4 Pumping storage power plants	2,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,4	.
8.5 Hydropower plants	2,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,1	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	-	.	.	.	.	.	.	.	0,1	-
9 Distribution losses	40,0	.	0,7	0,4	.	.	.	.	.	.	.	.	.	.	.	.	3,1	.	.	0,6	.	.	33,6	1,6
10 Final consumption (11+12)	844,9	21,3	11,4	21,2	.	.	57,6	73,4	17,1	5,6	21,6	52,4	38,6	23,6	8,9	8,5	40,3	42,8	.	0,7	3,0	0,3	389,4	7,3
11 Non energy consumption	96,3	2,5	.	15,4	.	.	49,3	.	.	.	.	.	0,1	.	.	.	29,0	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	66,2	.	.	15,4	.	.	47,5	.	.	.	.	.	.	.	.	.	3,3	.	.	.	.	.	.	.
11.2 In other production	30,1	2,5	.	-	.	.	1,8	.	.	.	.	.	0,1	.	.	.	25,7	.	.	.	.	.	.	.
12 Final energy consumption	748,6	18,7	11,4	5,8	.	.	8,3	73,4	17,1	5,6	21,6	52,4	38,6	23,6	8,9	8,5	11,3	42,8	.	0,7	3,0	0,3	389,4	7,3
12.1 Manufacturing, constr. and non-fuel mining	272,5	18,7	11,3	5,2	.	.	7,3	.	.	0,1	11,1	.	.	9,1	1,2	8,3	11,3	14,4	.	-	2,8	0,3	170,2	1,0
12.1.1 Iron and steel	42,9	9,7	9,7	.	.	.	0,1	.	.	.	0,1	.	.	0,5	-	.	.	0,2	.	.	-	.	22,7	-
12.1.2 Chemical and petrochemical	49,3	4,5	1,1	3,6	.	.	2,5	.	.	-	0,1	.	.	0,8	0,1	1,7	11,1	.	.	.	0,3	.	23,1	0,3
12.1.3 Non-ferrous metals	70,7	-	-	1,0	.	.	1,2	.	.	.	0,1	.	.	0,6	-	.	.	-	.	.	.	.	67,7	.
12.1.4 Non-metalic minerals	13,1	4,5	0,5	.	.	.	1,6	.	.	-	0,4	.	.	0,8	.	-	0,2	0,1	.	.	1,7	0,3	3,0	-
12.1.5 Transport equipment	3,9	.	.	.	.	.	0,2	.	.	.	0,1	.	.	0,4	-	-	.	-	.	.	-	.	3,2	0,1
12.1.6 Machinery	7,1	.	-	-	.	.	0,4	.	.	-	0,1	.	.	0,8	-	-	.	-	.	.	0,2	.	5,3	0,2
12.1.7 Mining and quarrying	3,6	.	.	-	.	.	-	.	.	-	1,5	.	.	0,2	.	0,2	.	-	.	.	-	.	1,6	-
12.1.8 Food and tobacco	16,7	.	.	0,3	.	.	0,5	.	.	-	0,1	.	.	2,7	1,0	1,2	.	.	.	.	.	.	10,5	0,3
12.1.9 Paper, pulp and print	41,1	.	.	0,3	.	.	0,2	.	.	-	0,1	.	.	0,3	-	5,0	.	10,8	.	-	0,5	.	23,9	-
12.1.10 Wood and wood products	6,7	.	.	.	.	.	-	.	.	.	0,3	.	.	0,2	-	0,2	.	3,2	.	.	.	.	2,7	0,1
12.1.11 Textile and leather	1,0	.	.	.	.	.	-	.	.	-	-	.	.	0,2	.	0,1	.	-	.	.	.	.	0,7	-
12.1.12 Construction	12,6	.	.	.	.	.	0,6	.	.	0,1	8,2	.	.	0,9	.	-	.	.	.	.	.	.	2,8	.
12.1.13 Other industries	3,7	.	.	.	.	.	-	.	.	-	-	.	.	0,6	-	-	.	0,1	.	.	-	.	2,9	-
12.2 Transport	172,4	.	.	0,1	.	.	0,1	73,4	12,7	.	1,9	52,0	25,0	.	5,1	0,1	.	.	.	.	.	.	2,0	.
12.2.1 Road	123,3	.	.	0,1	.	.	0,1	71,0	.	.	.	52,0	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	2,7	.	.	.	.	.	.	.	.	.	0,7	.	.	.	.	.	.	.	.	.	.	.	2,0	.
12.2.3 Domestic aviation	12,9	.	.	.	.	.	.	0,2	12,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	33,6	.	.	.	.	.	.	2,2	-	.	1,2	-	25,0	.	5,1	0,1	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	303,8	-	0,1	0,5	.	.	0,9	-	4,5	5,5	8,7	0,3	13,6	14,5	2,5	-	.	28,4	.	0,7	0,2	.	217,2	6,3
12.3.1 Agriculture and forestry	12,4	.	.	.	.	.	0,2	-	.	0,2	4,0	0,2	-	0,7	0,1	.	.	.	.	.	-	.	7,1	-
12.3.2 Fishing	15,0	.	.	.	.	.	.	-	.	-	0,1	-	12,6	0,1	1,7	-	.	.	.	.	.	.	0,5	.
12.3.3 Commerce and public services	111,6	-	.	0,4	.	.	0,3	-	4,5	2,1	4,5	0,1	1,0	7,2	0,5	-	.	.	.	0,7	0,2	.	84,9	5,0
12.3.4 Households	164,8	-	0,1	0,1	.	.	0,4	.	.	3,2	.	.	.	6,4	0,2	.	.	28,4	.	.	.	.	124,7	1,2
13 Statistical difference (6+7-8-9-10)	55,5	1,0	-1,1	14,7	48,0	-20,0	24,3	-17,8	-0,4	-0,7	-0,7	3,2	3,8	1,6	5,0	-11,9	4,9	1,3	.	-	0,2	-	-	-0,1
Memo01: Gas flared off on oil fields, terminals and landfills	17,9	.	.	17,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2003	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	9 872,2	82,7	.	2 806,6	6 237,3	37,1	271,9	.	.	.	.	.	.	.	.	.	.	43,3	.	1,3	6,5	2,9	382,7	.
2 Imports	285,2	18,9	10,9	.	26,4	.	24,4	13,7	11,3	1,0	3,6	9,1	11,0	5,3	4,4	58,3	34,8	3,6	.	.	.	.	48,3	.
3 Exports	8 922,7	75,8	-	2 568,1	5 662,8	24,8	206,9	107,2	1,3	3,1	10,7	26,8	32,3	15,7	31,8	73,4	62,1	0,1	.	.	.	.	20,0	.
4 International bunkers	38,4	.	.	.	.	.	.	.	9,9	.	.	.	15,9	.	0,4	12,3	.	.	.	.	.	.	.	.
4.1 International marine bunkers	28,5	.	.	.	.	.	.	.	.	.	.	.	15,9	.	0,4	12,3	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	9,9	.	.	.	.	.	.	.	9,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-41,2	-3,0	-0,7	.	-37,3	-0,5	-3,2	0,8	1,9	-0,1	1,6	-0,7	-0,9	-0,4	-0,2	0,8	0,6	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 155,2	22,9	10,2	238,6	563,5	11,8	86,2	-92,7	2,1	-2,2	-5,4	-18,5	-38,0	-10,8	-28,0	-26,4	-26,6	46,7	.	1,3	6,5	2,9	411,0	.
7 Transformation processes	5,0	-0,6	-0,1	-0,3	-572,1	-30,9	14,8	157,0	18,0	8,3	31,1	78,1	93,8	43,1	37,3	27,4	94,6	-2,6	.	-	-2,4	-2,5	2,8	10,1
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	3,5	.	.	.	-572,1	-30,9	28,8	155,7	18,0	8,3	31,1	78,1	93,8	45,6	37,4	27,6	82,2	.	.	.	.	.	.	.
7.3 In thermal power plants	1,5	.	.	-	.	.	.	.	.	.	-	.	.	-0,4	.	.	.	-1,2	.	.	.	.	3,1	.
7.4 In combined heat and power plants	0,1	-0,6	.	-	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	-1,3	-1,4	0,6	2,8
7.5 In district heating plants	-	.	.	-0,3	.	.	-0,1	.	.	.	.	.	.	-2,1	-0,1	-0,1	.	-1,4	.	-	-1,1	-1,1	-0,9	7,2
7.6 Other transformation processes	-	.	-	.	.	.	-13,8	1,3	.	.	.	.	.	.	.	.	12,5	.	.	.	.	.	.	.
8 Energy industries own use	223,6	.	.	172,0	.	.	0,6	.	.	0,1	0,1	.	9,0	0,5	-	-	29,0	.	.	.	.	.	12,2	-
8.1 Crude petroleum and natural gass production	186,5	.	.	172,0	.	.	.	.	.	0,1	0,1	.	9,0	0,1	.	.	.	.	.	.	.	.	5,2	.
8.2 Coal mines	0,5	.	.	.	.	.	.	.	.	.	.	.	.	0,4	.	.	.	.	.	.	.	.	0,1	-
8.3 Oil refineries	31,6	.	.	.	.	.	0,6	.	.	.	.	.	.	.	.	-	29,0	.	.	.	.	.	2,0	.
8.4 Pumping storage power plants	3,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,1	.
8.5 Hydropower plants	1,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1,7	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	0,2	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.	.	.	.	.	.	.	.	0,1	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	-	.	.	.	-	-	.	.	.	.	.	.	.	0,1	-
9 Distribution losses	34,8	.	0,5	0,5	.	.	.	.	.	.	.	.	.	.	.	.	2,5	.	.	0,6	.	.	28,6	2,2
10 Final consumption (11+12)	847,6	20,7	11,4	29,2	.	.	60,5	72,6	13,5	6,5	22,1	55,1	40,8	30,0	6,7	10,4	39,7	43,0	.	0,7	3,8	0,3	372,7	7,9
11 Non energy consumption	103,9	2,2	.	21,6	.	.	51,9	.	.	.	.	.	.	.	.	.	28,2	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	73,9	.	.	21,6	.	.	50,1	.	.	.	.	.	.	.	.	.	2,3	.	.	.	.	.	.	.
11.2 In other production	30,0	2,2	.	-	.	.	1,8	.	.	.	.	.	.	.	.	.	26,0	.	.	.	.	.	.	.
12 Final energy consumption	743,7	18,4	11,4	7,6	.	.	8,7	72,6	13,5	6,5	22,1	55,1	40,8	30,0	6,7	10,4	11,5	43,0	.	0,7	3,8	0,3	372,7	7,9
12.1 Manufacturing, constr. and non-fuel mining	278,5	18,4	11,4	7,0	.	.	7,7	.	.	0,1	11,4	.	.	10,2	2,0	8,2	11,5	14,7	.	-	3,5	0,3	171,1	1,1
12.1.1 Iron and steel	40,0	8,8	9,4	.	.	.	0,1	.	.	.	0,1	.	.	0,7	-	.	.	0,2	.	.	-	.	20,7	-
12.1.2 Chemical and petrochemical	52,8	4,9	1,6	5,5	.	.	2,4	.	.	-	0,1	.	.	0,8	0,3	1,8	11,3	-	.	.	0,4	.	23,4	0,4
12.1.3 Non-ferrous metals	77,5	-	.	1,1	.	.	1,2	.	.	.	0,2	.	.	0,9	.	.	.	.	.	.	-	.	74,2	.
12.1.4 Non-metalic minerals	14,2	4,7	0,4	.	.	.	1,9	.	.	-	0,5	.	.	0,7	.	-	0,2	0,1	.	.	2,4	0,3	3,0	-
12.1.5 Transport equipment	3,3	-	-	.	.	.	0,1	.	.	.	0,1	.	.	0,3	-	-	-	-	.	.	-	.	2,6	0,1
12.1.6 Machinery	6,1	.	-	-	.	.	0,1	.	.	-	0,1	.	.	0,8	-	.	.	-	.	.	-	.	4,8	0,2
12.1.7 Mining and quarrying	3,8	.	.	-	.	.	0,1	.	.	-	1,7	.	.	0,2	.	0,2	.	-	.	.	-	.	1,7	-
12.1.8 Food and tobacco	16,7	-	.	0,1	.	.	0,5	.	.	-	0,2	.	.	3,2	1,5	1,0	.	.	.	.	.	.	9,9	0,3
12.1.9 Paper, pulp and print	40,9	.	.	0,2	.	.	0,5	.	.	.	0,1	.	.	0,5	0,1	4,9	.	11,2	.	-	0,7	.	22,7	-
12.1.10 Wood and wood products	6,4	.	.	.	.	.	-	.	.	-	0,3	.	.	0,2	0,1	0,3	.	2,9	.	.	-	.	2,5	0,1
12.1.11 Textile and leather	1,0	.	.	-	.	.	-	.	.	-	-	.	.	0,2	-	-	.	.	.	.	.	.	0,7	.
12.1.12 Construction	12,0	.	.	.	.	.	0,6	.	.	0,1	8,0	.	.	1,0	.	-	.	.	.	.	.	.	2,4	.
12.1.13 Other industries	3,9	.	.	-	.	.	0,1	.	.	-	0,1	.	.	0,7	0,1	-	-	0,2	.	.	-	.	2,8	-
12.2 Transport	179,7	.	.	0,3	.	.	0,1	72,6	13,3	.	2,1	54,8	29,9	.	2,8	2,0	.	.	.	.	.	.	1,9	.
12.2.1 Road	125,2	.	.	0,1	.	.	0,1	70,2	.	.	.	54,8	.	.	.	.	.	.	.	.	.	.	.	.
12.2.2 Rail	2,8	.	.	.	.	.	.	.	.	.	0,9	.	.	.	.	.	.	.	.	.	.	.	1,9	.
12.2.3 Domestic aviation	13,4	.	.	.	.	.	.	0,2	13,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	38,3	.	.	0,2	.	.	.	2,2	-	.	1,2	-	29,9	.	2,8	2,0	.	.	.	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	285,5	-	0,1	0,4	.	.	0,9	-	0,3	6,3	8,6	0,3	10,9	19,8	1,9	0,1	.	28,3	.	0,7	0,3	.	199,6	6,8
12.3.1 Agriculture and forestry	12,1	.	.	-	.	.	0,2	-	.	0,2	4,1	0,2	-	0,9	0,1	.	.	.	.	.	0,1	.	6,4	-
12.3.2 Fishing	12,3	.	.	.	.	.	.	-	.	-	0,1	-	9,9	0,3	1,4	0,1	.	.	.	.	.	.	0,5	.
12.3.3 Commerce and public services	102,8	-	.	0,3	.	.	0,2	-	0,3	2,4	4,4	0,1	1,1	9,6	0,3	-	.	0,2	.	0,7	0,3	.	77,4	5,4
12.3.4 Households	158,3	-	0,1	0,1	.	.	0,5	.	.	3,7	.	.	.	9,0	0,1	.	.	28,2	.	.	.	.	115,3	1,3
13 Statistical difference (6+7-8-9-10)	53,8	1,6	-1,7	36,6	-8,6	-19,1	39,9	-8,3	6,6	-0,4	3,4	4,5	5,9	1,8	2,6	-9,4	-3,1	1,1	.	-	0,4	-	-	-0,1
Memo01: Gas flared off on oil fields, terminals and landfills	18,9	.	.	18,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2004	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	9 918,5	81,6	.	2 943,2	6 117,3	49,1	280,2	.	.	.	.	.	.	.	.	.	.	42,6	.	1,3	6,0	2,9	394,4	.
2 Imports	297,9	21,5	13,0	.	21,2	.	21,8	19,9	11,3	0,1	4,1	10,8	11,6	4,5	3,6	57,7	39,1	2,3	0,1	.	.	.	55,1	.
3 Exports	8 920,2	77,0	-	2 754,9	5 505,1	27,8	196,8	96,9	1,8	2,0	11,8	31,0	33,3	12,9	28,7	70,7	55,5	0,1	.	.	.	.	13,9	.
4 International bunkers	39,2	.	.	.	.	.	.	.	11,1	.	.	.	15,2	.	0,3	12,6	.	.	.	.	.	.	.	.
4.1 International marine bunkers	28,1	.	.	.	.	.	.	.	.	.	.	.	15,2	.	0,3	12,6	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	11,1	.	.	.	.	.	.	.	11,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	23,9	-0,4	0,1	.	19,2	0,4	-1,1	2,6	-0,2	-0,1	0,2	0,7	0,7	0,3	0,9	0,6	-0,1	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 280,8	25,7	13,1	188,3	652,6	21,7	104,2	-74,4	-1,8	-2,0	-7,5	-19,5	-36,1	-8,1	-24,5	-25,0	-16,5	44,8	0,1	1,3	6,0	2,9	435,6	.
7 Transformation processes	3,4	-0,8	-0,1	-0,3	-523,1	-40,2	-0,2	144,4	21,7	6,3	30,9	81,0	87,0	32,5	36,4	31,1	92,4	-3,0	.	-	-2,4	-2,6	1,8	10,6
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	1,5	.	.	.	-523,1	-40,2	13,1	143,1	21,7	6,3	30,9	81,0	87,0	33,6	36,4	31,1	80,4	.	.	.	.	.	.	.
7.3 In thermal power plants	1,7	.	.	-0,1	.	.	.	.	.	.	-	.	.	-0,3	.	.	.	-1,3	.	.	.	.	3,4	.
7.4 In combined heat and power plants	0,1	-0,8	.	-	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	-1,3	-1,4	0,6	3,1
7.5 In district heating plants	0,2	.	.	-0,2	.	.	-0,1	.	.	.	.	.	.	-0,8	.	-	.	-1,7	.	-	-1,1	-1,2	-2,2	7,5
7.6 Other transformation processes	-	.	-	.	.	.	-13,2	1,2	.	.	.	.	.	.	.	.	12,0	.	.	.	.	.	.	.
8 Energy industries own use	226,5	.	.	176,5	.	.	0,5	.	.	-	0,1	.	9,1	0,5	.	.	27,4	.	.	.	.	.	12,4	-
8.1 Crude petroleum and natural gass production	191,5	.	.	176,5	.	.	.	.	.	-	0,1	.	9,1	0,2	.	.	.	.	.	.	.	.	5,7	.
8.2 Coal mines	0,5	.	.	.	.	.	.	.	.	.	.	.	.	0,3	.	.	.	.	.	.	.	.	0,1	-
8.3 Oil refineries	29,8	.	.	.	.	.	0,5	.	.	.	.	.	.	-	.	.	27,4	.	.	.	.	.	1,9	.
8.4 Pumping storage power plants	2,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,6	.
8.5 Hydropower plants	1,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1,9	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	-
9 Distribution losses	40,2	.	0,6	0,5	.	.	.	.	.	.	.	.	.	.	.	.	2,8	.	.	0,5	.	.	33,6	2,2
10 Final consumption (11+12)	862,0	23,0	13,7	33,7	.	.	51,0	72,2	15,9	5,5	22,7	59,6	39,6	23,6	5,8	10,2	40,7	40,9	0,1	0,7	3,3	0,3	391,0	8,4
11 Non energy consumption	98,4	2,3	.	24,8	.	.	41,4	.	.	.	.	.	.	.	.	.	29,9	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	66,1	.	.	24,8	.	.	39,6	.	.	.	.	.	.	.	.	.	1,7	.	.	.	.	.	.	.
11.2 In other production	32,3	2,3	.	-	.	.	1,8	.	.	.	.	.	.	.	.	.	28,2	.	.	.	.	.	.	.
12 Final energy consumption	763,6	20,7	13,7	8,9	.	.	9,6	72,2	15,9	5,5	22,7	59,6	39,6	23,6	5,8	10,2	10,8	40,9	0,1	0,7	3,3	0,3	391,0	8,4
12.1 Manufacturing, constr. and non-fuel mining	293,1	20,6	13,7	7,8	.	.	8,5	.	.	0,1	12,0	.	.	7,6	1,8	8,0	10,8	14,2	.	-	3,0	0,3	183,6	1,1
12.1.1 Iron and steel	47,2	10,9	11,5	-	.	.	0,1	.	.	-	0,1	.	.	0,4	-	.	.	0,2	.	.	.	.	24,1	-
12.1.2 Chemical and petrochemical	54,6	5,9	1,6	5,4	.	.	3,5	.	.	.	0,1	.	.	0,7	0,2	1,7	10,8	-	.	.	0,3	.	24,2	0,3
12.1.3 Non-ferrous metals	83,6	.	.	1,1	.	.	1,0	.	.	.	0,2	.	.	0,6	.	.	-	.	.	.	-	.	80,7	.
12.1.4 Non-metalic minerals	13,3	3,9	0,6	-	.	.	2,0	.	.	-	0,5	.	.	0,7	.	.	0,1	0,1	.	.	2,0	0,3	3,1	-
12.1.5 Transport equipment	3,1	.	.	-	.	.	0,1	.	.	-	0,1	.	.	0,2	-	.	.	.	.	.	-	.	2,6	0,1
12.1.6 Machinery	6,1	.	.	-	.	.	0,1	.	.	.	0,2	.	.	0,7	-	.	.	-	.	.	-	.	4,8	0,1
12.1.7 Mining and quarrying	4,2	.	.	0,1	.	.	-	.	.	-	2,1	.	.	0,1	.	0,1	.	-	.	.	-	.	1,7	-
12.1.8 Food and tobacco	16,8	.	.	0,7	.	.	0,4	.	.	-	0,4	.	.	2,1	1,5	0,7	.	.	.	.	.	.	10,6	0,4
12.1.9 Paper, pulp and print	41,3	.	.	0,4	.	.	0,4	.	.	.	0,1	.	.	0,4	0,1	5,0	.	10,5	.	-	0,7	.	23,7	-
12.1.10 Wood and wood products	6,7	.	.	-	.	.	-	.	.	-	0,3	.	.	0,2	-	0,4	.	3,2	.	.	-	.	2,5	0,1
12.1.11 Textile and leather	0,9	.	.	-	.	.	-	.	.	-	-	.	.	0,2	.	0,1	.	.	.	.	.	.	0,6	.
12.1.12 Construction	11,6	.	.	.	.	.	0,6	.	.	-	7,9	.	.	1,0	.	-	.	.	.	.	.	.	2,0	.
12.1.13 Other industries	3,8	.	.	-	.	.	0,1	.	.	-	0,1	.	.	0,4	-	.	-	0,2	.	.	-	.	3,0	-
12.2 Transport	182,8	.	.	0,4	.	.	0,2	72,2	13,3	.	1,9	59,3	29,2	.	2,3	2,1	.	.	0,1	.	.	.	1,8	.
12.2.1 Road	129,4	.	.	0,1	.	.	0,2	69,8	.	.	.	59,3	.	.	.	.	.	.	0,1	.	.	.	.	.
12.2.2 Rail	2,5	.	.	.	.	.	.	.	.	.	0,7	.	.	.	.	.	.	.	.	.	.	.	1,8	.
12.2.3 Domestic aviation	13,5	.	.	.	.	.	.	0,2	13,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	37,4	.	.	0,3	.	.	.	2,2	-	.	1,2	-	29,2	.	2,3	2,1	.	.	-	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	287,7	0,1	-	0,7	.	.	1,0	-	2,6	5,4	8,8	0,3	10,4	16,0	1,7	0,2	.	26,7	-	0,7	0,3	.	205,6	7,4
12.3.1 Agriculture and forestry	12,6	.	.	0,2	.	.	0,2	-	.	0,1	4,2	0,2	-	0,6	-	.	.	.	-	.	0,1	.	7,1	-
12.3.2 Fishing	12,0	.	.	.	.	.	.	-	.	-	0,1	-	9,3	0,6	1,4	0,1	.	.	-	.	.	.	0,5	.
12.3.3 Commerce and public services	106,4	-	.	0,3	.	.	0,3	-	2,6	0,8	4,4	0,1	1,1	8,1	0,2	-	.	0,2	-	0,7	0,2	.	81,4	5,9
12.3.4 Households	156,7	0,1	-	0,1	.	.	0,5	.	.	4,5	.	.	.	6,7	0,1	.	.	26,5	.	.	.	.	116,7	1,5
13 Statistical difference (6+7-8-9-10)	155,2	1,9	-1,3	-22,8	129,5	-18,5	52,5	-2,2	4,1	-1,2	0,7	1,9	2,2	0,2	6,2	-4,1	5,0	0,9	-	-	0,3	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	20,0	.	.	20,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2005	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	9 725,8	41,3	.	3 155,7	5 590,7	100,0	289,6	.	.	.	.	.	.	.	.	.	.	44,0	.	1,4	6,7	3,4	493,0	.
2 Imports	267,2	18,8	10,9	.	47,0	.	16,7	13,9	6,9	0,1	3,0	8,0	8,3	2,4	3,4	69,3	42,2	3,2	0,1	.	.	.	13,2	.
3 Exports	8 655,9	46,8	0,1	2 971,3	4 958,3	30,2	233,4	112,4	5,3	1,3	12,2	33,0	34,2	9,8	16,8	70,2	64,0	0,1	.	.	.	.	56,5	.
4 International bunkers	46,7	.	.	.	.	.	.	.	12,5	.	.	.	19,2	.	0,5	14,5	.	.	.	.	.	.	.	.
4.1 International marine bunkers	34,3	.	.	.	.	.	.	.	.	.	.	.	19,2	.	0,5	14,5	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	12,5	.	.	.	.	.	.	.	12,5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-16,8	9,1	-0,7	.	-17,8	0,1	2,0	-2,6	0,2	-	-0,5	-1,5	-1,5	-0,4	-0,8	-1,7	-0,6	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 273,6	22,3	10,1	184,4	661,6	69,9	74,9	-101,0	-10,6	-1,2	-9,8	-26,5	-46,7	-7,9	-14,7	-17,2	-22,4	47,0	0,1	1,4	6,7	3,4	449,7	.
7 Transformation processes	2,5	-0,7	-0,1	-0,6	-521,1	-103,4	12,9	170,0	28,6	5,5	35,5	95,9	99,3	27,5	35,6	10,3	103,1	-3,3	.	-	-2,3	-2,5	1,3	11,0
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	0,5	.	.	.	-521,1	-103,4	26,4	168,1	28,6	5,5	35,5	95,9	99,3	28,4	35,6	10,3	91,5	.	.	.	.	.	.	.
7.3 In thermal power plants	1,4	.	.	-0,3	.	.	.	.	.	.	-	.	.	-0,3	.	.	.	-1,4	.	.	.	.	3,4	.
7.4 In combined heat and power plants	-	-0,7	.	-	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	-1,3	-1,4	0,4	3,0
7.5 In district heating plants	0,6	.	.	-0,3	.	.	-	.	.	.	.	.	.	-0,5	.	.	.	-1,9	.	-	-1,0	-1,1	-2,5	8,0
7.6 Other transformation processes	-	.	-	.	.	.	-13,5	1,9	.	.	.	.	.	.	.	.	11,6	.	.	.	.	.	.	.
8 Energy industries own use	232,3	.	.	174,0	.	.	-	.	.	-	0,1	.	11,1	0,4	.	.	30,4	.	.	.	.	.	16,3	-
8.1 Crude petroleum and natural gass production	193,1	.	.	174,0	.	.	-	.	.	-	0,1	.	11,1	-	.	.	.	.	.	.	.	.	7,9	.
8.2 Coal mines	0,4	.	.	.	.	.	.	.	.	.	.	.	.	0,3	.	.	.	.	.	.	.	.	0,1	-
8.3 Oil refineries	32,5	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	30,4	.	.	.	.	.	2,0	.
8.4 Pumping storage power plants	3,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,9	.
8.5 Hydropower plants	2,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,1	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	-
9 Distribution losses	41,6	.	0,4	0,3	.	.	.	.	.	.	.	.	.	.	.	.	2,1	.	.	0,5	.	.	36,0	2,2
10 Final consumption (11+12)	854,8	19,6	11,7	31,0	.	.	49,7	69,6	15,9	4,5	23,7	64,2	35,9	17,8	6,5	8,7	41,2	41,6	0,1	0,9	4,1	0,8	398,3	8,9
11 Non energy consumption	97,0	2,4	.	21,8	.	.	42,2	.	.	.	.	.	.	.	.	.	30,7	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	64,0	.	.	21,8	.	.	40,4	.	.	.	.	.	.	.	.	.	1,8	.	.	.	.	.	.	.
11.2 In other production	33,0	2,4	.	-	.	.	1,8	.	.	.	.	.	.	.	.	.	28,9	.	.	.	.	.	.	.
12 Final energy consumption	757,8	17,2	11,7	9,2	.	.	7,5	69,6	15,9	4,5	23,7	64,2	35,9	17,8	6,5	8,7	10,5	41,6	0,1	0,9	4,1	0,8	398,3	8,9
12.1 Manufacturing, constr. and non-fuel mining	288,1	17,2	11,7	7,6	.	.	6,9	.	.	0,1	12,1	.	.	6,8	0,9	7,5	10,5	14,7	.	-	3,7	0,8	186,3	1,1
12.1.1 Iron and steel	38,7	8,8	9,7	0,1	.	.	-	.	.	.	-	.	.	0,4	-	.	.	.	.	.	.	.	19,6	-
12.1.2 Chemical and petrochemical	54,1	5,2	1,5	4,2	.	.	2,5	.	.	.	0,1	.	.	0,6	0,1	2,1	10,4	0,3	.	.	0,5	0,3	26,0	0,3
12.1.3 Non-ferrous metals	88,7	.	.	1,7	.	.	1,0	.	.	.	0,2	.	.	0,4	.	.	.	.	.	.	.	.	85,5	-
12.1.4 Non-metalic minerals	13,5	3,2	0,6	0,1	.	.	2,1	.	.	-	0,7	.	.	0,6	.	.	0,1	0,2	.	.	2,4	0,6	3,2	-
12.1.5 Transport equipment	3,3	.	.	0,1	.	.	0,1	.	.	-	0,2	.	.	0,2	-	-	.	.	.	.	-	.	2,6	0,1
12.1.6 Machinery	6,3	.	-	0,1	.	.	0,2	.	.	-	0,2	.	.	0,7	-	-	.	-	.	.	-	.	4,9	0,1
12.1.7 Mining and quarrying	4,0	.	.	0,2	.	.	0,1	.	.	-	1,9	.	.	0,1	.	.	.	-	.	.	0,1	.	1,6	-
12.1.8 Food and tobacco	15,5	.	.	0,8	.	.	0,5	.	.	-	0,4	.	.	2,0	0,8	0,3	.	.	.	.	-	-	10,1	0,4
12.1.9 Paper, pulp and print	41,1	.	.	0,3	.	.	0,3	.	.	-	0,1	.	.	0,1	-	4,6	.	11,1	.	-	0,7	.	23,9	-
12.1.10 Wood and wood products	6,4	.	.	.	.	.	-	.	.	-	0,3	.	.	0,1	.	0,4	.	3,0	.	.	-	.	2,6	0,1
12.1.11 Textile and leather	0,9	.	.	-	.	.	-	.	.	-	-	.	.	0,1	.	-	.	.	.	.	.	.	0,6	.
12.1.12 Construction	11,6	.	.	-	.	.	0,1	.	.	-	8,0	.	.	0,9	.	-	.	.	.	.	.	.	2,5	.
12.1.13 Other industries	3,9	.	.	-	.	.	0,1	.	.	-	-	.	.	0,4	-	-	-	0,3	.	.	0,1	.	3,1	-
12.2 Transport	183,6	.	.	0,4	.	.	0,1	69,5	13,1	.	1,9	64,0	27,6	.	4,0	0,9	.	.	0,1	.	.	.	1,9	.
12.2.1 Road	131,5	.	.	0,1	.	.	0,1	67,2	.	.	.	64,0	.	.	.	.	.	.	0,1	.	.	.	-	.
12.2.2 Rail	2,5	.	.	.	.	.	-	.	.	.	0,7	.	.	.	.	.	.	.	.	.	.	.	1,9	.
12.2.3 Domestic aviation	13,2	.	.	.	.	.	.	0,1	13,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	36,4	.	.	0,3	.	.	-	2,2	-	.	1,3	-	27,6	.	4,0	0,9	.	.	-	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	286,1	-	-	1,2	.	.	0,5	-	2,9	4,5	9,6	0,2	8,4	11,0	1,6	0,2	.	26,8	-	0,9	0,4	.	210,1	7,8
12.3.1 Agriculture and forestry	13,2	.	.	0,7	.	.	0,2	-	.	0,1	4,5	0,2	-	0,4	-	.	.	.	-	.	0,1	.	7,1	-
12.3.2 Fishing	10,8	.	.	.	.	.	-	-	.	-	0,1	-	8,3	0,1	1,4	0,2	.	.	-	.	.	.	0,6	.
12.3.3 Commerce and public services	102,9	-	.	0,4	.	.	0,3	-	2,9	0,7	4,9	0,1	0,1	5,7	0,1	0,1	.	0,2	-	0,9	0,3	.	80,0	6,2
12.3.4 Households	159,2	-	-	0,2	.	.	-	.	.	3,7	.	.	.	4,7	-	.	.	26,6	.	.	.	.	122,4	1,5
13 Statistical difference (6+7-8-9-10)	146,9	2,1	-2,2	-21,5	140,5	-33,6	38,1	-0,6	2,1	-0,2	1,9	5,1	5,5	1,5	14,3	-15,5	7,0	2,2	-	-	0,3	-	-	-0,1
Memo01: Gas flared off on oil fields, terminals and landfills	19,5	.	.	19,5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2006	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	9 369,8	67,3	.	3 236,4	5 168,3	114,6	294,3	.	.	.	.	.	.	.	.	.	.	43,8	.	1,1	7,2	3,5	433,3	.
2 Imports	269,9	14,8	11,1	.	18,7	.	17,1	8,7	10,3	0,1	5,3	14,6	13,8	4,3	1,5	71,9	39,8	2,2	0,2	.	.	.	35,3	.
3 Exports	8 278,7	63,7	-	3 035,0	4 454,3	33,0	245,6	132,6	4,7	5,6	12,8	35,4	33,4	10,4	35,7	88,5	55,8	0,1	.	.	.	.	32,2	.
4 International bunkers	46,3	.	.	.	.	.	.	.	15,0	.	.	.	16,3	.	0,3	14,7	.	.	.	.	.	.	.	.
4.1 International marine bunkers	31,3	.	.	.	.	.	.	.	.	.	.	.	16,3	.	0,3	14,7	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	15,0	.	.	.	.	.	.	.	15,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-20,7	-0,6	0,8	.	-18,2	-	-1,6	0,1	0,3	0,1	-0,3	-0,9	-0,8	-0,3	-0,1	2,0	-1,3	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 294,0	17,9	12,0	201,3	714,5	81,6	64,2	-123,8	-9,1	-5,4	-7,8	-21,6	-36,7	-6,4	-34,6	-29,3	-17,3	45,9	0,2	1,1	7,2	3,5	436,4	.
7 Transformation processes	1,1	-0,7	-0,1	-0,8	-548,0	-121,7	16,0	183,8	28,6	9,2	36,9	102,1	96,3	28,9	41,1	21,7	102,7	-3,5	.	-	-2,5	-2,7	2,0	11,7
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	-1,1	.	.	.	-548,0	-121,7	33,1	181,5	28,6	9,2	36,9	102,1	96,3	30,0	41,1	21,7	88,1	.	.	.	.	.	.	.
7.3 In thermal power plants	1,7	.	.	-0,3	.	.	.	.	.	.	-	.	.	-0,3	.	.	.	-1,3	.	.	.	.	3,7	.
7.4 In combined heat and power plants	-	-0,7	.	-	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	-1,3	-1,4	0,5	3,0
7.5 In district heating plants	0,6	.	.	-0,4	.	.	-0,1	.	.	.	.	.	.	-0,8	.	.	.	-2,2	.	-	-1,1	-1,2	-2,2	8,7
7.6 Other transformation processes	-	.	-	.	.	.	-16,9	2,4	.	.	.	.	.	.	.	.	14,6	.	.	.	.	.	.	.
8 Energy industries own use	238,3	.	.	179,6	.	.	-	.	.	-	0,1	.	11,5	0,4	.	.	31,2	.	.	.	.	.	15,4	-
8.1 Crude petroleum and natural gass production	200,8	.	.	179,6	.	.	-	.	.	-	0,1	.	11,5	-	.	.	.	.	.	.	.	.	9,5	.
8.2 Coal mines	0,5	.	.	.	.	.	.	.	.	.	.	.	.	0,3	.	.	.	.	.	.	.	.	0,1	.
8.3 Oil refineries	32,9	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	31,2	.	.	.	.	.	1,8	.
8.4 Pumping storage power plants	1,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1,9	.
8.5 Hydropower plants	1,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1,9	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
8.9 District heating plants	0,1	.	.	.	.	.	-	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	-
9 Distribution losses	42,3	.	0,4	0,4	.	.	.	.	.	.	.	.	.	.	.	.	2,3	.	.	0,6	.	.	36,3	2,3
10 Final consumption (11+12)	856,2	16,6	10,8	32,2	.	.	49,7	66,9	16,2	4,6	25,3	70,6	38,4	19,3	5,1	11,2	45,7	41,8	0,2	0,5	4,5	0,9	386,4	9,5
11 Non energy consumption	97,8	2,0	.	22,3	.	.	41,3	.	.	.	.	.	.	.	.	.	32,2	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	63,0	.	.	22,3	.	.	39,5	.	.	.	.	.	.	.	.	.	1,2	.	.	.	.	.	.	.
11.2 In other production	34,8	2,0	.	-	.	.	1,8	.	.	.	.	.	.	.	.	.	31,0	.	.	.	.	.	.	.
12 Final energy consumption	758,4	14,6	10,8	9,9	.	.	8,4	66,9	16,2	4,6	25,3	70,6	38,4	19,3	5,1	11,2	13,5	41,8	0,2	0,5	4,5	0,9	386,4	9,5
12.1 Manufacturing, constr. and non-fuel mining	282,9	14,6	10,7	8,2	.	.	7,5	.	.	0,1	12,9	.	.	7,1	1,1	8,0	13,5	14,5	.	-	4,0	0,9	178,8	1,1
12.1.1 Iron and steel	31,5	7,9	8,5	0,1	.	.	-	.	.	.	-	.	.	0,3	-	.	.	.	.	.	.	.	14,6	-
12.1.2 Chemical and petrochemical	55,0	3,2	1,6	4,2	.	.	2,6	.	.	.	0,1	.	.	0,6	0,3	2,0	13,4	0,2	.	.	0,4	0,3	25,7	0,3
12.1.3 Non-ferrous metals	88,4	.	.	1,9	.	.	1,0	.	.	.	0,2	.	.	0,3	.	.	-	.	.	.	.	.	85,0	-
12.1.4 Non-metalic minerals	14,7	3,5	0,6	0,1	.	.	2,2	.	.	-	0,7	.	.	0,8	-	.	0,1	0,2	.	.	2,5	0,6	3,3	-
12.1.5 Transport equipment	3,9	.	.	0,1	.	.	0,1	.	.	-	0,1	.	.	0,3	-	.	.	.	.	.	-	.	3,1	0,1
12.1.6 Machinery	6,3	.	-	0,1	.	.	0,2	.	.	-	0,2	.	.	0,7	-	.	.	-	.	.	-	.	5,1	0,1
12.1.7 Mining and quarrying	4,1	.	.	0,2	.	.	0,1	.	.	-	2,0	.	.	0,1	-	.	.	-	.	.	0,1	.	1,6	-
12.1.8 Food and tobacco	15,9	.	.	1,0	.	.	0,6	.	.	-	0,2	.	.	2,3	0,8	0,4	.	.	.	.	-	.	10,1	0,4
12.1.9 Paper, pulp and print	39,6	.	.	0,4	.	.	0,4	.	.	-	0,1	.	.	0,1	.	5,1	.	10,9	.	-	0,9	.	21,7	-
12.1.10 Wood and wood products	6,4	.	.	.	.	.	-	.	.	.	0,3	.	.	0,2	.	0,4	.	2,8	.	.	-	.	2,6	0,1
12.1.11 Textile and leather	0,9	.	.	-	.	.	0,1	.	.	-	-	.	.	0,1	.	0,1	.	.	.	.	.	.	0,6	.
12.1.12 Construction	12,5	.	.	-	.	.	0,1	.	.	-	9,0	.	.	0,8	.	.	.	.	.	.	.	.	2,6	.
12.1.13 Other industries	3,9	.	.	-	.	.	0,1	.	.	-	-	.	.	0,5	-	.	.	0,4	.	.	0,1	.	2,8	-
12.2 Transport	190,8	.	.	0,4	.	.	0,1	66,9	13,7	.	1,9	70,4	29,7	.	2,5	2,8	.	.	0,2	.	.	.	2,0	.
12.2.1 Road	135,5	.	.	0,1	.	.	0,1	64,6	.	.	.	70,4	.	.	.	.	.	.	0,2	.	.	.	-	.
12.2.2 Rail	2,6	.	.	.	.	.	-	.	.	.	0,6	.	.	.	.	.	.	.	.	.	.	.	2,0	.
12.2.3 Domestic aviation	13,8	.	.	.	.	.	.	0,1	13,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	38,8	.	.	0,3	.	.	-	2,2	-	.	1,3	-	29,7	.	2,5	2,8	.	.	-	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	284,8	-	-	1,4	.	.	0,7	-	2,5	4,5	10,4	0,2	8,7	12,2	1,5	0,4	.	27,4	-	0,5	0,5	.	205,5	8,4
12.3.1 Agriculture and forestry	13,0	.	.	0,7	.	.	0,3	-	.	0,1	4,5	0,1	-	0,4	-	.	.	.	-	.	0,1	.	6,8	-
12.3.2 Fishing	11,0	.	.	.	.	.	-	-	.	-	0,2	-	8,5	0,1	1,4	0,3	.	.	-	.	.	.	0,5	.
12.3.3 Commerce and public services	100,2	-	.	0,6	.	.	0,5	-	2,5	0,8	5,7	-	0,2	4,9	0,1	0,1	.	0,3	-	0,5	0,4	.	77,0	6,5
12.3.4 Households	160,6	-	-	0,1	.	.	-	.	.	3,6	.	.	.	6,8	-	.	.	27,0	.	.	.	.	121,1	1,8
13 Statistical difference (6+7-8-9-10)	158,1	0,6	0,7	-11,7	166,5	-40,1	30,6	-6,9	3,3	-0,8	3,7	9,9	9,7	2,8	1,4	-18,7	6,2	0,6	-	-	0,3	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	18,1	.	.	18,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2007	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	9 047,1	114,5	.	3 288,7	4 695,2	95,3	308,3	.	.	.	.	.	.	.	.	.	.	44,7	.	1,4	7,1	3,7	488,3	.
2 Imports	293,2	17,1	12,6	5,7	61,2	.	9,8	11,7	8,3	0,1	4,7	12,7	11,0	2,9	4,2	67,6	41,0	2,2	1,3	.	.	.	19,0	.
3 Exports	8 141,5	94,7	.	3 065,5	4 216,4	33,5	246,5	132,8	3,9	5,6	13,4	36,0	31,0	8,2	32,3	88,6	78,0	0,1	.	.	.	.	55,2	.
4 International bunkers	47,6	.	.	.	.	.	.	.	15,5	.	.	.	17,6	.	0,4	14,1	.	.	.	.	.	.	.	.
4.1 International marine bunkers	32,1	.	.	.	.	.	.	.	.	.	.	.	17,6	.	0,4	14,1	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	15,5	.	.	.	.	.	.	.	15,5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	20,2	-15,6	-0,1	-2,1	41,8	-0,5	0,4	-1,3	-0,7	-0,2	-0,1	-0,2	-0,1	-	0,1	-0,9	-0,2	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 171,5	21,3	12,5	226,9	581,9	61,3	72,1	-122,4	-11,8	-5,7	-8,7	-23,4	-37,7	-5,3	-28,4	-36,1	-37,2	46,8	1,3	1,4	7,1	3,7	452,1	.
7 Transformation processes	-0,2	-0,7	-0,6	-5,3	-560,2	-93,8	10,6	173,2	26,6	7,9	37,7	102,3	88,0	22,4	43,7	30,0	111,9	-3,8	.	-0,1	-2,8	-3,0	2,9	12,9
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	1,8	.	.	.	-560,2	-93,8	23,0	173,0	26,6	7,9	38,1	102,3	88,0	23,2	43,7	30,0	99,9	.	.	.	.	.	.	.
7.3 In thermal power plants	-2,1	.	-0,5	-4,8	.	.	.	.	.	.	-0,2	.	.	.	.	.	.	-1,6	.	-0,1	.	.	5,0	.
7.4 In combined heat and power plants	-0,6	-0,7	.	-	.	.	.	.	.	.	-0,2	.	.	-	.	.	.	.	.	.	-1,5	-1,7	0,5	3,1
7.5 In district heating plants	0,9	.	.	-0,5	.	.	-0,1	.	.	.	.	.	.	-0,8	.	.	.	-2,2	.	-	-1,3	-1,3	-2,6	9,8
7.6 Other transformation processes	-	.	-	.	.	.	-12,2	0,2	.	.	.	.	.	.	.	.	12,0	.	.	.	.	.	.	.
8 Energy industries own use	242,5	.	.	179,5	.	.	-	.	.	0,1	0,3	.	11,7	0,3	.	.	30,2	.	.	.	.	.	20,4	-
8.1 Crude petroleum and natural gass production	202,1	.	.	179,5	.	.	-	.	.	0,1	0,1	.	11,7	0,2	.	.	.	.	.	.	.	.	10,5	.
8.2 Coal mines	0,3	.	.	.	.	.	.	.	.	.	0,2	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.3 Oil refineries	32,3	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.	.	30,2	.	.	.	.	.	2,1	.
8.4 Pumping storage power plants	5,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5,6	.
8.5 Hydropower plants	1,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1,9	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
8.9 District heating plants	0,1	.	.	.	.	.	-	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	-
9 Distribution losses	42,6	.	0,4	0,9	.	.	.	.	.	.	.	.	.	.	.	.	2,0	.	.	0,5	.	.	36,3	2,5
10 Final consumption (11+12)	874,1	18,2	11,6	29,0	.	.	56,7	63,5	15,7	3,5	28,5	76,9	38,0	16,7	4,6	8,8	44,9	42,5	1,3	0,8	4,0	0,7	398,0	10,4
11 Non energy consumption	102,1	2,4	.	18,2	.	.	47,8	.	.	.	.	.	.	.	.	.	33,6	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	65,4	.	.	18,2	.	.	46,0	.	.	.	.	.	.	.	.	.	1,1	.	.	.	.	.	.	.
11.2 In other production	36,7	2,4	.	-	.	.	1,8	.	.	.	.	.	.	.	.	.	32,5	.	.	.	.	.	.	.
12 Final energy consumption	772,0	15,8	11,6	10,7	.	.	8,9	63,5	15,7	3,5	28,5	76,9	38,0	16,7	4,6	8,8	11,2	42,5	1,3	0,8	4,0	0,7	398,0	10,4
12.1 Manufacturing, constr. and non-fuel mining	281,4	15,8	11,6	7,5	.	.	7,5	.	.	-	14,6	.	.	7,0	0,7	5,8	11,2	15,5	.	-	3,5	0,7	178,8	1,1
12.1.1 Iron and steel	32,5	7,0	7,7	0,1	.	.	-	.	.	-	-	.	.	0,3	-	.	.	.	.	.	.	.	17,3	-
12.1.2 Chemical and petrochemical	54,7	5,3	3,2	3,0	.	.	2,5	.	.	.	0,1	.	.	0,8	0,1	1,6	10,9	0,5	.	.	0,1	0,1	26,0	0,4
12.1.3 Non-ferrous metals	85,8	.	.	2,1	.	.	1,0	.	.	.	0,3	.	.	0,2	.	.	.	.	.	.	.	.	82,1	0,1
12.1.4 Non-metalic minerals	15,2	3,5	0,7	0,4	.	.	2,2	.	.	.	0,7	.	.	0,7	.	.	0,3	0,2	.	.	2,6	0,6	3,4	-
12.1.5 Transport equipment	3,4	.	.	0,1	.	.	0,2	.	.	.	0,2	.	.	0,3	.	.	.	-	.	.	.	.	2,4	0,1
12.1.6 Machinery	6,0	.	.	0,2	.	.	0,1	.	.	.	0,2	.	.	0,6	.	.	.	-	.	.	.	.	4,7	0,1
12.1.7 Mining and quarrying	4,2	.	.	0,2	.	.	-	.	.	-	2,1	.	.	0,1	.	.	.	-	.	.	.	.	1,7	-
12.1.8 Food and tobacco	15,5	.	.	1,2	.	.	0,8	.	.	-	0,2	.	.	2,2	0,6	0,3	.	.	.	.	.	.	10,1	0,1
12.1.9 Paper, pulp and print	38,1	.	.	0,2	.	.	0,2	.	.	-	-	.	.	0,2	.	3,7	.	11,3	.	-	0,7	.	21,8	-
12.1.10 Wood and wood products	7,0	.	.	.	.	.	-	.	.	.	0,3	.	.	0,1	.	0,1	.	3,4	.	.	.	.	2,9	0,2
12.1.11 Textile and leather	0,8	.	.	-	.	.	-	.	.	.	-	.	.	0,1	.	-	.	.	.	.	.	.	0,6	-
12.1.12 Construction	14,3	.	.	-	.	.	0,2	.	.	-	10,5	.	.	0,8	.	.	.	.	.	.	.	.	2,7	.
12.1.13 Other industries	3,9	.	.	-	.	.	0,1	.	.	-	-	.	.	0,5	.	-	.	0,1	.	.	0,1	.	3,1	-
12.2 Transport	195,9	.	.	1,7	.	.	0,2	63,4	13,9	.	2,0	76,7	29,6	.	2,2	2,8	.	.	1,3	.	.	.	2,0	.
12.2.1 Road	139,5	.	.	0,1	.	.	0,2	61,2	.	.	.	76,7	.	.	.	.	.	.	1,3	.	.	.	-	.
12.2.2 Rail	2,6	.	.	.	.	.	-	.	.	.	0,7	.	.	.	.	.	.	.	.	.	.	.	1,9	.
12.2.3 Domestic aviation	14,0	.	.	.	.	.	.	0,1	13,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	39,8	.	.	1,6	.	.	-	2,2	-	.	1,3	-	29,6	.	2,2	2,8	.	.	-	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	294,8	-	-	1,5	.	.	1,2	-	1,8	3,5	11,9	0,2	8,3	9,7	1,7	0,3	.	26,9	-	0,8	0,5	.	217,3	9,3
12.3.1 Agriculture and forestry	13,2	.	.	0,6	.	.	0,4	-	.	-	4,5	0,1	-	0,3	-	.	.	.	-	.	0,1	.	7,0	-
12.3.2 Fishing	10,9	.	.	.	.	.	-	-	.	-	0,3	-	8,3	0,1	1,5	0,2	.	.	-	.	.	.	0,5	.
12.3.3 Commerce and public services	108,0	-	.	0,7	.	.	0,8	-	1,8	0,5	7,1	-	-	3,8	0,1	0,1	.	0,6	-	0,8	0,4	.	84,0	7,2
12.3.4 Households	162,7	-	-	0,1	.	.	-	.	.	2,9	.	.	.	5,4	-	.	.	26,4	.	.	.	.	125,8	2,0
13 Statistical difference (6+7-8-9-10)	11,8	2,3	-0,2	12,1	21,8	-32,5	26,1	-12,6	-0,9	-1,4	0,2	2,0	0,6	0,1	10,7	-15,0	-2,3	0,5	-	-	0,2	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	39,7	.	.	39,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2008	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	9 265,0	96,4	.	3 676,1	4 515,4	92,3	319,5	.	.	.	.	.	.	.	.	.	.	44,8	.	1,6	7,7	4,0	507,2	.
2 Imports	260,9	18,1	13,0	-	35,1	.	5,1	15,4	10,8	0,1	5,8	17,2	13,2	3,2	1,3	60,3	44,2	2,4	3,4	.	.	.	12,3	.
3 Exports	8 175,7	94,1	.	3 438,0	3 886,0	33,5	263,3	95,9	5,0	7,1	11,4	33,9	25,9	6,3	27,7	110,9	74,6	0,1	.	.	.	.	62,2	.
4 International bunkers	44,5	.	.	.	.	.	.	.	15,3	.	.	.	15,4	.	0,3	13,5	.	.	.	.	.	.	.	.
4.1 International marine bunkers	29,2	.	.	.	.	.	.	.	.	.	.	.	15,4	.	0,3	13,5	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	15,3	.	.	.	.	.	.	.	15,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-49,3	2,8	-0,2	-5,5	-48,0	0,4	2,9	-0,4	-0,9	-0,3	0,2	0,5	0,4	0,1	-0,4	-1,1	0,3	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 256,2	23,2	12,8	232,6	616,4	59,2	64,2	-80,9	-10,4	-7,2	-5,5	-16,2	-27,8	-3,0	-27,0	-65,2	-30,0	47,2	3,4	1,6	7,7	4,0	457,3	.
7 Transformation processes	0,7	-0,6	-0,6	-3,2	-512,2	-89,6	8,4	133,1	30,3	9,2	33,1	99,1	75,9	17,7	36,7	48,4	110,0	-4,3	.	-0,2	-3,0	-3,2	2,0	13,7
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	1,3	.	.	.	-512,2	-89,6	22,9	131,0	30,3	9,2	33,4	99,1	75,9	18,3	36,7	48,4	97,8	.	.	.	.	.	.	.
7.3 In thermal power plants	-1,1	.	-0,5	-2,5	.	.	.	.	.	.	-0,1	.	.	.	.	.	.	-1,6	.	-0,1	.	.	3,7	.
7.4 In combined heat and power plants	-0,2	-0,6	.	.	.	.	.	.	.	.	-0,3	.	.	-0,1	.	.	.	.	.	.	-1,7	-1,8	0,6	3,6
7.5 In district heating plants	0,9	.	.	-0,7	.	.	-0,2	.	.	.	.	.	.	-0,5	.	.	.	-2,7	.	-	-1,3	-1,4	-2,4	10,1
7.6 Other transformation processes	-	.	-	.	.	.	-14,3	2,1	.	.	.	.	.	.	.	.	12,2	.	.	.	.	.	.	.
8 Energy industries own use	255,4	.	.	195,1	.	.	-	.	.	-	0,3	.	12,1	0,2	.	.	26,6	.	.	.	.	.	21,1	-
8.1 Crude petroleum and natural gass production	219,1	.	.	195,1	.	.	-	.	.	-	0,1	.	12,1	0,1	.	.	.	.	.	.	.	.	11,7	.
8.2 Coal mines	0,3	.	.	.	.	.	.	.	.	.	0,2	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.3 Oil refineries	28,6	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.	.	26,6	.	.	.	.	.	1,9	.
8.4 Pumping storage power plants	4,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4,8	.
8.5 Hydropower plants	2,2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,2	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	.
8.9 District heating plants	0,3	.	.	.	.	.	-	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,3	-
9 Distribution losses	40,9	.	0,3	0,5	.	.	.	.	.	.	.	.	.	.	.	.	2,2	.	.	0,6	.	.	34,8	2,6
10 Final consumption (11+12)	879,8	19,0	11,7	35,7	.	.	49,3	59,5	15,9	2,6	27,2	78,7	35,5	14,4	4,7	8,4	51,6	42,1	3,4	0,9	4,5	0,8	403,0	11,0
11 Non energy consumption	105,9	2,5	.	23,2	.	.	40,0	.	.	.	.	.	.	.	.	.	40,2	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	62,8	.	.	23,2	.	.	38,3	.	.	.	.	.	.	.	.	.	1,3	.	.	.	.	.	.	.
11.2 In other production	43,1	2,5	.	-	.	.	1,8	.	.	.	.	.	.	.	.	.	38,9	.	.	.	.	.	.	.
12 Final energy consumption	773,9	16,6	11,7	12,4	.	.	9,3	59,5	15,9	2,6	27,2	78,7	35,5	14,4	4,7	8,4	11,4	42,1	3,4	0,9	4,5	0,8	403,0	11,0
12.1 Manufacturing, constr. and non-fuel mining	286,3	16,5	11,6	8,8	.	.	7,9	.	.	0,1	14,3	.	.	5,9	1,2	4,9	11,4	15,4	.	0,2	3,9	0,8	182,4	1,1
12.1.1 Iron and steel	33,8	7,5	7,7	0,1	.	.	0,1	.	.	.	-	.	.	0,4	-	.	.	.	.	.	.	.	18,0	-
12.1.2 Chemical and petrochemical	57,7	5,8	3,3	3,5	.	.	2,6	.	.	-	0,1	.	.	0,6	0,1	1,2	11,0	0,3	.	.	0,1	0,1	28,3	0,5
12.1.3 Non-ferrous metals	86,1	.	.	2,0	.	.	1,0	.	.	.	0,2	.	.	0,3	.	.	.	.	.	.	.	.	82,6	0,1
12.1.4 Non-metalic minerals	16,5	3,2	0,6	1,2	.	.	2,6	.	.	-	0,8	.	.	0,4	.	.	0,4	0,1	.	.	3,0	0,7	3,5	-
12.1.5 Transport equipment	3,3	.	.	-	.	.	0,1	.	.	-	0,2	.	.	0,3	.	.	.	.	.	.	.	.	2,6	0,1
12.1.6 Machinery	5,7	.	.	0,1	.	.	0,1	.	.	-	0,1	.	.	0,5	.	.	.	-	.	.	-	.	4,7	0,1
12.1.7 Mining and quarrying	4,4	.	.	0,2	.	.	-	.	.	-	2,1	.	.	0,2	.	.	.	-	.	.	0,1	.	1,8	-
12.1.8 Food and tobacco	16,1	.	.	1,4	.	.	0,7	.	.	-	0,3	.	.	1,8	1,1	0,2	.	.	.	.	.	.	10,4	0,2
12.1.9 Paper, pulp and print	37,3	.	.	0,2	.	.	0,3	.	.	.	-	.	.	0,1	.	3,3	.	12,0	.	0,2	0,8	.	20,5	.
12.1.10 Wood and wood products	6,1	.	.	.	.	.	-	.	.	-	0,3	.	.	0,1	-	0,2	.	2,8	.	.	.	.	2,7	0,2
12.1.11 Textile and leather	0,6	.	.	-	.	.	0,1	.	.	-	-	.	.	0,1	.	.	.	.	.	.	.	.	0,5	.
12.1.12 Construction	14,9	.	.	-	.	.	0,2	.	.	-	10,2	.	.	0,7	.	-	.	.	.	.	.	.	3,7	.
12.1.13 Other industries	3,7	.	.	0,1	.	.	0,1	.	.	-	-	.	.	0,3	-	-	.	0,1	.	.	.	.	3,1	-
12.2 Transport	195,0	.	.	2,0	.	.	0,2	59,4	15,0	.	2,1	78,6	27,0	.	1,9	3,2	.	.	3,4	.	.	.	2,1	.
12.2.1 Road	139,5	.	.	0,1	.	.	0,2	57,2	.	.	.	78,6	.	.	.	.	.	.	3,4	.	.	.	-	.
12.2.2 Rail	2,8	.	.	.	.	.	-	.	.	.	0,7	.	.	.	.	.	.	.	.	.	.	.	2,1	.
12.2.3 Domestic aviation	15,1	.	.	.	.	.	.	0,1	15,0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	37,6	.	.	1,9	.	.	-	2,1	-	.	1,4	-	27,0	.	1,9	3,2	.	.	-	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	292,6	-	-	1,6	.	.	1,2	-	0,9	2,5	10,8	0,1	8,5	8,5	1,6	0,4	.	26,7	-	0,8	0,5	.	218,5	9,9
12.3.1 Agriculture and forestry	13,1	.	.	0,6	.	.	0,4	-	.	-	4,5	0,1	-	0,2	-	.	.	.	-	.	-	.	7,0	-
12.3.2 Fishing	10,7	.	.	-	.	.	-	-	.	-	0,2	-	8,1	0,1	1,4	0,2	.	.	-	.	.	.	0,6	.
12.3.3 Commerce and public services	107,4	-	.	0,8	.	.	0,8	-	0,9	0,4	6,1	-	0,4	3,5	0,1	0,2	.	0,4	-	0,8	0,5	.	85,2	7,3
12.3.4 Households	161,4	-	-	0,1	.	.	-	.	.	2,1	.	.	.	4,7	.	.	.	26,3	.	.	.	.	125,6	2,6
13 Statistical difference (6+7-8-9-10)	80,4	3,6	0,3	-1,8	104,2	-30,4	23,3	-7,3	4,0	-0,7	0,2	4,2	0,5	0,1	5,1	-25,3	-0,4	0,9	-	-0,2	0,3	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	36,7	.	.	36,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2009	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	9 081,0	74,2	.	3 822,2	4 259,2	103,2	309,2	.	.	.	.	.	.	.	.	.	.	42,7	.	1,5	7,4	4,0	457,4	.
2 Imports	299,1	11,8	7,9	-	51,8	.	5,2	12,8	7,8	0,8	9,2	29,9	23,2	5,9	5,4	59,3	41,7	1,9	4,0	.	.	.	20,3	.
3 Exports	8 198,9	67,3	.	3 597,6	3 783,7	32,5	273,6	123,1	2,2	3,8	8,8	28,8	22,3	5,7	32,3	84,5	79,8	0,2	.	.	.	.	52,7	.
4 International bunkers	43,0	.	.	.	.	.	.	.	14,8	.	.	.	16,2	.	0,3	11,7	.	.	.	.	.	.	.	.
4.1 International marine bunkers	28,2	.	.	.	.	.	.	.	.	.	.	.	16,2	.	0,3	11,7	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	14,8	.	.	.	.	.	.	.	14,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	28,1	-3,6	0,4	2,1	32,0	-0,3	-1,2	0,1	-0,9	-0,2	-0,1	-0,2	-0,2	-	1,3	-1,3	0,3	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 166,2	15,0	8,4	226,6	559,4	70,5	39,6	-110,2	-10,1	-3,2	0,3	0,9	-15,5	0,2	-25,9	-38,2	-37,8	44,4	4,0	1,5	7,4	4,0	425,1	.
7 Transformation processes	-5,1	-0,7	-0,4	-23,7	-505,6	-104,1	21,3	158,3	26,3	5,5	30,5	100,5	78,0	18,7	36,0	26,9	108,4	-4,0	.	-0,2	-2,9	-3,2	13,9	15,7
7.1 In blast furnaces	-0,1	.	-0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	2,5	.	.	.	-505,6	-104,1	34,3	156,5	26,3	5,5	30,9	100,5	78,0	19,8	36,0	26,9	97,5	.	.	.	.	.	.	.
7.3 In thermal power plants	-12,2	.	-0,3	-23,1	.	.	.	.	.	.	-0,1	.	.	.	.	.	.	-0,9	.	-0,2	.	.	12,5	.
7.4 In combined heat and power plants	3,9	-0,7	.	-	.	.	.	.	.	.	-0,3	.	.	-0,1	.	.	.	.	.	.	-1,8	-1,9	4,5	4,3
7.5 In district heating plants	0,8	.	.	-0,6	.	.	-0,3	.	.	.	.	.	.	-1,0	.	.	.	-3,2	.	-	-1,2	-1,3	-3,1	11,4
7.6 Other transformation processes	-	.	-	.	.	.	-12,7	1,8	.	.	.	.	.	.	.	.	10,9	.	.	.	.	.	.	.
8 Energy industries own use	250,7	.	.	182,4	.	.	0,1	.	.	-	0,3	.	13,5	0,1	.	.	28,8	.	.	.	.	.	25,5	-
8.1 Crude petroleum and natural gass production	212,8	.	.	182,4	.	.	-	.	.	-	0,1	.	13,5	-	.	.	.	.	.	.	.	.	16,8	.
8.2 Coal mines	0,3	.	.	.	.	.	.	.	.	.	0,2	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.3 Oil refineries	31,1	.	.	.	.	.	0,1	.	.	.	.	.	.	-	.	.	28,8	.	.	.	.	.	2,1	.
8.4 Pumping storage power plants	4,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4,1	.
8.5 Hydropower plants	2,2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,2	.
8.6 Wind power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.7 Thermal power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.8 Combined heat and power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	-	.
8.9 District heating plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	0,1	-
9 Distribution losses	37,7	.	0,2	0,7	.	.	.	.	.	.	.	.	.	.	.	.	1,9	.	.	0,6	.	.	31,1	3,2
10 Final consumption (11+12)	836,7	14,1	7,8	31,6	.	.	47,4	55,9	16,1	2,4	25,2	80,0	36,8	15,5	5,7	6,5	47,8	39,7	4,0	0,8	4,3	0,8	382,1	12,4
11 Non energy consumption	96,6	1,5	.	18,6	.	.	38,7	.	.	.	.	.	.	.	.	.	37,7	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	56,4	.	.	18,6	.	.	37,0	.	.	.	.	.	.	.	.	.	0,9	.	.	.	.	.	.	.
11.2 In other production	40,1	1,5	.	-	.	.	1,8	.	.	.	.	.	.	.	.	.	36,8	.	.	.	.	.	.	.
12 Final energy consumption	740,2	12,6	7,8	13,1	.	.	8,7	55,9	16,1	2,4	25,2	80,0	36,8	15,5	5,7	6,5	10,1	39,7	4,0	0,8	4,3	0,8	382,1	12,4
12.1 Manufacturing, constr. and non-fuel mining	237,4	12,6	7,8	9,3	.	.	7,2	.	.	0,1	12,7	.	.	5,1	1,3	4,3	10,1	12,4	.	0,1	3,8	0,8	148,6	1,3
12.1.1 Iron and steel	24,0	5,5	5,3	0,1	.	.	-	.	.	-	-	.	.	0,4	-	.	.	-	.	.	.	.	12,6	-
12.1.2 Chemical and petrochemical	50,2	3,8	2,0	4,6	.	.	3,1	.	.	-	0,4	.	.	0,5	0,1	1,2	9,9	0,4	.	.	0,2	0,1	23,5	0,5
12.1.3 Non-ferrous metals	71,9	.	.	1,9	.	.	0,9	.	.	-	0,2	.	.	0,1	.	.	0,1	.	.	.	.	.	68,7	-
12.1.4 Non-metalic minerals	13,7	3,3	0,5	0,7	.	.	1,7	.	.	-	0,2	.	.	0,6	-	-	0,2	0,2	.	.	2,8	0,6	2,6	-
12.1.5 Transport equipment	2,3	.	.	-	.	.	0,1	.	.	-	0,1	.	.	0,2	.	.	.	-	.	.	.	.	1,8	0,1
12.1.6 Machinery	4,3	.	.	0,1	.	.	0,1	.	.	-	0,1	.	.	0,4	-	.	.	-	.	.	.	.	3,5	0,1
12.1.7 Mining and quarrying	3,7	.	.	0,2	.	.	-	.	.	-	1,7	.	.	0,2	.	-	.	-	.	.	-	.	1,6	-
12.1.8 Food and tobacco	14,1	.	.	1,5	.	.	0,7	.	.	-	0,2	.	.	1,5	0,9	.	.	.	.	.	.	.	9,0	0,3
12.1.9 Paper, pulp and print	30,6	.	.	0,1	.	.	0,2	.	.	-	0,1	.	.	0,1	0,3	2,9	.	9,1	.	0,1	0,8	.	17,1	-
12.1.10 Wood and wood products	5,0	.	.	.	.	.	-	.	.	.	0,2	.	.	0,1	.	0,1	.	2,4	.	.	.	.	2,0	0,1
12.1.11 Textile and leather	0,4	.	.	-	.	.	-	.	.	-	-	.	.	0,1	.	.	.	.	.	.	.	.	0,3	-
12.1.12 Construction	14,3	.	.	-	.	.	0,2	.	.	-	9,5	.	.	0,7	.	-	.	.	.	.	.	.	3,9	.
12.1.13 Other industries	2,9	.	.	0,1	.	.	0,1	.	.	-	-	.	.	0,3	-	.	.	0,3	.	.	.	.	2,0	-
12.2 Transport	192,5	.	.	2,1	.	.	0,2	55,9	14,8	.	2,0	79,9	27,2	.	2,4	1,9	.	.	4,0	.	.	.	2,1	.
12.2.1 Road	137,9	.	.	0,1	.	.	0,2	53,7	.	.	.	79,9	.	.	.	.	.	.	4,0	.	.	.	-	.
12.2.2 Rail	2,7	.	.	.	.	.	-	-	.	.	0,6	.	.	.	.	.	.	.	-	.	.	.	2,1	.
12.2.3 Domestic aviation	14,9	.	.	.	.	.	.	0,1	14,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	37,0	.	.	2,0	.	.	-	2,1	-	.	1,4	-	27,2	.	2,4	1,9	.	.	-	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	310,3	-	.	1,6	.	.	1,3	-	1,2	2,3	10,4	0,1	9,6	10,4	2,0	0,3	.	27,3	-	0,7	0,5	.	231,4	11,2
12.3.1 Agriculture and forestry	13,0	.	.	0,7	.	.	0,4	-	.	-	4,5	0,1	-	0,2	.	.	.	.	-	.	.	.	7,0	-
12.3.2 Fishing	11,8	.	.	.	.	.	-	-	.	-	0,2	-	8,7	0,1	1,8	0,2	.	.	-	.	.	.	0,7	.
12.3.3 Commerce and public services	118,4	-	.	0,8	.	.	0,8	-	1,2	0,4	5,7	.	0,9	5,3	0,2	0,1	.	0,5	-	0,7	0,5	.	93,0	8,4
12.3.4 Households	167,1	.	.	0,1	.	.	-	.	.	1,9	.	.	.	4,7	-	.	.	26,8	.	.	.	.	130,7	2,7
13 Statistical difference (6+7-8-9-10)	35,6	0,2	-	-11,8	53,8	-33,6	13,4	-7,9	0,1	-0,1	5,3	21,4	12,1	3,3	4,4	-17,8	-8,0	0,6	-	-0,1	0,2	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	20,3	.	.	20,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2010	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 792,2	54,4	-	3 968,7	3 900,6	98,5	280,1	.	.	.	.	.	.	.	.	.	.	50,1	-	2,4	6,6	6,0	424,9	.
2 Imports	370,6	19,2	12,4	0,2	64,4	-	15,2	12,6	14,2	3,3	6,8	20,6	14,8	4,5	4,5	71,9	42,4	2,8	8,1	-	-	-	52,8	-
3 Exports	7 845,6	47,5	0,1	3 704,5	3 436,2	30,3	273,1	90,3	1,7	5,9	8,5	25,9	18,6	5,7	31,4	73,0	66,9	0,4	-	-	-	-	25,6	-
4 International bunkers	39,8	-	-	-	-	-	-	-	17,6	-	-	-	12,3	-	0,4	9,5	-	-	-	-	-	-	-	-
4.1 International marine bunkers	22,2	-	-	-	-	-	-	-	-	-	-	-	12,3	-	0,4	9,5	-	-	-	-	-	-	-	-
4.2 International aviation bunkers	17,6	-	-	-	-	-	-	-	17,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Stock changes	8,4	-6,2	-0,1	2,9	0,1	0,2	-1,3	5,8	1,2	0,3	0,6	1,7	1,2	0,4	-1,0	0,8	2,1	-	-	-	-	-	-	-
6 Total energy supply (1+2-3-4+5)	1 285,7	19,8	12,1	267,3	528,9	68,4	20,9	-71,9	-4,0	-2,3	-1,2	-3,6	-15,0	-0,8	-28,2	-9,8	-22,5	52,6	8,1	2,4	6,6	6,0	452,1	-
7 Transformation processes	-20,4	-0,8	-1,1	-29,4	-509,3	-65,4	24,2	146,9	21,9	5,3	32,1	98,3	70,7	18,7	36,4	6,4	104,4	-4,8	-2,2	-0,1	-3,9	-4,2	17,2	18,1
7.1 In blast furnaces	-0,7	-	-0,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.2 In oil refineries	-6,7	-	-	-	-509,3	-65,4	37,4	144,6	21,9	5,3	32,5	98,3	70,7	21,5	36,4	6,4	92,8	-	-	-	-	-	-	-
7.3 In thermal power plants	-7,6	-	-0,5	-17,3	-	-	-	-	-	-	-0,1	-	-	-	-	-	-	-1,3	-	-	-	-	11,6	-
7.4 In combined heat and power plants	-5,7	-0,7	-	-11,5	-	-	-	-	-	-	-0,2	-	-	-0,2	-	-	-0,4	-0,1	-	-	-2,6	-2,8	8,5	4,3
7.5 In district heating plants	-1,4	-	-	-0,6	-	-	-0,5	-	-	-	-	-	-	-2,6	-	-	-	-3,4	-2,2	-0,1	-1,3	-1,4	-3,0	13,8
7.6 Other transformation processes	1,6	-	-	-	-	-	-12,7	2,3	-	-	-	-	-	-	-	-	12,0	-	-	-	-	-	-	-
8 Energy industries own use	245,1	-	-	180,8	-	-	0,1	-	-	-	0,5	-	13,7	0,1	-	-	23,8	-	-	-	-	-	26,1	-
8.1 Crude petroleum and natural gass production	211,2	-	-	177,0	-	-	-	-	-	-	0,3	-	13,7	-	-	-	-	-	-	-	-	-	20,1	-
8.2 Coal mines	0,3	-	-	-	-	-	-	-	-	-	0,2	-	-	-	-	-	-	-	-	-	-	-	0,1	-
8.3 Oil refineries	25,8	-	-	-	-	-	0,1	-	-	-	-	-	-	-	-	-	23,8	-	-	-	-	-	1,8	-
8.4 Pumping storage power plants	2,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,1	-
8.5 Hydropower plants	1,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,7	-
8.6 Wind power plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.7 Thermal power plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.8 Combined heat and power plants	3,8	-	-	3,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.9 District heating plants	0,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9 Distribution losses	41,2	-	0,6	0,7	-	-	-	-	-	-	-	-	-	-	-	-	3,1	-	-	0,5	-	-	34,4	2,0
10 Final consumption (11+12)	894,6	18,4	9,3	32,8	-	-	48,4	52,7	16,2	2,8	29,0	86,2	39,7	16,9	6,5	5,2	46,8	47,9	5,8	0,8	2,7	1,7	408,9	16,1
11 Non energy consumption	93,1	2,1	-	19,4	-	-	36,3	-	-	-	-	-	-	-	-	-	35,2	-	-	-	-	-	-	-
11.1 In manufacture of industrial chemicals	57,0	-	-	19,4	-	-	36,3	-	-	-	-	-	-	-	-	-	1,3	-	-	-	-	-	-	-
11.2 In other production	36,0	2,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34,0	-	-	-	-	-	-	-
12 Final energy consumption	801,5	16,3	9,3	13,3	-	-	12,1	52,7	16,2	2,8	29,0	86,2	39,7	16,9	6,5	5,2	11,5	47,9	5,8	0,8	2,7	1,7	408,9	16,1
12.1 Manufacturing, constr. and non-fuel mining	264,5	16,3	9,3	9,2	-	-	8,0	-	-	-	13,8	-	-	5,5	1,3	4,4	11,5	17,1	0,9	0,1	2,6	1,7	160,3	2,5
12.1.1 Iron and steel	29,8	7,1	5,8	0,1	-	-	-	-	-	-	-	-	-	0,3	-	-	0,1	0,1	-	-	-	-	16,3	-
12.1.2 Chemical and petrochemical	58,6	5,9	3,0	3,6	-	-	2,7	-	-	-	1,0	-	-	0,7	0,2	0,9	10,9	0,9	-	-	0,2	0,1	28,1	0,5
12.1.3 Non-ferrous metals	72,1	-	-	3,1	-	-	1,2	-	-	-	0,3	-	-	0,2	-	-	0,1	-	-	-	-	-	67,2	-
12.1.4 Non-metalic minerals	14,0	3,3	0,6	0,1	-	-	2,0	-	-	-	0,4	-	-	0,7	-	-	0,4	0,5	-	-	2,0	0,8	3,1	-
12.1.5 Transport equipment	2,8	-	-	-	-	-	0,2	-	-	-	0,2	-	-	0,2	-	-	-	-	-	-	-	-	2,0	0,1
12.1.6 Machinery	5,3	-	-	0,2	-	-	0,1	-	-	-	0,1	-	-	0,6	-	-	-	-	-	-	-	-	4,2	0,2
12.1.7 Mining and quarrying	4,7	-	-	0,2	-	-	0,1	-	-	-	2,4	-	-	-	-	-	-	-	-	-	-	-	2,0	-
12.1.8 Food and tobacco	16,8	-	-	1,7	-	-	0,7	-	-	-	0,2	-	-	1,8	1,1	-	-	-	0,9	-	-	-	9,8	0,6
12.1.9 Paper, pulp and print	35,8	-	-	-	-	-	0,2	-	-	-	0,1	-	-	0,1	-	3,4	-	12,2	-	0,1	0,3	0,8	18,2	0,2
12.1.10 Wood and wood products	6,5	-	-	-	-	-	-	-	-	-	0,2	-	-	0,2	-	0,1	-	3,0	-	-	0,1	0,1	2,6	0,2
12.1.11 Textile and leather	0,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,3	-
12.1.12 Construction	14,5	-	-	-	-	-	0,7	-	-	-	8,9	-	-	0,2	-	-	-	-	-	-	-	-	4,1	0,5
12.1.13 Other industries	3,4	-	-	0,1	-	-	0,1	-	-	-	-	-	-	0,4	-	-	-	0,3	-	-	-	-	2,3	-
12.2 Transport	200,6	-	-	2,3	-	-	0,4	52,7	14,6	-	2,0	86,1	32,1	-	3,1	0,5	-	-	4,9	-	-	-	2,1	-
12.2.1 Road	142,0	-	-	0,2	-	-	0,4	50,5	-	-	-	86,1	-	-	-	-	-	-	4,9	-	-	-	-	-
12.2.2 Rail	2,6	-	-	-	-	-	-	-	-	-	0,5	-	-	-	-	-	-	-	-	-	-	-	2,0	-
12.2.3 Domestic aviation	14,7	-	-	-	-	-	-	0,1	14,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.2.4 Domestic navigation	41,4	-	-	2,1	-	-	-	2,1	-	-	1,5	-	32,1	-	3,1	0,5	-	-	-	-	-	-	-	-
12.2.5 Other transport	.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.3 Other	336,4	-	-	1,8	-	-	3,7	-	1,6	2,8	13,2	0,1	7,6	11,5	2,1	0,3	0,1	30,7	-	0,7	0,1	-	246,5	13,6
12.3.1 Agriculture and forestry	14,3	-	-	0,8	-	-	1,2	-	-	-	4,9	0,1	-	0,2	-	-	-	-	-	-	-	-	7,0	-
12.3.2 Fishing	9,9	-	-	-	-	-	-	-	-	-	0,3	-	7,0	-	1,5	0,2	-	-	-	-	-	-	0,8	-
12.3.3 Commerce and public services	126,9	-	-	0,9	-	-	2,2	-	1,6	0,4	8,0	-	0,6	5,7	0,6	0,1	0,1	0,6	-	0,7	0,1	-	95,6	9,7
12.3.4 Households	185,4	-	-	0,2	-	-	0,3	-	-	2,3	-	-	-	5,6	-	-	-	30,1	-	-	-	-	143,0	3,9
13 Statistical difference (6+7-8-9-10)	84,4	0,7	1,1	23,7	19,6	3,0	-3,4	22,3	1,7	0,2	1,5	8,6	2,4	0,9	1,8	-8,6	8,3	-0,1	-	0,9	-	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	19,7	-	-	19,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Energy balance (PJ) 2011	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 388,5	39,0	-	3 788,9	3 660,6	96,8	294,7	.	.	.	.	.	.	.	.	.	.	46,8	3,3	2,1	7,6	6,4	442,2	.
2 Imports	325,2	19,9	13,0	-	53,0	-	11,0	9,0	11,5	7,1	6,8	20,9	15,0	3,2	6,3	55,7	41,3	3,7	7,2	-	-	-	40,5	-
3 Exports	7 509,2	42,3	-	3 572,8	3 120,6	29,4	275,3	126,4	5,4	4,6	15,4	47,5	34,0	7,3	24,9	76,1	75,2	0,5	-	-	-	-	51,6	-
4 International bunkers	40,9	-	-	-	-	-	-	-	18,6	-	-	-	12,3	-	0,4	9,7	-	-	-	-	-	-	-	-
4.1 International marine bunkers	22,3	-	-	-	-	-	-	-	-	-	-	-	12,3	-	0,4	9,7	-	-	-	-	-	-	-	-
4.2 International aviation bunkers	18,6	-	-	-	-	-	-	-	18,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Stock changes	-25,1	5,2	0,5	-2,2	-19,7	0,2	0,4	-2,3	-3,0	-0,5	-0,9	-2,6	-1,9	-0,4	0,9	2,5	-1,4	-	-	-	-	-	-	-
6 Total energy supply (1+2-3-4+5)	1 138,3	21,8	13,6	214,0	573,3	67,6	30,8	-119,6	-15,6	2,0	-9,5	-29,2	-33,3	-4,5	-18,0	-27,6	-35,3	50,0	10,5	2,1	7,6	6,4	431,1	-
7 Transformation processes	-24,8	-2,3	-	-23,7	-568,6	-68,3	24,2	167,9	22,9	3,7	38,5	120,6	86,3	16,9	31,7	10,0	100,5	-4,9	-1,6	-0,1	-4,5	-4,9	14,8	16,1
7.1 In blast furnaces	-1,0	-1,6	0,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.2 In oil refineries	-10,2	-	-	-	-568,6	-68,3	37,0	165,8	22,9	3,7	39,1	120,6	86,3	18,5	31,7	10,0	91,2	-	-	-	-	-	-	-
7.3 In thermal power plants	-4,4	-	-0,5	-9,7	-	-	-	-	-	-	-0,1	-	-	-	-	-	-	-1,3	-	-	-	-	7,2	-
7.4 In combined heat and power plants	-9,2	-0,7	-	-13,3	-	-	-	-	-	-	-0,5	-	-	-0,1	-	-	-2,8	-	-	-	-2,9	-3,1	10,0	4,1
7.5 In district heating plants	-1,6	-	-	-0,7	-	-	-0,3	-	-	-	-	-	-	-1,4	-	-	-	-3,6	-1,6	-0,1	-1,6	-1,8	-2,4	12,0
7.6 Other transformation processes	1,7	-	-	-	-	-	-12,5	2,1	-	-	-	-	-	-	-	-	12,0	-	-	-	-	-	-	-
8 Energy industries own use	242,8	-	-	173,6	-	-	0,1	-	-	-	0,3	-	16,3	-	-	-	21,4	-	-	-	-	-	31,0	-
8.1 Crude petroleum and natural gass production	207,5	-	-	170,7	-	-	-	-	-	-	0,2	-	16,3	-	-	-	-	-	-	-	-	-	20,3	-
8.2 Coal mines	0,3	-	-	-	-	-	-	-	-	-	0,2	-	-	-	-	-	-	-	-	-	-	-	0,1	-
8.3 Oil refineries	23,5	-	-	-	-	-	0,1	-	-	-	-	-	-	-	-	-	21,4	-	-	-	-	-	2,0	-
8.4 Pumping storage power plants	6,5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,5	-
8.5 Hydropower plants	1,8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,8	-
8.6 Wind power plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.7 Thermal power plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.8 Combined heat and power plants	3,1	-	-	2,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,1	-
8.9 District heating plants	0,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,1	-
9 Distribution losses	32,0	-	0,6	0,6	-	-	-	-	-	-	-	-	-	-	-	-	2,2	-	-	0,4	-	-	26,3	1,9
10 Final consumption (11+12)	865,7	17,8	10,6	35,1	-	-	45,5	48,0	16,7	2,1	29,5	89,9	39,3	12,9	5,4	4,6	49,6	44,9	5,6	0,8	3,1	1,6	388,7	14,1
11 Non energy consumption	96,7	2,0	-	21,1	-	-	35,7	-	-	-	-	-	-	-	-	-	37,9	-	-	-	-	-	-	-
11.1 In manufacture of industrial chemicals	58,0	-	-	21,1	-	-	35,7	-	-	-	-	-	-	-	-	-	1,2	-	-	-	-	-	-	-
11.2 In other production	38,7	2,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36,7	-	-	-	-	-	-	-
12 Final energy consumption	769,0	15,7	10,6	14,0	-	-	9,8	48,0	16,7	2,1	29,5	89,9	39,3	12,9	5,4	4,6	11,7	44,9	5,6	0,8	3,1	1,6	388,7	14,1
12.1 Manufacturing, constr. and non-fuel mining	263,0	15,7	10,6	9,8	-	-	7,3	-	-	-	14,0	-	-	5,5	0,6	3,2	11,6	17,7	0,8	0,1	3,0	1,6	159,1	2,5
12.1.1 Iron and steel	32,1	6,2	7,2	-	-	-	0,1	-	-	-	-	-	-	0,2	-	-	0,1	0,1	-	-	-	-	18,1	-
12.1.2 Chemical and petrochemical	58,2	6,3	2,7	3,7	-	-	2,4	-	-	-	1,0	-	-	0,9	0,1	0,8	11,0	0,8	-	-	0,3	0,1	27,7	0,5
12.1.3 Non-ferrous metals	70,8	-	-	1,9	-	-	0,8	-	-	-	0,2	-	-	0,2	-	-	0,1	-	-	-	-	-	67,6	-
12.1.4 Non-metalic minerals	15,2	3,2	0,6	1,3	-	-	2,0	-	-	-	0,3	-	-	0,9	-	-	0,4	0,6	-	-	2,0	0,8	3,1	-
12.1.5 Transport equipment	2,4	-	-	-	-	-	0,2	-	-	-	0,1	-	-	0,1	-	-	-	-	-	-	-	-	1,8	0,1
12.1.6 Machinery	5,0	-	-	0,2	-	-	0,1	-	-	-	0,1	-	-	0,5	-	-	-	-	-	-	-	-	4,0	0,2
12.1.7 Mining and quarrying	5,3	-	-	0,2	-	-	0,1	-	-	-	2,6	-	-	0,2	-	-	-	-	-	-	-	-	2,2	-
12.1.8 Food and tobacco	16,0	-	-	1,8	-	-	0,8	-	-	-	0,2	-	-	1,7	0,5	-	-	0,1	0,8	-	-	-	9,5	0,6
12.1.9 Paper, pulp and print	33,4	-	-	0,1	-	-	0,1	-	-	-	0,1	-	-	0,1	-	2,3	-	12,6	-	0,1	0,7	0,6	16,3	0,2
12.1.10 Wood and wood products	6,9	-	-	0,3	-	-	-	-	-	-	0,3	-	-	0,2	-	-	-	3,4	-	-	0,1	0,1	2,3	0,3
12.1.11 Textile and leather	0,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,3	-
12.1.12 Construction	14,1	-	-	-	-	-	0,4	-	-	-	9,0	-	-	0,2	-	-	-	-	-	-	-	-	4,0	0,4
12.1.13 Other industries	3,1	-	-	0,2	-	-	0,1	-	-	-	0,1	-	-	0,5	-	-	-	0,1	-	-	-	-	2,2	-
12.2 Transport	201,1	-	-	2,7	-	-	0,3	48,0	15,3	-	2,0	89,8	32,1	-	3,0	1,1	-	-	4,8	-	-	-	2,0	-
12.2.1 Road	140,8	-	-	0,2	-	-	0,3	45,7	-	-	-	89,8	-	-	-	-	-	-	4,8	-	-	-	-	-
12.2.2 Rail	2,5	-	-	-	-	-	-	-	-	-	0,6	-	-	-	-	-	-	-	-	-	-	-	1,9	-
12.2.3 Domestic aviation	15,4	-	-	-	-	-	-	0,1	15,3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.2.4 Domestic navigation	42,4	-	-	2,5	-	-	-	2,2	-	-	1,5	-	32,1	-	3,0	1,1	-	-	-	-	-	-	-	-
12.2.5 Other transport	.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.3 Other	304,9	-	-	1,6	-	-	2,3	-	1,4	2,1	13,5	0,1	7,2	7,4	1,8	0,2	0,1	27,3	-	0,7	0,1	-	227,6	11,7
12.3.1 Agriculture and forestry	13,0	-	-	0,6	-	-	0,7	-	-	-	5,0	0,1	-	0,1	-	-	-	-	-	-	-	-	6,4	-
12.3.2 Fishing	8,9	-	-	-	-	-	-	-	-	-	0,3	-	6,4	-	1,3	0,2	-	-	-	-	-	-	0,7	-
12.3.3 Commerce and public services	118,4	-	-	0,8	-	-	1,4	-	1,4	0,3	8,2	-	0,8	3,8	0,5	0,1	0,1	0,7	-	0,7	0,1	-	90,7	8,8
12.3.4 Households	164,6	-	-	0,1	-	-	0,1	-	-	1,7	-	-	-	3,5	-	-	-	26,5	-	-	-	-	129,8	2,8
13 Statistical difference (6+7-8-9-10)	-26,9	1,8	2,5	-19,0	4,7	-0,7	9,4	0,3	-9,4	3,6	-0,8	1,5	-2,5	-0,5	8,2	-22,2	-8,0	0,1	3,3	0,8	-	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	19,3	-	-	19,3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Energy balance (PJ) 2012	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 647,5	34,5	-	4 248,9	3 354,6	112,6	309,8	.	.	.	.	.	.	.	.	.	.	46,9	2,6	2,0	8,6	7,2	519,7	.
2 Imports	310,4	20,3	13,4	0,1	58,7	-	10,9	8,1	14,9	6,0	8,7	27,4	19,2	3,2	4,6	48,8	40,2	2,5	8,1	-	-	-	15,1	-
3 Exports	7 708,5	35,8	-	4 017,3	2 868,8	28,5	282,8	118,9	4,2	10,8	12,4	38,9	27,2	4,5	25,9	67,2	82,0	0,8	3,3	-	-	-	79,2	-
4 International bunkers	41,8	-	-	-	-	-	-	-	20,6	-	-	-	12,7	-	0,2	8,3	-	-	-	-	-	-	-	-
4.1 International marine bunkers	21,2	-	-	-	-	-	-	-	-	-	-	-	12,7	-	0,2	8,3	-	-	-	-	-	-	-	-
4.2 International aviation bunkers	20,6	-	-	-	-	-	-	-	20,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Stock changes	-9,5	2,1	-0,2	1,4	-4,0	-0,6	-3,3	-1,2	0,3	0,1	-0,6	-1,8	-1,3	-0,2	0,3	0,7	-1,4	-	-	-	-	-	-	-
6 Total energy supply (1+2-3-4+5)	1 197,9	21,2	13,1	233,2	540,4	83,5	34,6	-111,9	-9,6	-4,6	-4,2	-13,2	-22,1	-1,5	-21,2	-26,0	-43,1	48,6	7,4	2,0	8,6	7,2	455,6	-
7 Transformation processes	-23,5	-2,2	-	-14,7	-556,8	-85,4	33,5	161,3	23,7	6,9	36,7	116,4	81,4	12,9	30,8	8,5	115,7	-6,2	-1,2	-0,1	-5,6	-6,0	9,0	17,8
7.1 In blast furnaces	-0,9	-1,6	0,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.2 In oil refineries	-10,9	-	-	-	-556,8	-85,4	44,8	159,5	23,7	6,9	37,1	116,4	81,4	13,5	30,8	8,5	108,6	-	-	-	-	-	-	-
7.3 In thermal power plants	-0,7	-	-0,7	-0,5	-	-	-	-	-	-	-0,2	-	-	-	-	-	-	-1,1	-	-	-	-	1,7	-
7.4 In combined heat and power plants	-10,4	-0,6	-	-13,6	-	-	-	-	-	-	-0,2	-	-	-0,1	-	-	-3,6	-0,5	-	-	-3,5	-3,8	10,5	5,0
7.5 In district heating plants	-2,0	-	-	-0,6	-	-	-0,3	-	-	-	-	-	-	-0,5	-	-	-	-4,6	-1,2	-0,1	-2,0	-2,2	-3,3	12,8
7.6 Other transformation processes	1,5	-	-	-	-	-	-11,0	1,8	-	-	-	-	-	-	-	-	10,7	-	-	-	-	-	-	-
8 Energy industries own use	248,6	-	-	176,6	-	-	0,6	-	-	-	0,2	-	17,0	-	-	-	20,7	0,2	-	-	-	-	33,3	-
8.1 Crude petroleum and natural gass production	214,5	-	-	174,0	-	-	-	-	-	-	0,1	-	17,0	-	-	-	-	-	-	-	-	-	23,4	-
8.2 Coal mines	0,3	-	-	-	-	-	-	-	-	-	0,1	-	-	-	-	-	-	-	-	-	-	-	0,1	-
8.3 Oil refineries	23,2	-	-	-	-	-	0,5	-	-	-	-	-	-	-	-	-	20,7	-	-	-	-	-	1,9	-
8.4 Pumping storage power plants	5,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,6	-
8.5 Hydropower plants	1,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,9	-
8.6 Wind power plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.7 Thermal power plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.8 Combined heat and power plants	2,7	-	-	2,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,1	-
8.9 District heating plants	0,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,2	-	-	-	-	0,2	-
9 Distribution losses	38,2	-	0,2	0,9	-	-	-	-	-	-	-	-	-	-	-	-	2,0	-	-	0,4	-	-	33,0	1,9
10 Final consumption (11+12)	871,0	18,7	10,8	35,2	-	-	42,7	44,8	17,2	1,5	30,7	93,1	40,0	10,8	5,5	2,8	49,7	42,2	6,2	0,9	3,0	1,2	398,2	15,9
11 Non energy consumption	93,3	2,2	-	18,2	-	-	34,0	-	-	-	-	-	-	-	-	-	38,9	-	-	-	-	-	-	-
11.1 In manufacture of industrial chemicals	53,0	-	-	18,2	-	-	34,0	-	-	-	-	-	-	-	-	-	0,7	-	-	-	-	-	-	-
11.2 In other production	40,3	2,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38,1	-	-	-	-	-	-	-
12 Final energy consumption	777,6	16,5	10,8	17,0	-	-	8,7	44,8	17,2	1,5	30,7	93,1	40,0	10,8	5,5	2,8	10,8	42,2	6,2	0,9	3,0	1,2	398,2	15,9
12.1 Manufacturing, constr. and non-fuel mining	255,6	16,5	10,8	11,5	-	-	6,7	-	-	-	15,2	-	-	4,0	0,5	1,8	10,7	13,8	0,7	0,2	2,9	1,2	156,6	2,5
12.1.1 Iron and steel	31,9	6,0	7,6	-	-	-	-	-	-	-	-	-	-	0,2	-	-	0,2	0,1	-	-	-	-	17,7	-
12.1.2 Chemical and petrochemical	56,6	7,3	2,6	4,3	-	-	2,8	-	-	-	0,1	-	-	0,8	-	0,4	10,1	1,3	-	-	0,3	0,1	26,1	0,4
12.1.3 Non-ferrous metals	71,1	-	-	1,6	-	-	0,6	-	-	-	0,2	-	-	0,1	-	-	-	-	-	-	-	-	68,5	0,1
12.1.4 Non-metalic minerals	14,8	3,2	0,6	2,1	-	-	1,3	-	-	-	0,3	-	-	0,4	-	-	0,4	0,4	0,3	-	2,0	0,8	3,0	-
12.1.5 Transport equipment	2,5	-	-	0,1	-	-	0,2	-	-	-	0,1	-	-	0,1	-	-	-	-	-	-	-	-	1,8	0,1
12.1.6 Machinery	5,0	-	-	0,2	-	-	0,2	-	-	-	0,1	-	-	0,3	-	-	-	-	-	-	-	-	4,0	0,2
12.1.7 Mining and quarrying	5,0	-	-	0,2	-	-	0,1	-	-	-	2,4	-	-	0,2	-	-	-	-	-	-	-	-	2,1	-
12.1.8 Food and tobacco	15,3	-	-	2,1	-	-	0,9	-	-	-	0,5	-	-	1,2	0,5	-	-	-	0,4	-	-	-	9,1	0,7
12.1.9 Paper, pulp and print	26,4	-	-	0,2	-	-	0,1	-	-	-	-	-	-	-	-	1,5	-	8,4	-	0,2	0,6	0,3	15,0	0,2
12.1.10 Wood and wood products	6,7	-	-	0,2	-	-	0,1	-	-	-	0,3	-	-	0,1	-	-	-	3,4	-	-	-	-	2,4	0,3
12.1.11 Textile and leather	0,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,3	-
12.1.12 Construction	16,5	-	-	-	-	-	0,3	-	-	-	11,1	-	-	0,1	-	-	-	-	-	-	-	-	4,5	0,5
12.1.13 Other industries	3,3	-	-	0,4	-	-	0,1	-	-	-	0,1	-	-	0,4	-	-	-	0,1	-	-	-	-	2,3	-
12.2 Transport	203,8	-	-	3,7	-	-	0,2	44,8	15,7	-	2,0	93,0	32,6	-	3,4	0,7	-	-	5,6	-	-	-	2,2	-
12.2.1 Road	141,8	-	-	0,5	-	-	0,2	42,5	-	-	-	93,0	-	-	-	-	-	-	5,5	-	-	-	-	-
12.2.2 Rail	2,8	-	-	-	-	-	-	-	-	-	0,6	-	-	-	-	-	-	-	-	-	-	-	2,2	-
12.2.3 Domestic aviation	15,8	-	-	-	-	-	-	0,1	15,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.2.4 Domestic navigation	43,5	-	-	3,2	-	-	-	2,2	-	-	1,4	-	32,6	-	3,4	0,7	-	-	-	-	-	-	-	-
12.2.5 Other transport	.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.3 Other	318,2	-	-	1,8	-	-	1,8	-	1,5	1,5	13,5	0,1	7,5	6,9	1,6	0,2	0,1	28,3	-	0,6	0,2	-	239,4	13,4
12.3.1 Agriculture and forestry	13,3	-	-	0,6	-	-	0,6	-	-	-	5,1	0,1	-	0,1	-	-	-	-	-	-	-	-	6,8	-
12.3.2 Fishing	9,2	-	-	-	-	-	-	-	-	-	0,2	-	6,8	0,1	1,2	0,1	-	-	-	-	-	-	0,8	-
12.3.3 Commerce and public services	121,2	-	-	1,0	-	-	1,1	-	1,5	-	8,2	-	0,7	2,4	0,4	0,1	0,1	0,8	-	0,6	0,2	-	94,2	9,9
12.3.4 Households	174,6	-	-	0,1	-	-	0,1	-	-	1,4	-	-	-	4,3	-	-	-	27,6	-	-	-	-	137,7	3,4
13 Statistical difference (6+7-8-9-10)	16,7	0,3	2,1	5,9	-16,4	-1,9	24,9	4,7	-3,0	0,8	1,5	10,1	2,4	0,5	4,1	-20,3	0,2	0,1	-	0,7	-	-	0,1	-
Memo01: Gas flared off on oil fields, terminals and landfills	18,4	-	-	18,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Energy balance (PJ) 2013	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 214,1	52,1	-	4 034,8	3 180,5	110,7	304,5	.	.	.	.	.	.	.	.	.	.	41,2	1,2	1,8	9,8	7,4	470,1	.
2 Imports	372,8	18,1	11,9	-	77,5	-	11,0	7,9	18,7	5,3	7,8	23,7	16,1	2,5	5,3	80,9	39,3	3,0	7,2	-	-	-	36,5	-
3 Exports	7 309,2	58,1	-	3 798,6	2 682,5	29,8	290,9	109,9	3,7	11,9	12,1	36,8	25,0	3,9	36,9	78,1	74,3	0,6	1,5	-	-	-	54,5	-
4 International bunkers	41,6	-	-	-	-	-	-	-	21,8	-	-	-	11,4	-	0,2	8,2	-	-	-	-	-	-	-	-
4.1 International marine bunkers	19,8	-	-	-	-	-	-	-	-	-	-	-	11,4	-	0,2	8,2	-	-	-	-	-	-	-	-
4.2 International aviation bunkers	21,8	-	-	-	-	-	-	-	21,8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Stock changes	-4,1	8,4	0,1	-0,8	-15,6	0,7	2,3	-0,8	2,0	0,6	-0,1	-0,3	-0,2	-	-0,5	-	0,1	-	-	-	-	-	-	-
6 Total energy supply (1+2-3-4+5)	1 232,0	20,5	12,0	235,4	560,0	81,6	27,0	-102,9	-4,9	-6,0	-4,4	-13,4	-20,6	-1,4	-32,2	-5,4	-34,9	43,6	6,9	1,8	9,8	7,4	452,1	-
7 Transformation processes	-13,6	-2,3	-0,2	-13,6	-571,3	-80,6	36,1	169,0	25,4	8,1	40,2	123,7	84,0	12,5	35,7	-10,4	121,3	-6,4	-0,8	-0,1	-6,2	-6,7	8,9	19,9
7.1 In blast furnaces	-0,9	-1,6	0,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.2 In oil refineries	-2,9	-	-	-	-571,3	-80,6	48,4	167,2	25,4	8,1	40,6	123,7	84,0	13,0	35,7	-10,4	113,1	-	-	-	-	-	-	-
7.3 In thermal power plants	-	-	-0,8	-0,2	-	-	-	-	-	-	-0,2	-	-	-	-	-	-	-1,0	-	-	-	-	2,2	-
7.4 In combined heat and power plants	-10,2	-0,7	-	-12,9	-	-	-	-	-	-	-0,2	-	-	-0,1	-	-	-3,4	-0,4	-	-	-4,0	-4,3	10,4	5,4
7.5 In district heating plants	-0,9	-	-	-0,5	-	-	-0,3	-	-	-	-	-	-	-0,5	-	-	-	-5,1	-0,8	-0,1	-2,2	-2,4	-3,6	14,5
7.6 Other transformation processes	1,5	-	-	-	-	-	-12,0	1,8	-	-	-	-	-	-	-	-	11,7	-	-	-	-	-	-	-
8 Energy industries own use	254,2	-	-	177,3	-	-	1,0	-	-	-	0,3	-	18,8	-	-	-	26,0	0,1	-	-	-	-	30,8	-
8.1 Crude petroleum and natural gass production	217,6	-	-	175,3	-	-	-	-	-	-	0,1	-	18,8	-	-	-	-	-	-	-	-	-	23,3	-
8.2 Coal mines	0,3	-	-	-	-	-	-	-	-	-	0,2	-	-	-	-	-	-	-	-	-	-	-	0,1	-
8.3 Oil refineries	29,0	-	-	-	-	-	1,0	-	-	-	-	-	-	-	-	-	26,0	-	-	-	-	-	2,0	-
8.4 Pumping storage power plants	2,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,9	-
8.5 Hydropower plants	2,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,1	-
8.6 Wind power plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.7 Thermal power plants	.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.8 Combined heat and power plants	2,3	-	-	2,0	-	-	-	-	-	-	-	-	-	-	-	-	-	0,1	-	-	-	-	0,2	-
8.9 District heating plants	0,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,1	-
9 Distribution losses	33,5	-	-	0,6	-	-	-	-	-	-	-	-	-	-	-	-	1,5	-	-	0,3	-	-	29,0	2,2
10 Final consumption (11+12)	872,4	19,5	10,1	37,4	-	-	48,0	41,8	16,5	1,4	32,7	96,4	39,5	10,1	4,8	2,7	44,3	36,9	6,1	0,8	3,6	0,8	401,2	17,7
11 Non energy consumption	93,5	2,2	-	20,0	-	-	38,9	-	-	-	-	-	-	-	-	-	32,4	-	-	-	-	-	-	-
11.1 In manufacture of industrial chemicals	59,7	-	-	20,0	-	-	38,9	-	-	-	-	-	-	-	-	-	0,8	-	-	-	-	-	-	-
11.2 In other production	33,8	2,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31,6	-	-	-	-	-	-	-
12 Final energy consumption	778,9	17,3	10,1	17,4	-	-	9,2	41,8	16,5	1,4	32,7	96,4	39,5	10,1	4,8	2,7	11,9	36,9	6,1	0,8	3,6	0,8	401,2	17,7
12.1 Manufacturing, constr. and non-fuel mining	256,7	17,3	10,1	11,4	-	-	6,0	-	-	-	17,1	-	-	4,0	0,4	0,8	11,8	14,1	0,7	0,2	3,3	0,8	156,1	2,5
12.1.1 Iron and steel	32,4	7,1	7,0	-	-	-	-	-	-	-	-	-	-	0,2	-	-	0,3	0,1	-	-	0,1	-	17,6	-
12.1.2 Chemical and petrochemical	57,6	7,3	2,6	4,6	-	-	1,6	-	-	-	0,1	-	-	0,6	-	0,1	11,0	2,3	-	-	0,8	0,1	26,0	0,5
12.1.3 Non-ferrous metals	71,6	-	-	1,5	-	-	0,5	-	-	-	0,2	-	-	0,1	-	-	0,1	-	-	-	-	-	69,2	-
12.1.4 Non-metalic minerals	15,2	2,9	0,5	1,9	-	-	1,7	-	-	-	0,4	-	-	0,9	-	-	0,4	0,5	0,3	-	1,9	0,7	3,2	-
12.1.5 Transport equipment	2,6	-	-	0,1	-	-	0,2	-	-	-	0,1	-	-	0,1	-	-	-	-	-	-	-	-	1,9	0,1
12.1.6 Machinery	5,2	-	-	0,2	-	-	0,1	-	-	-	0,1	-	-	0,4	-	-	-	-	-	-	-	-	4,2	0,2
12.1.7 Mining and quarrying	5,4	-	-	0,2	-	-	0,1	-	-	-	2,8	-	-	0,1	-	-	-	-	-	-	-	-	2,1	-
12.1.8 Food and tobacco	15,4	-	-	2,0	-	-	1,1	-	-	-	0,3	-	-	1,2	0,4	-	-	0,1	0,4	-	-	-	9,3	0,6
12.1.9 Paper, pulp and print	23,0	-	-	0,5	-	-	0,1	-	-	-	-	-	-	-	-	0,7	-	7,6	-	0,2	0,5	-	13,1	0,3
12.1.10 Wood and wood products	6,3	-	-	0,2	-	-	-	-	-	-	0,2	-	-	-	-	-	-	3,4	-	-	-	-	2,2	0,3
12.1.11 Textile and leather	0,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,3	-
12.1.12 Construction	18,4	-	-	-	-	-	0,5	-	-	-	12,6	-	-	0,1	-	-	-	-	-	-	-	-	4,6	0,5
12.1.13 Other industries	3,1	-	-	0,2	-	-	0,1	-	-	-	0,1	-	-	0,4	-	-	-	0,2	-	-	-	-	2,2	-
12.2 Transport	204,3	-	-	4,3	-	-	0,3	41,8	15,0	-	1,9	96,4	32,3	-	3,0	1,6	-	-	5,4	-	-	-	2,3	-
12.2.1 Road	142,2	-	-	0,6	-	-	0,3	39,4	-	-	-	96,4	-	-	-	-	-	-	5,3	-	-	-	0,1	-
12.2.2 Rail	2,7	-	-	-	-	-	-	-	-	-	0,5	-	-	-	-	-	-	-	-	-	-	-	2,2	-
12.2.3 Domestic aviation	15,0	-	-	-	-	-	-	0,1	15,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.2.4 Domestic navigation	44,3	-	-	3,7	-	-	-	2,3	-	-	1,4	-	32,3	-	3,0	1,6	-	-	-	-	-	-	-	-
12.2.5 Other transport	.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.3 Other	318,0	-	-	1,7	-	-	2,8	-	1,5	1,4	13,6	0,1	7,3	6,1	1,4	0,3	0,1	22,8	-	0,6	0,3	-	242,8	15,1
12.3.1 Agriculture and forestry	13,3	-	-	0,6	-	-	0,9	-	-	-	5,0	0,1	-	-	-	-	-	-	-	-	-	-	6,7	-
12.3.2 Fishing	8,4	-	-	-	-	-	-	-	-	-	0,2	-	6,4	0,1	0,9	-	-	-	-	-	-	-	0,7	-
12.3.3 Commerce and public services	124,9	-	-	0,9	-	-	1,7	-	1,5	-	8,5	-	0,9	2,2	0,4	0,3	0,1	0,9	-	0,6	0,3	-	95,4	11,2
12.3.4 Households	171,4	-	-	0,2	-	-	0,2	-	-	1,4	-	-	-	3,8	-	-	-	22,0	-	-	-	-	140,0	3,9
13 Statistical difference (6+7-8-9-10)	58,2	-1,3	1,7	6,5	-11,3	1,0	14,1	24,3	4,0	0,7	2,9	13,8	5,2	0,9	-1,3	-18,5	14,6	0,2	-	0,6	-	-	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	21,1	-	-	21,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Energy balance (PJ) 2014	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 278,3	47,1	-	4 009,4	3 233,2	110,8	328,0	.	.	.	.	.	.	.	.	.	.	32,2	0,3	1,4	10,1	7,8	498,2	.
2 Imports	300,0	21,4	13,0	-	52,2	-	10,3	8,8	16,6	5,6	6,6	22,4	14,5	1,6	3,0	48,1	44,8	2,5	5,9	-	-	-	22,8	-
3 Exports	7 368,2	45,2	-	3 768,1	2 749,1	31,8	319,2	98,2	0,5	5,0	12,5	42,7	27,7	3,1	33,0	64,0	88,4	0,5	0,3	-	-	-	79,0	-
4 International bunkers	38,3	-	-	-	-	-	-	-	23,0	-	-	-	10,5	-	0,2	4,7	-	-	-	-	-	-	-	-
4.1 International marine bunkers	15,3	-	-	-	-	-	-	-	-	-	-	-	10,5	-	0,2	4,7	-	-	-	-	-	-	-	-
4.2 International aviation bunkers	23,0	-	-	-	-	-	-	-	23,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Stock changes	39,0	-0,7	0,1	-1,5	29,7	-0,6	3,1	2,9	2,2	0,3	0,3	1,1	0,7	0,1	-2,5	0,6	3,4	-	-	-	-	-	-	-
6 Total energy supply (1+2-3-4+5)	1 210,9	22,6	13,0	239,8	565,9	78,4	22,2	-86,6	-4,7	0,8	-5,7	-19,3	-23,0	-1,4	-32,6	-19,9	-40,2	34,2	5,9	1,4	10,1	7,8	442,1	-
7 Transformation processes	-2,5	-2,2	-0,5	-14,3	-540,4	-75,6	32,2	145,7	23,3	3,3	35,9	123,9	80,2	8,5	32,8	28,0	106,7	-5,6	-0,1	-0,2	-6,1	-6,7	9,6	19,0
7.1 In blast furnaces	-1,0	-1,5	0,5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.2 In oil refineries	7,0	-	-	-	-540,4	-75,6	44,4	143,4	23,3	3,3	36,4	123,9	80,2	8,9	32,8	28,0	98,6	-	-	-	-	-	-	-
7.3 In thermal power plants	0,5	-	-0,9	-0,1	-	-	-	-	-	-	-0,1	-	-	-	-	-	-	-0,1	-	-	-	-	1,8	-
7.4 In combined heat and power plants	-10,3	-0,7	-	-13,7	-	-	-	-	-	-	-0,3	-	-	-0,1	-	-	-3,6	-	-	-	-4,4	-4,8	11,0	6,4
7.5 In district heating plants	-0,8	-	-	-0,5	-	-	-0,2	-	-	-	-	-	-	-0,3	-	-	-	-5,4	-0,1	-0,1	-1,8	-1,9	-3,2	12,7
7.6 Other transformation processes	2,0	-	-	-	-	-	-12,0	2,3	-	-	-	-	-	-	-	-	11,7	-	-	-	-	-	-	-
8 Energy industries own use	260,4	-	-	187,2	-	-	0,8	-	-	-	0,4	-	17,8	0,1	-	-	22,2	-	-	-	-	-	31,9	-
8.1 Crude petroleum and natural gass production	226,5	-	-	184,8	-	-	-	-	-	-	0,1	-	17,8	0,1	-	-	-	-	-	-	-	-	23,6	-
8.2 Coal mines	0,4	-	-	-	-	-	-	-	-	-	0,3	-	-	-	-	-	-	-	-	-	-	-	0,1	-
8.3 Oil refineries	24,8	-	-	-	-	-	0,8	-	-	-	-	-	-	-	-	-	22,2	-	-	-	-	-	1,8	-
8.4 Pumping storage power plants	3,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,7	-
8.5 Hydropower plants	2,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,2	-
8.6 Wind power plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.7 Thermal power plants	.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.8 Combined heat and power plants	2,7	-	-	2,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,3	-
8.9 District heating plants	0,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,2	-
9 Distribution losses	31,8	-	0,2	0,4	-	-	-	-	-	-	-	-	-	-	-	-	1,4	-	-	0,2	-	-	27,4	2,1
10 Final consumption (11+12)	858,5	20,8	8,9	39,0	-	-	46,2	39,9	17,9	0,9	30,3	101,1	41,0	7,4	4,6	1,9	49,0	28,7	5,8	0,5	4,0	1,0	392,5	16,9
11 Non energy consumption	97,9	2,2	-	21,7	-	-	37,1	-	-	-	-	-	-	-	-	-	36,8	-	-	-	-	-	-	-
11.1 In manufacture of industrial chemicals	59,6	-	-	21,7	-	-	37,1	-	-	-	-	-	-	-	-	-	0,8	-	-	-	-	-	-	-
11.2 In other production	38,3	2,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36,0	-	-	-	-	-	-	-
12 Final energy consumption	760,6	18,6	8,9	17,3	-	-	9,1	39,9	17,9	0,9	30,3	101,1	41,0	7,4	4,6	1,9	12,2	28,7	5,8	0,5	4,0	1,0	392,5	16,9
12.1 Manufacturing, constr. and non-fuel mining	252,4	18,6	8,9	11,0	-	-	5,8	-	-	-	15,4	-	-	2,9	0,6	0,4	12,1	9,0	0,4	0,1	3,5	1,0	160,0	2,6
12.1.1 Iron and steel	33,6	7,9	6,0	-	-	-	0,1	-	-	-	0,1	-	-	0,2	-	-	0,6	0,1	-	-	0,1	-	18,6	-
12.1.2 Chemical and petrochemical	60,3	7,9	2,4	4,4	-	-	1,7	-	-	-	0,1	-	-	0,4	-	0,2	11,1	2,7	-	0,1	1,3	-	27,5	0,5
12.1.3 Non-ferrous metals	73,3	-	-	1,6	-	-	0,7	-	-	-	0,2	-	-	0,1	-	-	-	-	-	-	-	-	70,7	-
12.1.4 Non-metalic minerals	13,7	2,8	0,5	1,9	-	-	1,1	-	-	-	0,2	-	-	0,4	-	-	0,4	0,5	0,1	-	1,8	0,5	3,3	-
12.1.5 Transport equipment	2,8	-	-	0,1	-	-	0,2	-	-	-	0,1	-	-	0,1	-	-	-	-	-	-	-	-	2,2	0,1
12.1.6 Machinery	5,2	-	-	0,1	-	-	0,1	-	-	-	0,1	-	-	0,3	-	-	-	-	-	-	-	-	4,3	0,1
12.1.7 Mining and quarrying	5,0	-	-	0,2	-	-	0,1	-	-	-	2,6	-	-	-	-	-	-	-	-	-	-	-	2,1	-
12.1.8 Food and tobacco	15,2	-	-	1,8	-	-	1,0	-	-	-	0,2	-	-	1,1	0,6	-	-	0,1	0,2	-	-	-	9,5	0,7
12.1.9 Paper, pulp and print	17,0	-	-	0,6	-	-	0,1	-	-	-	-	-	-	-	-	0,2	-	2,2	-	-	0,4	0,5	12,7	0,3
12.1.10 Wood and wood products	6,1	-	-	0,1	-	-	-	-	-	-	0,2	-	-	-	-	-	-	3,2	-	-	-	-	2,3	0,2
12.1.11 Textile and leather	0,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,3	-
12.1.12 Construction	17,1	-	-	-	-	-	0,5	-	-	-	11,4	-	-	-	-	-	-	-	-	-	-	-	4,5	0,5
12.1.13 Other industries	2,8	-	-	0,1	-	-	0,2	-	-	-	0,2	-	-	0,2	-	-	-	0,1	0,1	-	-	-	1,8	-
12.2 Transport	209,1	-	-	5,0	-	-	0,3	39,9	16,4	-	1,9	101,1	32,7	-	3,1	1,1	-	-	5,4	-	-	-	2,4	-
12.2.1 Road	145,0	-	-	0,6	-	-	0,3	37,4	-	-	-	101,1	-	-	-	-	-	-	5,3	-	-	-	0,2	-
12.2.2 Rail	2,7	-	-	-	-	-	-	-	-	-	0,6	-	-	-	-	-	-	-	-	-	-	-	2,1	-
12.2.3 Domestic aviation	16,4	-	-	-	-	-	-	0,1	16,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.2.4 Domestic navigation	45,0	-	-	4,4	-	-	-	2,4	-	-	1,3	-	32,7	-	3,1	1,1	-	-	-	-	-	-	-	-
12.2.5 Other transport	.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.3 Other	299,1	-	-	1,4	-	-	3,0	-	1,6	0,8	13,1	0,1	8,4	4,5	0,9	0,4	0,1	19,7	-	0,4	0,6	-	230,1	14,3
12.3.1 Agriculture and forestry	12,5	-	-	0,5	-	-	1,0	-	-	-	4,6	0,1	-	-	-	-	-	-	-	-	-	-	6,3	-
12.3.2 Fishing	9,0	-	-	-	-	-	-	-	-	-	0,2	-	7,3	-	0,8	-	-	-	-	-	-	-	0,7	-
12.3.3 Commerce and public services	118,4	-	-	0,7	-	-	1,8	-	1,6	-	8,3	-	1,0	1,6	0,1	0,4	0,1	0,7	-	0,4	0,6	-	90,4	10,7
12.3.4 Households	159,3	-	-	0,2	-	-	0,2	-	-	0,8	-	-	-	2,8	-	-	-	19,0	-	-	-	-	132,7	3,6
13 Statistical difference (6+7-8-9-10)	57,7	-0,5	3,4	-1,1	25,4	2,8	7,4	19,1	0,6	3,3	-0,4	3,5	-1,6	-0,3	-4,4	6,1	-6,1	-0,1	-	0,5	-0,1	0,1	-	-
Memo01: Gas flared off on oil fields, terminals and landfills	18,1	-	-	18,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Energy balance (PJ) 2015	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 685,2	31,1	-	4 308,4	3 328,4	107,1	346,9	.	.	.	.	.	.	.	.	.	.	35,4	-	1,6	10,5	8,3	507,5	.
2 Imports	341,2	19,5	12,2	0,6	50,4	-	6,0	13,3	17,1	5,2	10,5	36,1	22,4	2,4	1,7	66,4	41,6	2,6	6,5	-	-	-	26,7	-
3 Exports	7 745,8	31,6	-	4 053,3	2 770,8	33,3	325,7	140,5	1,7	17,9	17,0	58,4	36,3	3,9	28,5	59,1	87,9	0,6	0,2	-	-	-	79,3	-
4 International bunkers	37,4	-	-	1,4	-	-	-	-	22,2	-	-	-	12,0	-	0,1	1,6	-	-	-	-	-	-	-	-
4.1 International marine bunkers	15,2	-	-	1,4	-	-	-	-	-	-	-	-	12,0	-	0,1	1,6	-	-	-	-	-	-	-	-
4.2 International aviation bunkers	22,2	-	-	-	-	-	-	-	22,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Stock changes	-8,3	3,2	0,1	3,2	-5,1	-0,1	-5,7	-0,7	-0,2	-0,1	-0,4	-1,4	-0,9	-0,1	2,3	-0,6	-1,8	-	-	-	-	-	-	-
6 Total energy supply (1+2-3-4+5)	1 234,9	22,1	12,2	257,6	602,9	73,7	21,6	-127,9	-6,9	-12,8	-6,9	-23,8	-26,8	-1,6	-24,6	5,1	-48,1	37,4	6,4	1,7	10,5	8,3	454,8	-
7 Transformation processes	-1,1	-1,7	-1,0	-14,2	-582,1	-72,1	34,1	176,5	25,5	11,8	38,0	132,1	82,0	8,5	32,0	4,2	115,8	-6,8	-0,1	-0,1	-6,6	-7,2	9,7	20,5
7.1 In blast furnaces	-0,9	-1,0	0,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.2 In oil refineries	10,3	-	-	-	-582,1	-72,1	46,7	174,3	25,5	11,8	38,5	132,1	82,0	8,8	32,0	4,2	108,5	-	-	-	-	-	-	-
7.3 In thermal power plants	0,5	-	-1,1	-	-	-	-	-	-	-	-0,1	-	-	-	-	-	-	-0,1	-	-	-	-	1,8	-
7.4 In combined heat and power plants	-11,1	-0,7	-	-13,8	-	-	-	-	-	-	-0,3	-	-	-0,1	-	-	-4,5	-0,1	-	-	-4,2	-4,5	11,1	6,0
7.5 In district heating plants	-1,5	-	-	-0,4	-	-	-0,2	-	-	-	-	-	-	-0,3	-	-	-	-6,7	-0,1	-0,1	-2,5	-2,7	-3,2	14,5
7.6 Other transformation processes	1,7	-	-	-	-	-	-12,3	2,2	-	-	-	-	-	-	-	-	11,8	-	-	-	-	-	-	-
8 Energy industries own use	270,7	-	-	193,5	-	-	0,6	-	-	-	0,4	-	15,4	0,1	-	-	24,7	-	-	-	-	-	36,1	-
8.1 Crude petroleum and natural gass production	232,3	-	-	191,5	-	-	-	-	-	-	0,1	-	15,4	-	-	-	-	-	-	-	-	-	25,3	-
8.2 Coal mines	0,4	-	-	-	-	-	-	-	-	-	0,3	-	-	-	-	-	-	-	-	-	-	-	0,1	-
8.3 Oil refineries	27,1	-	-	-	-	-	0,6	-	-	-	-	-	-	-	-	-	24,7	-	-	-	-	-	1,9	-
8.4 Pumping storage power plants	5,9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,9	-
8.5 Hydropower plants	2,3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,3	-
8.6 Wind power plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.7 Thermal power plants	.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.8 Combined heat and power plants	2,4	-	-	1,9	-	-	-	-	-	-	-	-	-	0,1	-	-	-	-	-	-	-	-	0,4	-
8.9 District heating plants	0,3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,2	-
9 Distribution losses	32,0	-	0,1	0,3	-	-	-	-	-	-	-	-	-	-	-	-	1,8	-	-	0,6	-	-	26,9	2,3
10 Final consumption (11+12)	871,3	19,2	9,7	40,4	-	-	49,2	37,7	17,0	0,7	31,1	104,0	40,6	7,1	3,4	0,3	48,5	30,4	6,3	1,1	4,0	1,0	401,4	18,2
11 Non energy consumption	101,3	2,3	-	23,0	-	-	39,9	-	-	-	-	-	-	-	-	-	36,2	-	-	-	-	-	-	-
11.1 In manufacture of industrial chemicals	63,7	-	-	23,0	-	-	39,9	-	-	-	-	-	-	-	-	-	0,8	-	-	-	-	-	-	-
11.2 In other production	37,7	2,3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35,4	-	-	-	-	-	-	-
12 Final energy consumption	770,0	17,0	9,7	17,4	-	-	9,4	37,7	17,0	0,7	31,1	104,0	40,6	7,1	3,4	0,3	12,3	30,4	6,3	1,1	4,0	1,0	401,4	18,2
12.1 Manufacturing, constr. and non-fuel mining	255,5	17,0	9,7	10,8	-	-	6,9	-	-	-	15,8	-	-	2,9	0,6	0,2	12,3	9,6	0,3	0,1	3,5	1,0	162,0	2,7
12.1.1 Iron and steel	32,5	7,0	6,7	-	-	-	-	-	-	-	0,1	-	-	0,2	-	-	0,5	-	-	-	0,1	-	17,9	-
12.1.2 Chemical and petrochemical	61,9	7,4	2,6	4,1	-	-	2,9	-	-	-	0,1	-	-	0,4	-	0,1	11,3	3,0	-	0,1	1,2	-	28,2	0,6
12.1.3 Non-ferrous metals	75,6	-	-	1,2	-	-	0,7	-	-	-	0,2	-	-	-	-	-	0,1	-	-	-	-	-	73,4	-
12.1.4 Non-metalic minerals	14,1	2,6	0,5	2,1	-	-	1,2	-	-	-	0,4	-	-	0,5	-	-	0,5	0,6	-	-	1,8	0,5	3,4	-
12.1.5 Transport equipment	1,8	-	-	-	-	-	-	-	-	-	0,1	-	-	0,1	-	-	-	-	-	-	-	-	1,5	0,1
12.1.6 Machinery	5,4	-	-	0,1	-	-	0,1	-	-	-	0,2	-	-	0,4	-	-	-	-	-	-	-	-	4,5	0,2
12.1.7 Mining and quarrying	5,0	-	-	0,1	-	-	0,1	-	-	-	2,8	-	-	-	-	-	-	-	-	-	-	-	1,9	-
12.1.8 Food and tobacco	15,8	-	-	2,4	-	-	1,1	-	-	-	0,2	-	-	1,0	0,6	-	-	-	0,1	-	-	-	9,7	0,7
12.1.9 Paper, pulp and print	16,6	-	-	0,3	-	-	0,1	-	-	-	-	-	-	0,1	-	0,2	-	2,4	-	-	0,3	0,5	12,6	0,2
12.1.10 Wood and wood products	6,6	-	-	0,1	-	-	-	-	-	-	0,3	-	-	-	-	-	-	3,5	-	-	-	-	2,3	0,3
12.1.11 Textile and leather	0,4	-	-	-	-	-	-	-	-	-	-	-	-	0,1	-	-	-	-	-	-	-	-	0,3	-
12.1.12 Construction	17,1	-	-	-	-	-	0,4	-	-	-	11,4	-	-	-	-	-	-	-	-	-	-	-	4,7	0,5
12.1.13 Other industries	2,6	-	-	0,1	-	-	0,3	-	-	-	-	-	-	0,1	-	-	-	0,1	0,2	-	-	-	1,8	-
12.2 Transport	207,6	-	-	5,0	-	-	0,2	37,7	15,7	-	1,9	103,9	31,7	-	2,2	-	-	-	5,9	0,4	-	-	2,9	-
12.2.1 Road	146,6	-	-	0,4	-	-	0,2	35,1	-	-	-	103,9	-	-	-	-	-	-	5,9	0,4	-	-	0,6	-
12.2.2 Rail	2,9	-	-	-	-	-	-	-	-	-	0,6	-	-	-	-	-	-	-	-	-	-	-	2,3	-
12.2.3 Domestic aviation	15,8	-	-	-	-	-	-	0,1	15,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.2.4 Domestic navigation	42,3	-	-	4,5	-	-	-	2,5	-	-	1,3	-	31,7	-	2,2	-	-	-	-	-	-	-	-	-
12.2.5 Other transport	.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.3 Other	306,8	-	-	1,6	-	-	2,2	-	1,4	0,7	13,4	-	8,9	4,2	0,6	-	-	20,8	-	0,5	0,5	-	236,5	15,5
12.3.1 Agriculture and forestry	12,5	-	-	0,6	-	-	0,7	-	-	-	4,6	-	-	-	-	-	-	-	-	-	-	-	6,5	0,1
12.3.2 Fishing	9,3	-	-	-	-	-	-	-	-	-	0,1	-	8,0	-	0,4	-	-	-	-	-	-	-	0,7	-
12.3.3 Commerce and public services	118,7	-	-	0,9	-	-	1,3	-	1,4	-	8,6	-	0,9	1,6	0,1	-	-	0,6	-	0,5	0,5	-	90,4	11,7
12.3.4 Households	166,4	-	-	0,1	-	-	0,1	-	-	0,7	-	-	-	2,6	-	-	-	20,2	-	-	-	-	138,8	3,7
13 Statistical difference (6+7-8-9-10)	59,9	1,1	1,4	9,3	20,8	1,6	5,9	10,9	1,6	-1,6	-0,3	4,4	-0,7	-0,3	4,0	9,0	-7,3	0,2	-	-	-0,1	0,1	0,1	-
Memo01: Gas flared off on oil fields, terminals and landfills	19,8	-	-	19,8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Energy balance (PJ) 2016	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 773,0	23,0	-	4 285,8	3 410,6	128,8	344,4	.	.	.	.	.	.	.	.	.	.	34,1	2,2	1,7	10,2	8,3	523,9	.
2 Imports	335,8	18,5	12,2	1,6	21,1	-	34,5	16,9	16,5	1,8	11,4	38,7	21,7	2,3	2,3	54,8	45,5	2,6	12,7	0,1	-	-	20,7	-
3 Exports	7 897,5	25,6	-	4 047,1	2 958,8	47,6	351,7	148,3	0,8	9,0	13,9	47,2	26,5	2,8	24,7	43,0	68,6	0,7	1,4	-	-	-	79,7	-
4 International bunkers	34,3	-	-	2,0	-	-	-	-	21,7	-	-	-	9,7	-	0,1	0,9	-	-	-	-	-	-	-	-
4.1 International marine bunkers	12,6	-	-	2,0	-	-	-	-	-	-	-	-	9,7	-	0,1	0,9	-	-	-	-	-	-	-	-
4.2 International aviation bunkers	21,7	-	-	-	-	-	-	-	21,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Stock changes	-11,1	4,1	-0,4	0,8	-31,2	-	4,0	0,3	0,2	-	1,4	4,8	2,7	0,3	-0,7	-	2,6	-	-	-	-	-	-	-
6 Total energy supply (1+2-3-4+5)	1 165,8	20,0	11,7	239,1	441,7	81,2	31,2	-131,1	-5,9	-7,2	-1,1	-3,7	-11,7	-0,2	-23,1	11,0	-20,5	36,0	13,5	1,8	10,2	8,3	464,8	-
7 Transformation processes	-12,2	-1,5	-1,0	-14,3	-443,8	-75,2	36,8	166,4	19,9	5,0	29,7	101,5	57,0	5,6	24,7	-15,6	83,0	-7,7	-0,2	-0,1	-6,4	-7,0	9,1	22,2
7.1 In blast furnaces	-0,8	-0,8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.2 In oil refineries	-1,0	-	-	-	-443,8	-75,2	47,3	164,7	19,9	5,0	29,9	101,5	57,0	6,0	24,7	-15,6	77,6	-	-	-	-	-	-	-
7.3 In thermal power plants	0,6	-	-1,0	-	-	-	-	-	-	-	-0,1	-	-	-	-	-	-	-0,2	-	-	-	-	1,9	-
7.4 In combined heat and power plants	-11,0	-0,7	-	-13,8	-	-	-	-	-	-	-0,1	-	-	-0,1	-	-	-4,7	-0,2	-	-	-4,1	-4,5	10,8	6,5
7.5 In district heating plants	-1,4	-	-	-0,5	-	-	-0,4	-	-	-	-	-	-	-0,3	-	-	-	-7,3	-0,2	-0,1	-2,3	-2,5	-3,5	15,7
7.6 Other transformation processes	1,5	-	-	-	-	-	-10,2	1,7	-	-	-	-	-	-	-	-	10,0	-	-	-	-	-	-	-
8 Energy industries own use	261,4	-	-	190,3	-	-	0,5	-	-	-	0,2	-	14,4	0,2	-	-	21,6	-	-	-	-	-	34,1	-
8.1 Crude petroleum and natural gass production	229,6	-	-	189,2	-	-	-	-	-	-	0,1	-	14,4	-	-	-	-	-	-	-	-	-	25,9	-
8.2 Coal mines	0,2	-	-	-	-	-	-	-	-	-	0,1	-	-	-	-	-	-	-	-	-	-	-	0,1	-
8.3 Oil refineries	23,8	-	-	-	-	-	0,5	-	-	-	-	-	-	-	-	-	21,6	-	-	-	-	-	1,7	-
8.4 Pumping storage power plants	3,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,2	-
8.5 Hydropower plants	1,8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,8	-
8.6 Wind power plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.7 Thermal power plants	0,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,1	-
8.8 Combined heat and power plants	1,6	-	-	1,1	-	-	-	-	-	-	-	-	-	0,2	-	-	-	-	-	-	-	-	0,3	-
8.9 District heating plants	1,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,2	-
9 Distribution losses	33,0	-	0,1	0,4	-	-	-	-	-	-	-	-	-	-	-	-	1,8	-	-	0,6	-	-	27,7	2,5
10 Final consumption (11+12)	878,7	19,5	10,7	36,0	-	-	48,2	35,5	16,3	0,7	28,8	102,2	39,5	7,1	2,9	0,5	46,9	28,3	17,4	1,1	3,9	1,2	412,3	19,7
11 Non energy consumption	94,6	2,2	-	18,8	-	-	37,2	-	-	-	-	-	-	-	-	-	36,4	-	-	-	-	-	-	-
11.1 In manufacture of industrial chemicals	56,9	-	-	18,8	-	-	37,2	-	-	-	-	-	-	-	-	-	0,9	-	-	-	-	-	-	-
11.2 In other production	37,7	2,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35,6	-	-	-	-	-	-	-
12 Final energy consumption	784,1	17,4	10,7	17,2	-	-	11,0	35,5	16,3	0,7	28,8	102,2	39,5	7,1	2,9	0,5	10,4	28,3	17,4	1,1	3,9	1,2	412,3	19,7
12.1 Manufacturing, constr. and non-fuel mining	256,7	17,4	10,7	11,0	-	-	7,2	-	-	-	15,3	-	-	2,5	0,4	0,5	10,4	8,2	0,2	0,1	3,3	1,2	165,8	2,6
12.1.1 Iron and steel	33,9	6,6	8,0	-	-	-	-	-	-	-	0,1	-	-	0,2	-	-	0,5	0,1	-	-	0,1	-	18,2	-
12.1.2 Chemical and petrochemical	59,0	8,1	2,1	4,1	-	-	2,6	-	-	-	0,1	-	-	0,5	-	0,4	9,3	2,0	-	0,1	1,0	-	28,3	0,5
12.1.3 Non-ferrous metals	77,2	-	-	1,4	-	-	0,7	-	-	-	0,2	-	-	0,1	-	-	0,1	-	-	-	-	-	74,7	0,1
12.1.4 Non-metalic minerals	14,4	2,6	0,5	2,3	-	-	1,3	-	-	-	0,5	-	-	0,2	-	-	0,5	0,5	-	-	1,9	0,6	3,4	-
12.1.5 Transport equipment	1,9	-	-	-	-	-	-	-	-	-	0,1	-	-	0,1	-	-	-	-	-	-	-	-	1,6	0,1
12.1.6 Machinery	5,0	-	-	0,1	-	-	0,1	-	-	-	0,2	-	-	0,2	-	-	-	-	-	-	-	-	4,2	0,2
12.1.7 Mining and quarrying	4,6	-	-	0,1	-	-	0,1	-	-	-	2,9	-	-	-	-	-	-	-	-	-	-	-	1,5	-
12.1.8 Food and tobacco	16,5	-	-	2,2	-	-	1,4	-	-	-	0,3	-	-	1,0	0,4	-	-	-	0,1	-	-	-	10,5	0,7
12.1.9 Paper, pulp and print	18,0	-	-	0,5	-	-	-	-	-	-	-	-	-	0,1	-	0,1	-	2,3	-	-	0,3	0,6	13,7	0,2
12.1.10 Wood and wood products	6,4	-	-	0,1	-	-	-	-	-	-	0,3	-	-	-	-	-	-	3,2	-	-	-	-	2,5	0,3
12.1.11 Textile and leather	0,4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,3	-
12.1.12 Construction	16,9	-	-	-	-	-	0,6	-	-	-	10,7	-	-	-	-	-	-	-	-	-	-	-	5,0	0,6
12.1.13 Other industries	2,6	-	-	0,1	-	-	0,4	-	-	-	-	-	-	0,1	-	-	-	-	0,2	-	-	-	1,8	-
12.2 Transport	208,0	-	-	4,5	-	-	0,3	35,5	14,8	-	1,9	102,2	30,0	-	2,2	-	-	-	13,1	0,4	-	-	3,1	-
12.2.1 Road	150,3	-	-	0,4	-	-	0,3	32,9	-	-	-	102,2	-	-	-	-	-	-	13,0	0,4	-	-	1,0	-
12.2.2 Rail	2,7	-	-	-	-	-	-	-	-	-	0,6	-	-	-	-	-	-	-	-	-	-	-	2,1	-
12.2.3 Domestic aviation	14,9	-	-	-	-	-	-	0,1	14,8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.2.4 Domestic navigation	40,1	-	-	4,1	-	-	-	2,4	-	-	1,2	-	30,0	-	2,2	-	-	-	0,1	-	-	-	-	-
12.2.5 Other transport	.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.3 Other	319,3	-	-	1,7	-	-	3,4	-	1,5	0,6	11,7	0,1	9,4	4,6	0,3	-	0,1	20,1	4,1	0,6	0,6	-	243,4	17,2
12.3.1 Agriculture and forestry	13,2	-	-	0,5	-	-	1,1	-	-	-	0,6	-	-	-	-	-	-	-	4,1	-	-	-	6,7	-
12.3.2 Fishing	9,7	-	-	-	-	-	-	-	-	-	0,1	-	8,6	-	0,3	-	-	-	-	-	-	-	0,7	-
12.3.3 Commerce and public services	125,2	-	-	1,0	-	-	2,0	-	1,5	-	10,9	-	0,8	1,6	-	-	0,1	0,6	-	0,6	0,6	-	92,6	12,8
12.3.4 Households	171,2	-	-	0,2	-	-	0,2	-	-	0,6	-	-	-	2,9	-	-	-	19,5	-	-	-	-	143,4	4,4
13 Statistical difference (6+7-8-9-10)	-19,5	-1,0	-	-2,0	-2,2	5,9	19,2	-0,2	-2,3	-2,9	-0,4	-4,5	-8,7	-1,9	-1,3	-5,1	-7,7	-	-4,1	-	-0,1	0,1	-0,2	-
Memo01: Gas flared off on oil fields, terminals and landfills	20,0	-	-	20,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Energy balance (PJ) 2017	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 996,1	3,7	.	4 568,3	3 352,9	139,2	345,0	.	.	.	.	.	.	.	.	.	.	36,9	4,2	2,0	10,2	8,3	525,5	.
2 Imports	421,1	21,9	11,7	1,1	76,7	.	37,8	15,6	9,4	3,5	11,1	38,4	22,0	1,9	.	76,2	49,4	2,7	19,3	0,1	.	.	22,0	.
3 Exports	8 157,9	2,1	-	4 353,9	2 872,3	48,2	354,7	160,5	0,2	4,0	25,0	86,2	49,4	4,3	17,9	58,1	40,9	1,1	2,5	.	.	.	76,6	.
4 International bunkers	36,7	.	.	1,8	.	.	.	-	22,8	.	.	.	10,8	.	0,2	1,0	.	.	.	.	.	.	.	.
4.1 International marine bunkers	13,9	.	.	1,8	.	.	.	.	.	.	.	.	10,8	.	0,2	1,0	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	22,8	.	.	.	.	.	.	-	22,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	35,1	-0,1	0,4	-3,9	33,0	0,9	-1,1	1,4	0,4	0,1	0,7	2,4	1,4	0,1	0,1	2,5	-3,2	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 257,7	23,4	12,1	209,7	590,4	91,9	27,0	-143,5	-13,2	-0,5	-13,1	-45,3	-36,8	-2,3	-18,0	19,6	5,3	38,5	21,0	2,1	10,2	8,3	470,9	.
7 Transformation processes	-13,2	-2,2	-0,9	-13,9	-600,4	-93,6	52,8	204,7	31,9	3,7	39,6	137,2	78,6	6,6	49,7	-5,7	88,2	-7,7	-0,1	-0,2	-6,6	-7,2	9,4	23,1
7.1 In blast furnaces	-1,0	-1,4	0,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	-2,3	.	.	.	-600,4	-93,6	64,3	202,9	31,9	3,7	39,8	137,2	78,6	6,8	49,7	-5,7	82,5	.	.	.	.	.	.	.
7.3 In thermal power plants	0,9	.	-1,3	-	.	.	.	.	.	.	-0,1	.	.	.	.	.	.	.	.	-0,1	.	.	2,4	.
7.4 In combined heat and power plants	-11,9	-0,8	.	-13,4	.	.	-	.	.	.	-0,1	.	.	-	.	.	-5,3	-1,5	-	-	-4,1	-4,5	10,6	7,3
7.5 In district heating plants	-0,5	.	-	-0,5	.	.	-0,3	.	.	.	-	.	.	-0,2	.	.	.	-6,2	-0,1	-0,1	-2,5	-2,7	-3,6	15,8
7.6 Other transformation processes	1,7	.	.	.	.	.	-11,2	1,8	.	.	-	.	.	.	.	.	11,0	.	.	.	.	.	.	.
8 Energy industries own use	271,5	.	.	194,9	.	.	0,6	.	.	.	0,2	.	12,3	0,1	.	.	24,9	.	.	.	-	-	38,4	-
8.1 Crude petroleum and natural gass production	234,2	.	.	193,4	.	.	-	.	.	.	0,1	.	12,3	0,1	.	.	.	.	.	.	.	.	28,3	-
8.2 Coal mines	0,1	.	.	.	.	.	.	.	.	.	0,1	.	.	.	.	.	.	.	.	.	.	.	-	.
8.3 Oil refineries	27,5	.	.	.	.	.	0,6	.	.	.	-	.	.	-	.	.	24,9	.	.	.	.	.	2,0	.
8.4 Pumping storage power plants	3,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,9	.
8.5 Hydropower plants	2,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,4	.
8.6 Wind power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.7 Thermal power plants	0,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.8 Combined heat and power plants	1,6	.	.	1,2	.	.	.	.	.	.	-	.	.	-	.	.	.	.	.	.	.	.	0,3	.
8.9 District heating plants	1,8	.	.	0,3	.	.	.	.	.	.	-	.	.	-	.	.	.	.	.	.	-	-	1,4	-
9 Distribution losses	32,5	.	0,2	0,2	.	.	.	.	.	.	.	.	.	.	.	.	1,6	.	.	0,6	.	.	27,5	2,5
10 Final consumption (11+12)	888,5	20,4	10,5	39,9	.	.	47,6	34,5	16,6	0,5	32,1	91,3	41,1	6,1	2,8	0,6	51,8	30,9	20,9	1,2	3,8	1,0	414,2	20,6
11 Non energy consumption	101,0	2,5	.	21,2	.	.	37,6	.	.	.	.	.	.	.	.	.	39,8	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	59,4	.	.	21,2	.	.	37,6	.	.	.	.	.	.	.	.	.	0,7	.	.	.	.	.	.	.
11.2 In other production	41,6	2,5	.	-	.	.	-	.	.	.	.	.	.	.	.	.	39,1	.	.	.	.	.	.	.
12 Final energy consumption	787,4	17,9	10,5	18,7	.	.	10,1	34,5	16,6	0,5	32,1	91,3	41,1	6,1	2,8	0,6	12,0	30,9	20,9	1,2	3,8	1,0	414,2	20,6
12.1 Manufacturing, constr. and non-fuel mining	260,7	17,9	10,5	12,2	.	.	7,1	.	.	0,1	15,6	.	.	2,2	0,3	0,6	11,9	9,5	0,1	0,1	3,2	1,0	166,2	2,2
12.1.1 Iron and steel	35,4	7,2	8,1	-	.	.	0,1	.	.	.	0,1	.	.	0,2	.	.	0,3	0,2	.	.	-	.	19,3	-
12.1.2 Chemical and petrochemical	58,2	7,7	1,8	4,5	.	.	2,0	.	.	-	0,1	.	.	0,4	-	0,4	11,0	1,9	-	0,1	0,7	.	27,0	0,4
12.1.3 Non-ferrous metals	77,5	.	.	1,6	.	.	0,6	.	.	.	0,2	.	.	0,1	.	.	0,1	.	.	.	.	.	74,9	-
12.1.4 Non-metalic minerals	15,0	3,0	0,6	2,2	.	.	1,6	.	.	-	0,4	.	.	0,2	-	.	0,5	0,6	.	.	2,1	0,6	3,4	-
12.1.5 Transport equipment	1,7	.	.	-	.	.	-	.	.	-	0,1	.	.	0,1	.	-	.	-	.	.	-	.	1,4	0,1
12.1.6 Machinery	4,5	.	.	0,1	.	.	0,1	.	.	-	0,2	.	.	0,1	-	.	.	-	.	.	-	.	3,8	0,2
12.1.7 Mining and quarrying	3,8	.	.	0,1	.	.	0,1	.	.	-	2,1	.	.	-	.	.	.	.	.	.	.	.	1,5	-
12.1.8 Food and tobacco	17,5	.	.	2,7	.	.	1,7	.	.	-	0,2	.	.	1,1	0,3	.	.	-	0,1	-	-	-	10,7	0,7
12.1.9 Paper, pulp and print	19,3	.	.	0,5	.	.	-	.	.	-	-	.	.	0,1	.	0,2	.	3,7	.	.	0,3	0,3	14,1	0,1
12.1.10 Wood and wood products	6,2	.	.	0,2	.	.	-	.	.	-	0,2	.	.	-	.	.	.	3,1	.	.	.	0,1	2,2	0,3
12.1.11 Textile and leather	0,3	.	.	-	.	.	-	.	.	.	-	.	.	-	.	-	.	.	.	.	.	.	0,2	-
12.1.12 Construction	18,3	.	.	-	.	.	0,5	.	.	-	12,1	.	.	-	.	.	.	.	.	.	.	.	5,4	0,2
12.1.13 Other industries	3,1	.	.	0,1	.	.	0,5	.	.	-	-	.	.	0,1	.	.	.	-	-	.	.	-	2,3	-
12.2 Transport	205,5	.	.	4,8	.	.	0,3	34,5	15,1	.	1,8	91,2	30,3	.	2,4	.	.	.	20,8	0,4	.	.	3,8	.
12.2.1 Road	146,5	.	.	0,6	.	.	0,3	31,9	.	.	.	91,2	.	.	.	.	.	.	20,7	0,4	.	.	1,5	.
12.2.2 Rail	2,9	.	.	.	.	.	-	.	.	.	0,6	.	.	.	.	.	.	.	.	.	.	.	2,3	.
12.2.3 Domestic aviation	15,3	.	.	.	.	.	.	0,1	15,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	40,8	.	.	4,2	.	.	-	2,5	-	.	1,2	-	30,3	.	2,4	.	.	.	0,1	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	321,2	-	.	1,8	.	.	2,6	-	1,5	0,5	14,7	-	10,8	3,8	0,1	.	0,1	21,4	-	0,7	0,6	.	244,2	18,4
12.3.1 Agriculture and forestry	13,4	.	.	0,6	.	.	0,9	-	.	-	4,8	-	-	-	.	.	.	.	-	.	.	.	7,1	-
12.3.2 Fishing	10,9	.	.	-	.	.	-	-	.	-	0,1	-	9,9	-	0,1	.	.	.	-	.	.	.	0,8	.
12.3.3 Commerce and public services	123,6	-	.	1,1	.	.	1,6	-	1,5	-	9,8	-	0,9	1,4	-	.	0,1	0,6	-	0,7	0,6	.	91,9	13,5
12.3.4 Households	173,3	.	.	0,1	.	.	0,2	.	.	0,4	.	.	.	2,4	.	.	.	20,8	.	-	.	.	144,5	4,9
13 Statistical difference (6+7-8-9-10)	52,0	0,7	0,5	-39,3	-10,0	-1,6	31,6	26,7	2,1	2,6	-5,9	0,6	-11,7	-1,9	28,9	13,2	15,3	-0,1	-0,1	0,1	-0,2	0,2	0,2	-
Memo01: Gas flared off on oil fields, terminals and landfills	15,7	.	.	15,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2018	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 663,9	4,2	.	4 470,3	3 148,6	133,3	328,0	.	.	.	.	.	.	.	.	.	.	36,8	3,7	2,2	10,9	8,9	516,9	.
2 Imports	471,2	21,0	11,9	0,4	140,3	.	45,7	17,2	9,9	2,9	10,8	34,0	21,0	1,4	.	58,7	47,9	3,5	14,5	-	.	.	30,0	.
3 Exports	7 818,3	3,2	-	4 239,6	2 645,7	46,5	345,1	172,5	.	2,7	24,6	77,3	47,8	3,2	23,9	57,6	58,8	0,7	2,4	.	.	.	66,6	.
4 International bunkers	39,6	.	.	2,1	.	.	.	-	23,9	.	.	.	12,1	.	0,2	1,2	.	.	.	.	.	.	.	.
4.1 International marine bunkers	15,6	.	.	2,1	.	.	.	.	.	.	.	.	12,1	.	0,2	1,2	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	23,9	.	.	.	.	.	.	-	23,9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-22,6	0,3	0,3	1,8	-16,8	-1,3	-1,7	-0,2	-1,6	-0,1	-0,4	-1,2	-0,8	-0,1	0,7	-1,0	-0,5	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 254,6	22,3	12,2	230,8	626,4	85,4	26,9	-155,5	-15,7	0,1	-14,2	-44,6	-39,7	-1,9	-23,5	-1,1	-11,4	39,6	15,9	2,2	10,9	8,9	480,4	.
7 Transformation processes	-15,5	-2,5	-0,7	-14,3	-606,9	-89,7	44,5	193,1	33,1	0,3	43,2	136,2	84,2	5,5	52,3	-	96,1	-8,5	-0,3	-0,3	-6,9	-7,4	8,9	24,4
7.1 In blast furnaces	-1,0	-1,6	0,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	-4,4	.	.	.	-606,9	-89,7	56,4	191,2	33,1	0,3	43,4	136,2	84,2	5,7	52,3	-	89,3	.	.	.	.	.	.	.
7.3 In thermal power plants	0,4	.	-1,2	-	.	.	.	.	.	.	-0,1	.	.	.	.	.	.	.	.	-0,1	.	.	1,8	.
7.4 In combined heat and power plants	-11,3	-0,9	.	-13,7	.	.	-	.	.	.	-0,1	.	.	.	.	.	-4,3	-1,6	-	-	-4,3	-4,6	10,6	7,6
7.5 In district heating plants	-0,7	.	-	-0,6	.	.	-0,4	.	.	.	-	.	.	-0,2	.	.	.	-6,9	-0,3	-0,1	-2,6	-2,8	-3,5	16,9
7.6 Other transformation processes	1,6	.	.	.	.	.	-11,4	1,9	.	.	-	.	.	.	.	.	11,1	.	.	.	.	.	.	.
8 Energy industries own use	264,4	.	.	182,8	.	.	0,6	.	.	-	0,2	.	14,5	0,1	.	.	25,4	-	-	.	.	.	40,9	-
8.1 Crude petroleum and natural gass production	227,7	.	.	181,4	.	.	-	.	.	.	0,1	.	14,5	-	.	.	.	.	.	.	.	.	31,8	-
8.2 Coal mines	0,2	.	.	.	.	.	-	.	.	-	0,1	.	.	.	.	.	.	.	.	.	.	.	0,1	.
8.3 Oil refineries	27,9	.	.	.	.	.	0,6	.	.	.	-	.	.	-	.	.	25,4	.	.	.	.	.	2,0	.
8.4 Pumping storage power plants	3,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,8	.
8.5 Hydropower plants	2,5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,5	.
8.6 Wind power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.7 Thermal power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.8 Combined heat and power plants	1,7	.	.	1,4	.	.	-	.	.	.	-	.	.	0,1	.	.	.	-	.	.	.	.	0,2	.
8.9 District heating plants	0,6	.	.	.	.	.	.	.	.	.	-	.	.	-	.	.	.	.	-	.	.	.	0,6	-
9 Distribution losses	32,6	.	0,1	0,4	.	.	.	.	.	.	.	.	.	.	.	.	1,5	.	.	0,6	.	.	27,2	2,7
10 Final consumption (11+12)	898,5	20,2	9,9	35,9	.	.	54,4	33,2	17,0	0,6	34,8	95,9	41,7	4,5	2,7	0,2	50,5	31,2	15,6	1,4	4,2	1,3	421,5	21,7
11 Non energy consumption	103,1	2,7	.	18,9	.	.	43,0	.	.	.	.	.	.	.	.	.	38,4	-	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	62,4	0,2	.	18,9	.	.	42,5	.	.	.	.	.	.	.	.	.	0,7	-	.	.	.	.	.	.
11.2 In other production	40,7	2,5	.	-	.	.	0,5	.	.	.	.	.	.	.	.	.	37,7	-	.	.	.	.	.	.
12 Final energy consumption	795,4	17,5	9,9	16,9	.	.	11,4	33,2	17,0	0,6	34,8	95,9	41,7	4,5	2,7	0,2	12,1	31,1	15,6	1,4	4,2	1,3	421,5	21,7
12.1 Manufacturing, constr. and non-fuel mining	265,9	17,5	9,9	11,9	.	.	8,7	.	.	0,1	17,1	.	.	1,9	0,3	0,2	12,0	10,1	0,2	0,2	3,5	1,3	168,8	2,2
12.1.1 Iron and steel	34,4	7,3	7,2	-	.	.	0,1	.	.	.	0,1	.	.	0,1	.	.	0,2	0,4	.	.	-	.	19,0	-
12.1.2 Chemical and petrochemical	60,4	7,5	2,2	4,4	.	.	3,3	.	.	-	0,1	.	.	0,4	-	-	11,2	1,8	0,1	0,1	1,0	.	27,8	0,4
12.1.3 Non-ferrous metals	80,6	.	.	1,8	.	.	0,6	.	.	.	0,2	.	.	-	.	.	0,1	.	.	.	.	.	77,9	0,1
12.1.4 Non-metalic minerals	15,5	2,6	0,6	2,2	.	.	1,9	.	.	-	0,3	.	.	0,2	.	.	0,5	0,5	-	.	2,2	0,8	3,7	-
12.1.5 Transport equipment	1,9	.	.	-	.	.	0,1	.	.	.	0,1	.	.	0,1	.	.	.	-	.	.	-	.	1,6	0,1
12.1.6 Machinery	4,1	.	.	0,2	.	.	-	.	.	.	0,2	.	.	0,1	.	-	.	-	.	-	.	.	3,4	0,2
12.1.7 Mining and quarrying	4,5	.	.	0,1	.	.	0,1	.	.	-	2,7	.	.	-	.	.	.	-	.	.	.	.	1,5	-
12.1.8 Food and tobacco	15,9	.	.	2,1	.	.	1,6	.	.	0,1	0,1	.	.	0,9	0,2	.	.	-	0,1	0,1	-	-	10,0	0,7
12.1.9 Paper, pulp and print	19,2	.	.	0,7	.	.	-	.	.	.	-	.	.	0,1	.	0,2	.	3,9	.	.	0,3	0,4	13,7	-
12.1.10 Wood and wood products	6,7	.	.	0,2	.	.	-	.	.	-	0,3	.	.	-	.	.	.	3,5	.	.	.	0,1	2,3	0,3
12.1.11 Textile and leather	0,4	.	.	-	.	.	-	.	.	.	-	.	.	-	.	.	.	-	.	.	.	.	0,3	-
12.1.12 Construction	19,3	.	.	-	.	.	0,4	.	.	-	12,9	.	.	-	.	.	.	.	.	.	.	.	5,5	0,5
12.1.13 Other industries	3,0	.	.	0,2	.	.	0,6	.	.	-	-	.	.	-	.	-	.	0,1	-	.	.	-	2,1	-
12.2 Transport	203,6	.	.	3,6	.	.	0,3	33,2	15,7	.	1,8	95,9	30,3	.	2,4	.	.	.	15,4	0,8	.	.	4,3	.
12.2.1 Road	145,3	.	.	0,3	.	.	0,3	30,5	.	.	.	95,9	.	.	.	.	.	.	15,3	0,8	.	.	2,3	.
12.2.2 Rail	2,7	.	.	.	.	.	-	.	.	.	0,6	.	.	.	.	.	.	.	.	.	.	.	2,1	.
12.2.3 Domestic aviation	15,8	.	.	.	.	.	.	0,1	15,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	39,8	.	.	3,3	.	.	-	2,6	-	.	1,2	-	30,3	.	2,4	.	.	.	0,1	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	325,9	-	.	1,5	.	.	2,4	-	1,4	0,5	15,9	-	11,5	2,6	-	-	0,1	21,0	-	0,5	0,7	.	248,3	19,5
12.3.1 Agriculture and forestry	13,5	.	.	0,6	.	.	0,8	-	-	-	4,8	-	-	-	.	.	.	.	-	.	.	.	7,3	-
12.3.2 Fishing	11,8	.	.	-	.	.	-	.	.	.	0,1	.	10,9	-	-	.	.	.	.	.	.	.	0,8	.
12.3.3 Commerce and public services	127,7	-	.	0,8	.	.	1,4	-	1,4	0,1	11,0	-	0,6	1,1	.	.	0,1	0,7	-	0,5	0,7	.	95,0	14,4
12.3.4 Households	173,0	.	.	0,1	.	.	0,2	.	.	0,4	.	.	.	1,5	.	.	.	20,3	.	.	.	.	145,3	5,1
13 Statistical difference (6+7-8-9-10)	43,6	-0,4	1,4	-2,6	19,4	-4,2	16,5	4,3	0,5	-0,1	-6,0	-4,3	-11,7	-1,0	26,2	-1,3	7,3	-	-0,1	-0,1	-0,2	0,2	-0,3	-
Memo01: Gas flared off on oil fields, terminals and landfills	13,7	.	.	13,7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2019	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 172,4	3,4	.	4 223,4	2 990,8	119,2	298,5	.	.	.	.	.	.	.	.	.	.	37,9	3,2	2,7	10,9	8,9	473,6	.
2 Imports	512,7	22,3	10,2	1,0	149,3	.	41,6	22,6	10,7	2,5	13,5	43,3	28,1	3,3	0,5	41,1	54,3	3,9	19,9	-	.	.	44,5	.
3 Exports	7 489,8	2,2	-	4 015,9	2 600,2	44,6	312,8	162,1	0,4	2,3	22,0	70,7	45,8	1,9	34,9	67,4	58,6	0,5	3,0	-	.	.	44,3	.
4 International bunkers	38,5	.	.	2,2	.	.	.	-	23,8	.	.	.	10,8	.	0,1	1,4	.	.	.	.	.	.	.	.
4.1 International marine bunkers	14,6	.	.	2,2	.	.	.	.	.	.	.	.	10,8	.	0,1	1,4	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	23,9	.	.	.	.	.	.	-	23,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	33,5	-0,2	-	2,3	26,4	1,1	1,2	-1,9	-0,2	-	0,7	2,4	1,6	0,1	0,1	1,3	-1,3	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 190,3	23,3	10,2	208,6	566,2	75,7	28,5	-141,5	-13,8	0,2	-7,8	-25,0	-27,0	1,5	-34,3	-26,5	-5,5	41,3	20,0	2,7	10,9	8,9	473,8	.
7 Transformation processes	-16,6	-2,4	-0,6	-13,1	-562,5	-80,3	36,8	161,0	28,3	1,7	37,3	120,2	77,9	2,9	43,4	33,0	90,2	-9,0	-0,3	-0,3	-6,9	-7,4	8,7	24,8
7.1 In blast furnaces	-0,9	-1,5	0,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	-7,2	.	.	.	-562,5	-80,3	48,8	159,1	28,3	1,7	37,4	120,2	77,9	3,1	43,4	33,0	82,6	.	.	.	.	.	.	.
7.3 In thermal power plants	0,3	.	-1,3	-	.	.	.	.	.	.	-0,1	.	.	.	.	.	.	-	.	-0,1	.	.	1,7	.
7.4 In combined heat and power plants	-9,7	-0,9	.	-12,6	.	.	-	.	.	.	-	.	.	-	.	.	-3,6	-1,8	-	.	-4,4	-4,8	10,2	8,2
7.5 In district heating plants	-0,6	.	-	-0,5	.	.	-0,5	.	.	.	-	.	.	-0,1	.	.	.	-7,2	-0,2	-0,2	-2,5	-2,7	-3,2	16,6
7.6 Other transformation processes	1,6	.	.	.	.	.	-11,4	1,9	.	.	.	.	.	.	.	.	11,1	.	.	.	.	.	.	.
8 Energy industries own use	260,5	.	.	184,8	.	.	0,6	.	.	.	0,1	.	14,9	-	.	.	20,5	-	-	-	.	.	39,0	0,5
8.1 Crude petroleum and natural gass production	227,1	.	.	182,2	.	.	-	.	.	.	0,1	.	14,9	-	.	.	.	.	.	.	.	.	30,0	-
8.2 Coal mines	-	.	.	.	.	.	-	.	.	.	-	.	.	.	.	.	.	.	.	.	.	.	-	.
8.3 Oil refineries	23,0	.	.	-	.	.	0,6	.	.	.	-	.	.	-	.	.	20,5	.	.	.	.	.	1,8	.
8.4 Pumping storage power plants	3,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,8	.
8.5 Hydropower plants	2,8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,8	.
8.6 Wind power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.7 Thermal power plants	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.8 Combined heat and power plants	3,1	.	.	2,6	.	.	.	.	.	.	-	.	.	0,1	.	.	.	-	.	-	.	.	0,2	0,2
8.9 District heating plants	0,7	.	.	.	.	.	.	.	.	.	-	.	.	-	.	.	.	.	-	.	.	.	0,4	0,3
9 Distribution losses	30,5	.	0,1	0,3	.	.	.	.	.	.	.	.	.	.	.	.	1,5	.	.	0,6	.	.	25,2	2,7
10 Final consumption (11+12)	891,5	20,3	9,3	39,4	.	.	51,3	30,5	16,6	0,1	33,2	89,7	43,7	2,8	2,7	0,4	52,1	32,3	19,9	1,7	4,2	1,3	418,6	21,5
11 Non energy consumption	104,0	2,2	.	21,8	.	.	40,6	.	.	.	.	.	.	.	.	.	39,3	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	63,2	.	.	21,8	.	.	40,6	.	.	.	.	.	.	.	.	.	0,8	.	.	.	.	.	.	.
11.2 In other production	40,8	2,2	.	-	.	.	-	.	.	.	.	.	.	.	.	.	38,5	.	.	.	.	.	.	.
12 Final energy consumption	787,6	18,0	9,3	17,6	.	.	10,7	30,5	16,6	0,1	33,2	89,7	43,7	2,8	2,7	0,4	12,8	32,3	19,9	1,7	4,2	1,3	418,6	21,5
12.1 Manufacturing, constr. and non-fuel mining	267,7	18,0	9,3	12,7	.	.	8,6	.	.	0,1	15,3	.	.	1,7	0,3	0,3	12,7	12,6	0,4	0,2	3,5	1,3	168,6	2,1
12.1.1 Iron and steel	34,1	7,6	7,0	-	.	.	-	.	.	.	0,1	.	.	0,2	.	.	0,6	0,6	.	.	-	.	18,0	-
12.1.2 Chemical and petrochemical	62,2	8,1	1,7	4,5	.	.	3,8	.	.	-	0,1	.	.	0,3	-	0,1	11,4	3,6	0,1	0,2	1,1	.	27,0	0,3
12.1.3 Non-ferrous metals	81,5	.	.	1,9	.	.	0,7	.	.	.	0,1	.	.	-	.	.	0,1	.	.	.	.	.	78,7	-
12.1.4 Non-metalic minerals	15,1	2,3	0,6	2,1	.	.	1,4	.	.	-	0,4	.	.	0,1	.	.	0,6	0,5	.	.	2,4	0,9	3,6	-
12.1.5 Transport equipment	2,0	.	.	0,1	.	.	0,1	.	.	.	0,2	.	.	0,1	.	-	.	.	.	.	.	.	1,5	0,1
12.1.6 Machinery	5,0	.	.	0,1	.	.	0,1	.	.	.	0,2	.	.	0,1	.	.	.	-	-	-	-	.	4,2	0,2
12.1.7 Mining and quarrying	4,6	.	.	0,1	.	.	0,1	.	.	.	2,7	.	.	-	.	.	.	.	.	.	.	.	1,6	.
12.1.8 Food and tobacco	16,3	.	.	2,3	.	.	1,5	.	.	-	0,2	.	.	0,7	0,3	.	.	-	0,3	-	.	-	10,3	0,6
12.1.9 Paper, pulp and print	19,2	.	.	1,1	.	.	0,1	.	.	-	0,1	.	.	0,1	.	0,2	.	4,1	.	.	-	0,3	13,2	-
12.1.10 Wood and wood products	7,2	.	.	0,2	.	.	-	.	.	-	0,4	.	.	-	.	.	.	3,9	.	.	.	0,1	2,3	0,3
12.1.11 Textile and leather	0,4	.	.	-	.	.	-	.	.	.	-	.	.	-	.	.	.	-	.	.	.	-	0,4	-
12.1.12 Construction	17,0	.	.	0,1	.	.	0,3	.	.	-	10,8	.	.	-	.	.	.	.	.	.	.	.	5,3	0,5
12.1.13 Other industries	3,1	.	.	0,1	.	.	0,4	.	.	-	0,1	.	.	-	.	-	.	-	-	.	.	.	2,4	-
12.2 Transport	201,9	.	.	3,5	.	.	0,2	30,5	15,2	.	1,8	89,6	32,9	.	2,4	0,1	.	.	19,5	1,0	.	.	5,1	.
12.2.1 Road	141,4	.	.	0,3	.	.	0,2	27,8	.	.	.	89,6	.	.	.	.	.	.	19,3	1,0	.	.	3,1	.
12.2.2 Rail	2,6	.	.	.	.	.	-	.	.	.	0,6	.	.	.	.	.	.	.	.	.	.	.	2,0	.
12.2.3 Domestic aviation	15,3	.	.	.	.	.	.	0,1	15,2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	42,6	.	.	3,2	.	.	-	2,6	-	.	1,1	-	32,9	.	2,4	0,1	.	.	0,2	-	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	318,0	-	.	1,4	.	.	1,8	-	1,4	-	16,1	0,1	10,8	1,0	-	-	0,1	19,6	-	0,5	0,7	.	244,9	19,4
12.3.1 Agriculture and forestry	13,3	.	.	0,6	.	.	0,6	-	-	.	4,7	-	-	-	.	.	.	.	-	.	.	.	7,3	-
12.3.2 Fishing	11,6	.	.	.	.	.	-	-	.	.	0,1	-	10,8	-	.	.	.	.	-	.	.	.	0,8	.
12.3.3 Commerce and public services	124,9	-	.	0,8	.	.	1,1	-	1,4	-	11,3	-	0,1	0,6	-	-	0,1	1,1	-	0,5	0,7	.	93,4	13,8
12.3.4 Households	168,2	.	.	0,1	.	.	0,2	.	.	-	.	.	.	0,4	.	.	.	18,6	.	-	.	.	143,4	5,6
13 Statistical difference (6+7-8-9-10)	-8,7	0,7	0,2	-29,1	3,7	-4,7	13,5	-11,1	-2,2	1,8	-3,7	5,6	-7,7	1,7	6,4	6,1	10,6	-	-0,1	0,1	-0,2	0,2	-0,3	-
Memo01: Gas flared off on oil fields, terminals and landfills	12,3	.	.	12,3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2020	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 732,4	1,9	.	4 104,7	3 606,2	120,3	283,5	.	.	.	.	.	.	.	.	.	.	41,9	3,1	2,7	10,9	8,5	548,6	.
2 Imports	466,2	23,9	9,2	1,2	138,3	.	43,8	18,7	9,8	1,9	16,0	49,5	34,1	2,6	0,4	34,4	46,3	2,8	17,2	-	.	.	16,2	.
3 Exports	7 963,7	1,3	.	3 913,6	3 208,5	38,8	299,3	139,4	2,8	0,7	17,9	55,5	38,3	1,0	26,1	65,0	61,0	1,0	3,6	-	.	.	89,9	.
4 International bunkers	21,3	.	.	2,4	.	.	.	-	7,6	.	.	.	10,4	.	-	0,9	.	.	.	.	.	.	.	.
4.1 International marine bunkers	13,7	.	.	2,4	.	.	.	.	.	.	.	.	10,4	.	-	0,9	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	7,6	.	.	.	.	.	.	-	7,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5 Stock changes	-35,3	0,7	0,1	0,3	-31,1	-0,7	1,6	-0,4	-0,4	-	-0,9	-2,8	-1,9	-	-0,8	-0,9	1,9	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 178,3	25,2	9,3	190,2	504,9	80,8	29,6	-121,0	-1,0	1,2	-2,9	-8,9	-16,5	1,5	-26,5	-32,4	-12,8	43,7	16,8	2,7	10,9	8,5	474,9	.
7 Transformation processes	-6,6	-3,0	0,6	-9,9	-506,0	-83,9	42,1	156,3	16,0	0,6	35,5	110,0	75,9	1,8	27,6	27,3	95,1	-8,0	-0,1	-0,2	-6,7	-7,3	6,7	22,9
7.1 In blast furnaces	-0,8	-2,2	1,5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	-1,0	.	.	.	-506,0	-83,9	52,3	154,6	16,0	0,6	35,5	110,0	75,9	1,9	27,6	27,3	87,2	.	.	.	.	.	.	.
7.3 In thermal power plants	1,1	.	-0,9	.	.	.	.	.	.	.	-	.	.	.	.	.	.	-	.	-0,1	.	.	2,1	.
7.4 In combined heat and power plants	-6,8	-0,8	.	-9,6	.	.	-	.	.	.	-	.	.	-	.	.	-1,6	-1,7	-	-	-4,3	-4,6	8,1	7,7
7.5 In district heating plants	-0,6	.	-	-0,3	.	.	-0,2	.	.	.	-	.	.	-0,1	.	.	.	-6,2	-0,1	-0,2	-2,5	-2,7	-3,5	15,2
7.6 Other transformation processes	1,3	.	.	.	.	.	-9,9	1,7	.	.	.	.	.	.	.	.	9,6	.	.	.	.	.	.	.
8 Energy industries own use	257,1	.	.	178,7	.	.	0,4	.	.	.	0,1	.	14,9	0,1	.	.	22,1	.	-	.	.	.	40,3	0,5
8.1 Crude petroleum and natural gass production	221,3	.	.	175,0	.	.	-	.	.	.	0,1	.	14,9	-	.	.	.	.	.	.	.	.	31,3	-
8.2 Coal mines	-	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	.	.	.	.	-	.
8.3 Oil refineries	24,5	.	.	-	.	.	0,4	.	.	.	-	.	.	-	.	.	22,1	.	.	.	.	.	1,9	.
8.4 Pumping storage power plants	3,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,4	.
8.5 Hydropower plants	3,2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3,2	.
8.6 Wind power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.7 Thermal power plants	-	.	.	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.8 Combined heat and power plants	4,2	.	.	3,7	.	.	.	.	.	.	-	.	.	0,1	.	.	.	.	.	.	.	.	0,2	0,2
8.9 District heating plants	0,5	.	.	.	.	.	.	.	.	.	-	.	.	-	.	.	.	.	-	.	.	.	0,2	0,2
9 Distribution losses	28,3	.	-	0,3	.	.	.	.	.	.	.	.	.	.	.	.	1,7	.	.	0,7	.	.	22,9	2,7
10 Final consumption (11+12)	875,7	20,5	9,4	36,5	.	.	53,1	28,9	12,0	-	33,1	87,0	45,7	1,5	1,1	0,1	49,0	35,7	16,3	1,9	4,3	1,1	418,7	19,7
11 Non energy consumption	102,1	2,1	.	20,7	.	.	41,9	.	.	.	.	.	.	.	.	.	37,5	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	63,3	.	.	20,7	.	.	41,9	.	.	.	.	.	.	.	.	.	0,7	.	.	.	.	.	.	.
11.2 In other production	38,8	2,1	.	-	.	.	-	.	.	.	.	.	.	.	.	.	36,7	.	.	.	.	.	.	.
12 Final energy consumption	773,6	18,4	9,4	15,8	.	.	11,2	28,9	12,0	-	33,1	87,0	45,7	1,5	1,1	0,1	11,5	35,7	16,3	1,9	4,3	1,1	418,7	19,7
12.1 Manufacturing, constr. and non-fuel mining	269,3	18,4	9,4	11,3	.	.	9,7	.	.	0,1	14,6	.	.	1,7	0,3	0,1	11,4	14,4	0,3	0,2	3,6	1,1	170,7	2,2
12.1.1 Iron and steel	33,9	7,0	7,7	0,1	.	.	-	.	.	.	-	.	.	0,2	.	.	0,2	0,8	.	.	0,1	.	17,7	-
12.1.2 Chemical and petrochemical	66,0	9,5	1,2	3,8	.	.	4,5	.	.	-	0,1	.	.	0,3	-	.	10,9	5,0	-	0,2	0,7	.	29,3	0,5
12.1.3 Non-ferrous metals	82,4	.	.	1,8	.	.	1,0	.	.	.	0,2	.	.	-	.	.	0,1	.	.	.	.	.	79,3	-
12.1.4 Non-metalic minerals	14,2	1,8	0,5	1,8	.	.	1,6	.	.	-	0,6	.	.	0,1	.	.	0,2	0,4	-	.	2,7	0,8	3,6	-
12.1.5 Transport equipment	1,8	.	.	-	.	.	0,1	.	.	-	0,1	.	.	0,1	.	.	.	.	-	.	.	.	1,4	0,1
12.1.6 Machinery	5,3	.	.	0,1	.	.	0,1	.	.	-	0,2	.	.	0,1	.	.	.	.	-	-	.	.	4,6	0,2
12.1.7 Mining and quarrying	4,6	.	.	0,1	.	.	0,1	.	.	.	2,7	.	.	-	.	.	.	.	-	.	-	.	1,6	.
12.1.8 Food and tobacco	17,1	.	.	2,4	.	.	1,5	.	.	-	0,4	.	.	0,8	0,3	.	.	0,1	0,2	-	-	-	10,7	0,6
12.1.9 Paper, pulp and print	17,9	.	.	0,8	.	.	-	.	.	.	0,1	.	.	0,1	.	0,1	.	4,1	-	.	.	0,3	12,4	-
12.1.10 Wood and wood products	7,2	.	.	0,1	.	.	-	.	.	-	0,3	.	.	-	.	.	.	3,9	-	.	.	-	2,5	0,3
12.1.11 Textile and leather	0,4	.	.	-	.	.	-	.	.	.	-	.	.	-	.	.	.	-	.	.	.	.	0,3	-
12.1.12 Construction	15,7	.	.	-	.	.	0,2	.	.	.	9,8	.	.	-	.	.	.	.	.	.	.	.	5,3	0,4
12.1.13 Other industries	2,8	.	.	0,2	.	.	0,5	.	.	-	0,1	.	.	-	.	.	.	-	-	-	-	.	2,0	-
12.2 Transport	190,0	.	.	3,3	.	.	0,2	28,9	10,6	.	1,7	87,0	33,6	.	0,9	.	.	.	16,0	1,0	.	.	6,9	.
12.2.1 Road	134,2	.	.	0,2	.	.	0,2	26,1	.	.	.	87,0	.	.	.	.	.	.	15,8	1,0	.	.	3,9	.
12.2.2 Rail	3,6	.	.	.	.	.	-	.	.	.	0,6	.	.	.	.	.	.	.	.	.	.	.	3,0	.
12.2.3 Domestic aviation	10,7	.	.	.	.	.	.	0,1	10,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.2.4 Domestic navigation	41,6	.	.	3,1	.	.	-	2,7	.	.	1,1	-	33,6	.	0,9	.	.	.	0,2	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	314,3	-	.	1,3	.	.	1,3	-	1,4	-	16,9	-	12,1	-0,2	.	.	0,1	21,3	-	0,7	0,7	.	241,2	17,5
12.3.1 Agriculture and forestry	13,6	.	.	0,6	.	.	0,4	-	.	.	4,8	-	-	-	.	.	.	.	-	-	.	.	7,7	-
12.3.2 Fishing	12,9	.	.	.	.	.	-	-	.	.	0,1	-	12,0	.	.	.	.	.	-	.	.	.	0,9	.
12.3.3 Commerce and public services	119,1	-	.	0,6	.	.	0,8	-	1,4	-	12,0	-	-	-0,2	.	.	0,1	1,1	-	0,7	0,7	.	89,7	12,2
12.3.4 Households	168,7	.	.	0,1	.	.	0,1	.	.	.	.	.	.	-	.	.	.	20,3	.	.	.	.	143,0	5,3
13 Statistical difference (6+7-8-9-10)	10,5	1,7	0,5	-35,3	-1,0	-3,1	18,2	6,4	2,9	1,8	-0,6	14,1	-1,1	1,8	-0,1	-5,3	9,5	0,1	0,3	-0,1	-0,1	0,1	-0,3	-
Memo01: Gas flared off on oil fields, terminals and landfills	10,6	.	.	10,6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Energy balance (PJ) 2021	Total	Coal	Coal products	Natural gas	Crude oil	NGL	LPG, ethane	Gasolines [1]	Jet kerosene	Other kerosenes	Off-road diesel	Road diesel [1]	Marine gas oil	Gas oil/ diesel oil	Heavy gas oil	Fuel oil	Other oil products	Solid biofuels	Liquid biofuels	Biogas	Nonrenew-able waste	Renewable waste	Elec-tricity	District heating
1 Primary energy production	8 947,9	3,4	.	4 220,7	3 733,2	119,0	236,0	.	.	.	.	.	.	.	.	.	.	48,1	3,2	2,7	11,0	8,6	562,0	.
2 Imports	464,3	24,8	9,2	5,7	105,6	.	49,2	19,5	8,6	0,9	18,2	55,2	37,4	2,2	-	36,1	42,1	3,9	15,9	-	.	.	29,6	.
3 Exports	8 211,7	2,3	.	4 008,8	3 370,0	37,2	271,4	174,2	10,0	.	21,6	65,3	44,3	0,9	16,1	32,9	59,4	1,7	2,8	-	.	.	92,9	.
4 International bunkers	21,1	.	.	2,4	.	.	.	-	7,0	.	.	.	10,7	.	-	0,9	.	.	-	.	.	.	.	.
4.1 International marine bunkers	14,0	.	.	2,4	.	.	.	.	.	.	.	.	10,7	.	-	0,9	.	.	.	.	.	.	.	.
4.2 International aviation bunkers	7,1	.	.	.	.	.	.	-	7,0	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.
5 Stock changes	36,5	0,2	-0,1	-5,2	34,1	-0,4	-1,8	1,2	2,2	-	0,6	1,9	1,3	-	1,3	1,6	-0,4	.	.	.	.	.	.	.
6 Total energy supply (1+2-3-4+5)	1 216,0	26,1	9,1	210,0	502,9	81,4	11,9	-153,5	-6,2	0,9	-2,7	-8,2	-16,2	1,3	-14,9	4,0	-17,7	50,3	16,4	2,7	11,0	8,6	498,7	.
7 Transformation processes	-7,2	-3,1	0,4	-4,2	-471,1	-84,2	46,6	183,7	20,1	-	32,7	99,1	67,2	1,1	15,5	-6,9	92,2	-11,1	-0,8	-0,2	-6,9	-7,5	2,8	27,4
7.1 In blast furnaces	-0,9	-2,3	1,5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7.2 In oil refineries	0,3	.	.	.	-471,1	-84,2	56,7	182,0	20,1	-	32,8	99,1	67,2	1,4	15,5	-6,9	87,8	.	.	.	.	.	.	.
7.3 In thermal power plants	1,5	.	-1,0	-	.	.	.	-	.	.	-0,1	.	.	.	.	.	.	-	.	-	.	.	2,6	.
7.4 In combined heat and power plants	-8,4	-0,8	.	-3,7	.	.	-	.	.	.	-	.	.	-	.	.	-5,0	-2,4	-0,1	-	-3,9	-4,2	4,0	7,8
7.5 In district heating plants	-1,1	.	-	-0,5	.	.	-0,4	.	.	.	-	.	.	-0,3	.	.	.	-8,7	-0,7	-0,1	-3,0	-3,3	-3,8	19,7
7.6 Other transformation processes	1,4	.	.	.	.	.	-9,7	1,7	.	.	-	.	.	.	.	.	9,5	.	.	.	.	.	.	.
8 Energy industries own use	240,9	.	.	167,8	.	.	0,3	.	.	-	0,2	.	14,4	0,2	.	.	22,2	-	-	.	.	.	35,1	0,6
8.1 Crude petroleum and natural gass production	208,8	.	.	166,1	.	.	-	.	.	-	0,1	.	14,4	-	.	.	.	.	-	.	.	.	28,1	-
8.2 Coal mines	-	.	.	.	.	.	.	.	.	.	-	.	.	.	.	.	.	.	-	.	.	.	-	.
8.3 Oil refineries	24,6	.	.	-	.	.	0,3	.	.	.	-	.	.	0,2	.	.	22,2	.	-	.	.	.	1,8	.
8.4 Pumping storage power plants	2,1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,1	.
8.5 Hydropower plants	2,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2,4	.
8.6 Wind power plants	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.7 Thermal power plants	-	.	.	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	.
8.8 Combined heat and power plants	2,1	.	.	1,7	.	.	.	.	.	.	0,1	.	.	0,1	.	.	.	.	-	.	.	.	0,2	0,2
8.9 District heating plants	0,9	.	.	.	.	.	-	.	.	.	-	.	.	-	.	.	.	-	-	.	.	.	0,5	0,4
9 Distribution losses	40,2	.	0,1	0,4	.	.	.	.	.	.	.	.	.	.	.	.	1,7	.	.	0,5	.	.	34,7	2,9
10 Final consumption (11+12)	901,9	22,8	9,7	34,9	.	.	52,5	26,9	12,3	0,1	34,3	93,3	45,6	2,1	0,5	0,3	47,9	39,3	16,4	2,0	4,2	1,0	432,0	24,0
11 Non energy consumption	97,8	2,3	.	18,1	.	.	41,0	.	.	.	.	.	.	.	.	.	36,4	.	.	.	.	.	.	.
11.1 In manufacture of industrial chemicals	59,8	.	.	18,1	.	.	41,0	.	.	.	.	.	.	.	.	.	0,7	.	.	.	.	.	.	.
11.2 In other production	38,0	2,3	.	-	.	.	-	.	.	.	.	.	.	.	.	.	35,7	.	.	.	.	.	.	.
12 Final energy consumption	804,1	20,5	9,7	16,9	.	.	11,6	26,9	12,3	0,1	34,3	93,3	45,6	2,1	0,5	0,3	11,4	39,3	16,4	2,0	4,2	1,0	432,0	24,0
12.1 Manufacturing, constr. and non-fuel mining	284,5	20,5	9,7	12,3	.	.	9,1	.	.	-	15,1	.	.	1,7	0,2	0,3	11,4	16,1	0,5	0,3	3,5	1,0	179,8	3,0
12.1.1 Iron and steel	35,1	6,8	8,2	-	.	.	0,1	.	.	.	0,1	.	.	0,1	.	.	0,3	0,8	-	.	0,1	.	18,6	-
12.1.2 Chemical and petrochemical	72,1	11,7	1,1	4,5	.	.	3,6	.	.	-	0,2	.	.	0,3	.	-	10,8	6,0	-	0,2	0,6	.	32,7	0,4
12.1.3 Non-ferrous metals	86,6	.	.	1,7	.	.	0,9	.	.	.	0,2	.	.	-	.	.	0,1	.	-	.	.	.	83,6	0,1
12.1.4 Non-metalic minerals	14,4	2,0	0,4	2,0	.	.	1,8	.	.	-	0,3	.	.	0,1	.	.	0,2	0,5	-	.	2,8	0,7	3,7	-
12.1.5 Transport equipment	2,0	.	.	0,1	.	.	0,1	.	.	-	0,2	.	.	-	.	.	.	-	-	.	.	.	1,5	0,1
12.1.6 Machinery	4,7	.	.	0,2	.	.	0,1	.	.	-	0,2	.	.	-	.	.	.	-	-	-	-	.	4,0	0,2
12.1.7 Mining and quarrying	4,6	.	.	0,1	.	.	0,1	.	.	-	2,7	.	.	-	.	.	.	-	0,1	.	.	.	1,7	-
12.1.8 Food and tobacco	17,8	.	.	2,3	.	.	1,5	.	.	-	0,3	.	.	1,0	0,2	-	.	-	0,1	-	-	-	11,7	0,7
12.1.9 Paper, pulp and print	19,7	.	.	1,1	.	.	0,1	.	.	.	0,1	.	.	0,1	.	0,2	.	4,7	-	.	.	0,2	12,5	0,7
12.1.10 Wood and wood products	7,4	.	.	0,1	.	.	-	.	.	-	0,3	.	.	-	.	.	.	4,1	-	.	.	-	2,4	0,4
12.1.11 Textile and leather	0,4	.	.	-	.	.	-	.	.	.	-	.	.	-	.	.	.	-	-	.	.	.	0,3	-
12.1.12 Construction	16,7	.	.	-	.	.	0,4	.	.	.	10,4	.	.	-	.	.	.	.	0,2	-	.	.	5,2	0,5
12.1.13 Other industries	3,0	.	.	0,2	.	.	0,6	.	.	-	0,1	.	.	-	.	-	-	0,1	-	.	.	.	2,0	-
12.2 Transport	194,0	.	.	3,2	.	.	0,2	26,9	11,0	.	1,6	93,2	33,3	.	0,3	.	.	.	15,5	1,2	.	.	7,6	.
12.2.1 Road	139,3	.	.	-	.	.	0,2	24,1	.	.	.	93,2	.	.	.	.	.	.	15,1	1,2	.	.	5,5	.
12.2.2 Rail	2,7	.	.	.	.	.	-	.	.	.	0,6	.	.	.	.	.	.	.	-	.	.	.	2,1	.
12.2.3 Domestic aviation	11,1	.	.	.	.	.	.	0,1	11,0	.	.	.	.	.	.	.	.	.	0,1	.	.	.	.	.
12.2.4 Domestic navigation	40,8	.	.	3,2	.	.	-	2,7	.	.	1,0	-	33,3	.	0,3	.	.	.	0,3	.	.	.	.	.
12.2.5 Other transport	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12.3 Other	325,6	-	.	1,3	.	.	2,2	-	1,3	-	17,5	0,1	12,3	0,4	-	.	.	23,2	0,4	0,5	0,7	.	244,6	21,0
12.3.1 Agriculture and forestry	13,3	.	.	0,6	.	.	0,7	-	.	.	4,9	-	-	-	.	.	.	.	0,1	-	.	.	6,9	-
12.3.2 Fishing	13,1	.	.	.	.	.	-	-	.	.	0,1	.	12,2	.	.	.	.	.	-	.	.	.	0,8	.
12.3.3 Commerce and public services	126,6	-	.	0,6	.	.	1,3	.	1,3	-	12,5	0,1	0,1	0,3	-	.	.	0,7	0,3	0,5	0,7	.	93,3	14,8
12.3.4 Households	172,6	.	.	0,1	.	.	0,2	.	.	.	.	.	.	-	.	.	.	22,5	.	-	.	.	143,7	6,2
13 Statistical difference (6+7-8-9-10)	25,8	0,2	-0,2	2,7	31,8	-2,8	5,7	3,4	1,5	0,9	-4,5	-2,4	-9,0	0,1	0,1	-3,2	2,7	-	-0,8	-	-0,2	0,2	-0,3	-0,1
Memo01: Gas flared off on oil fields, terminals and landfills	9,4	.	.	9,4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Annex IV: CO2 capture and storage

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1. Capture from Sleipner Vest Field well stream and storage at Sleipner Øst Field

1.1 The reservoir's ability to store CO_2 over time

Key goals for geological CO_2 storage site selection and characterization are to assess how much CO_2 can be stored at a potential storage site, demonstrate that the site is capable of meeting required storage performance criteria and to establish a baseline for the management and monitoring of the CO_2 injection and storage.

CO_2 separated from the from well stream at the Sleipner Vest Field is injected into the Utsira Formation at Sleipner Øst for storage. The Utsira Formation aquifer, which is located above the producing reservoirs at a depth of 800 – 1000 m below sea level, was chosen for CO_2 storage because of its large extension (which guarantees sufficient volume), and its excellent porosity and permeability (which is well suited for high injectivity). Furthermore, the formation is overlain by a thick, widespread sequence of Hordaland Group shales, which should act as an effective barrier to vertical CO_2 leakage, see figure AIV-1 below:

Figure AIV- 1 CO_2 capture at Sleipner Vest and storage at Sleipner Øst

The Utsira formation has the following properties:

- Dome type of structure
- Large extension
- Thickness: 150 – 200 m
- Temp. = 37 degC, P = 104 bar (hydrostatic)
- Unconsolidated fine-grained sand
- High permeability (~ 2 D) and high porosity (35-40%)
- Homogeneous
- Water filled

It also contains several thin intercalated shale layers (1-1.5m), as well as a 5 m thick shaly interval about 20 m below the top. In the Sleipner case it has been very important to locate the injection well and the storage site such that the injected CO_2 could not migrate back to the Sleipner A platform (SLA) and the production wells. This will both prevent corrosion problems in the production wells and minimise the risk of CO_2 leakage through production wells. The injection point is located 2.5 km east of the Sleipner A platform. Following is a figure illustrating the distance between the injection point and the Sleipner installation. Migration evaluations have been based on the Top Utsira map (figure below) with the CO_2 expected to migrate vertically to the sealing shales and horizontally along the saddle point of the structure. This will take the CO_2 away from other wells drilled from the Sleipner platform.

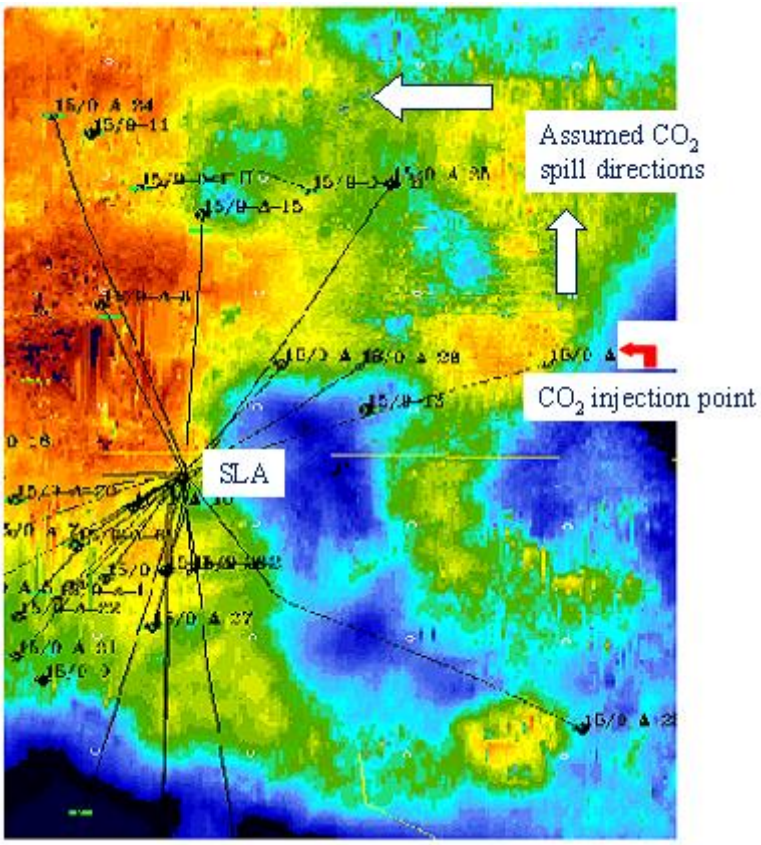

Figure AIV- 2 Position of CO_2 injection point and expected migration direction of CO_2 Sleipner field.

1.2 Applied methods for monitoring the injected CO_2

a) 4D seismic monitoring:

- Baseline seismic survey was shot prior to injection in 1994.
- Repeat time lapse seismic monitoring have been acquired in 1999, 2001, 2002, 2004, 2006, 2008, 2010, 2013, 2016 and 2020.

b) Gravimetric monitoring:

- Pre-installed 30 concrete benchmarks in 2002 across the CO_2 bubble
- Repeat survey 2005 and 2013.

c) Pressure measurements:

The need for reservoir measurements of pressure and temperature in the injection well is being continuously evaluated. Up until now, these measurements have not been deemed critical

d) Well monitoring, safety precautions (leakage):

The wells in the Sleipner area are plotted on a chart to indicate the positioning relative to the CO_2 injection well. The relative distances are given at the top of the Utsira formation. The labels numbered "900" indicate where the wells are penetrating the 900 meter depth level (top of Utsira formation).

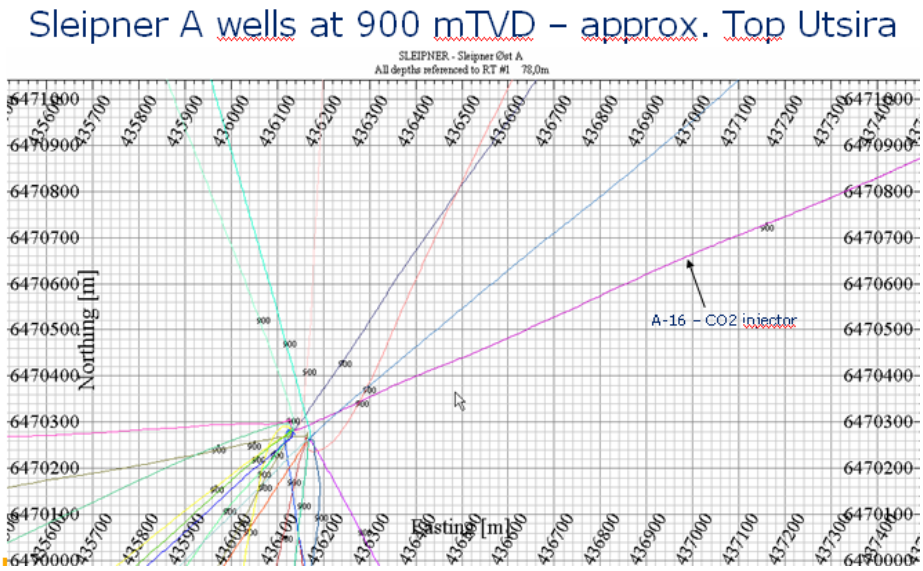

Figure AIV- 3 Positions of Sleipner production wells relative to the CO_2 injection well.

The figure shows that the distance from the CO_2 injection well to the closest neighbouring well is 1000 metres at top of the Utsira formation. Note that the extension of the CO_2 plume is found to be extending NE-SW from the injection point, based on seismic data, and that no production wells (other than the injector) are exposed to the CO_2 plume. This is in accordance with the simulations carried out for the injection on Sleipner.

The main well design at Utsira level:

- 18 5/8" casing set above Utsira Formation
- 13 3/8" casing through Utsira Formation
  - 13 Cr casing from 10 m MD below to 50 m MD above Utsira Formation
  - cemented into 18 5/8" casing

The material quality chosen for the casing through Utsira formation, increases the wells' resistance against CO_2 corrosion.

The reported amounts of CO_2 which are injected in the Utsira formation are based on continuous metering of the gas stream by orifice meter.

1.3 Results of the monitoring programme

a) 4-D seismic

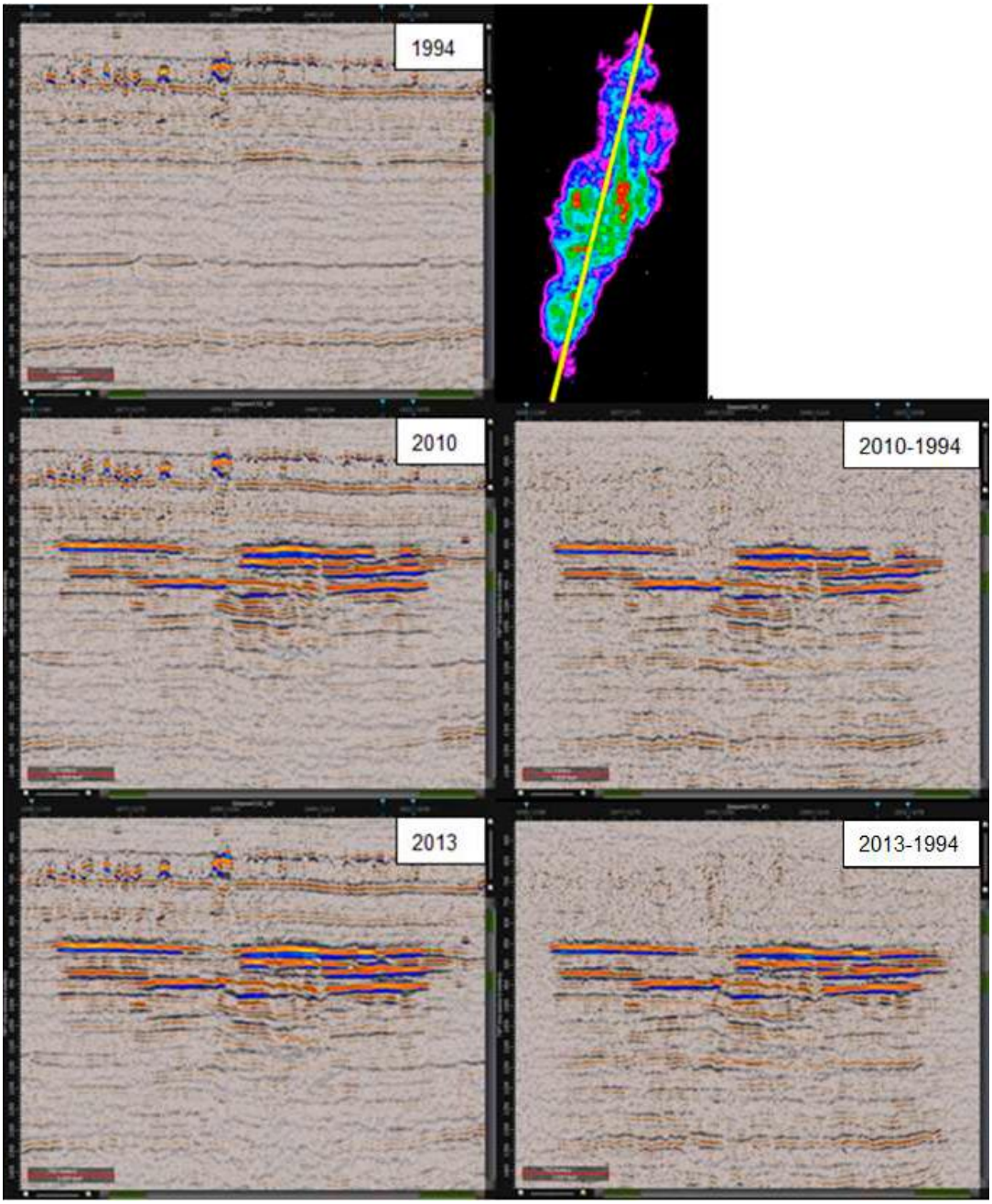

Figure AIV- 4 Results of seismic monitoring 1994 – 2013.Seismic section shown on the upper right figure.

The figure above is based on seismic data from 1994 – 2013.
Based on the seismic data, the extent of the CO_2 plume has been estimated. The figure below shows the CO_2 plume extension in the years 1999, 2001, 2002, 2004, 2006, 2008, 2013 and 2016. Data from the 2020 survey will be presented in the next report.

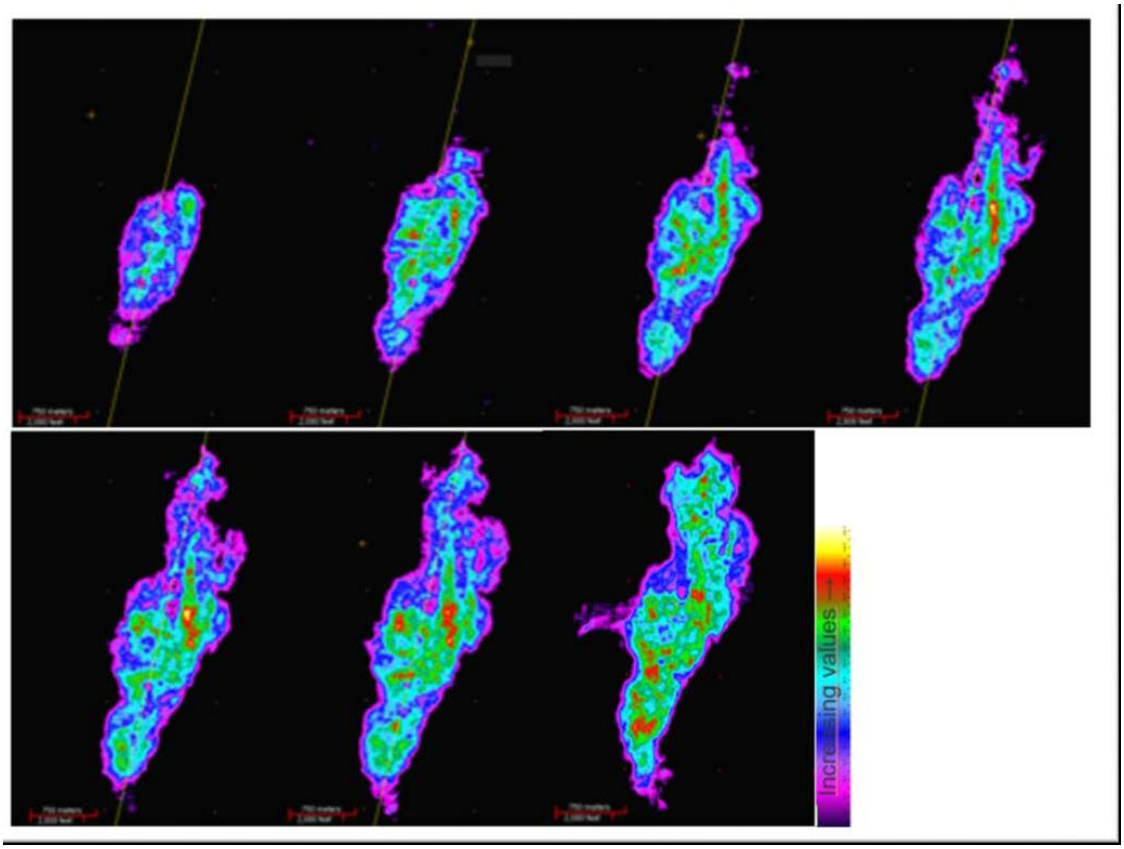

Figure AIV- 5 CO_2 plume extension in 1999 to 2016

In 2016, after injection of about 16 million tonnes since 1996, the maximum lateral migration from the injection point was 3 ,025 km to the northeast, and the area of the CO_2 plume was about 4,8 km^2. Since the injection started, the plume has steadily grown, and has adopted a preferred NE-SW elongation, which is believed to be caused by the topography of the aquifer/cap rock interface and the inherent buoyancy of the injected CO_2 within the saline aquifer.

b) Gravimetric monitoring:

There is a large uncertainty on in-situ CO_2 density, related to temperature, which cannot be resolved by seismic measurements. CO_2 is close to critical point, and possible densities range from 0.2 to more than 0.7. The gravity data supports a low-density/high temperature CO_2 plume.

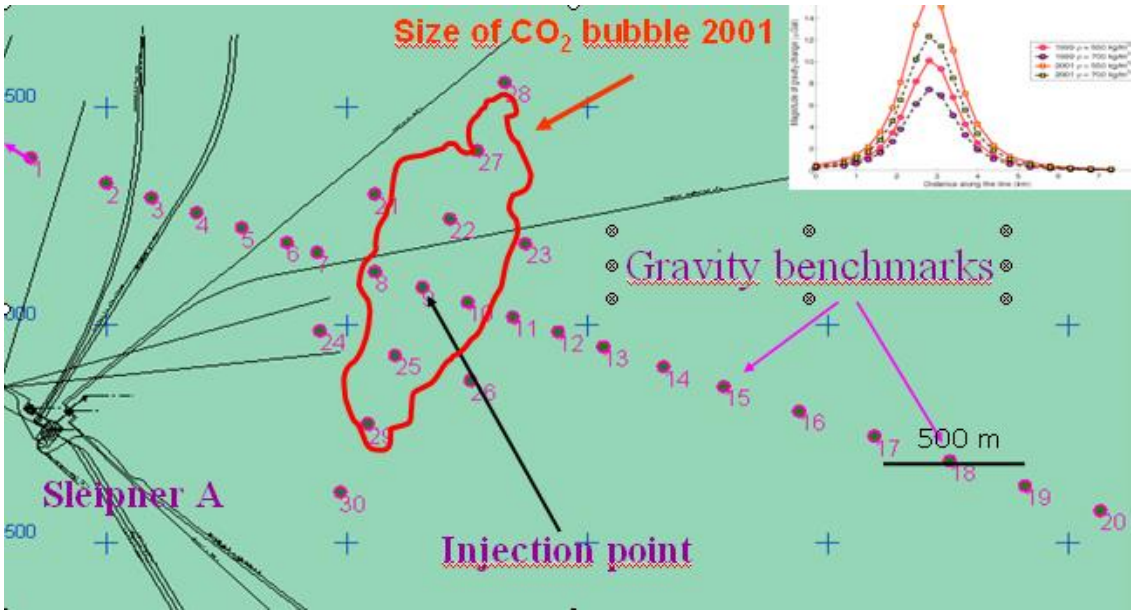

Figure AIV- 6 Gravimetric monitoring.

c) Reservoir simulation:

Flow simulation models, which match the 4D seismic data reasonably well, have been used to predict the CO_2 behaviour. The figure below illustrates results from the simulation model.

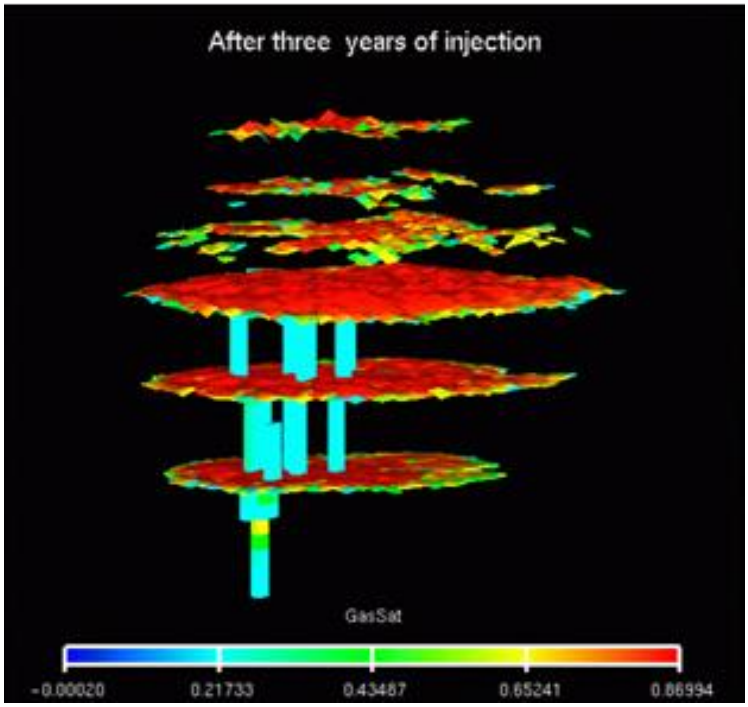

Figure AIV- 7 Flow simulation of CO_2.

The results from the simulations indicate that cap rock shales provide a capillary seal for the CO_2 phase.

Dissolution of CO_2 from the gas cap into the underlying brine column will have a most pronounced effect. The brine on top of the column, which becomes enriched in CO_2, is denser than the brine below due to the special volumetric properties of the CO_2 – brine system. This instability could induce convection currents and enhance the dissolution of CO_2.

The following figure shows simulation results (seen from above) without taking into account the effect of CO_2 dissolution. This gives a conservative estimate of the extent of the CO_2 plume, as dissolution of the CO_2 will contribute to the CO_2 "sinking" inside the Utsira formation, thus reducing the size of the plume. The figure assumes stop of CO_2 injection after 25 years.

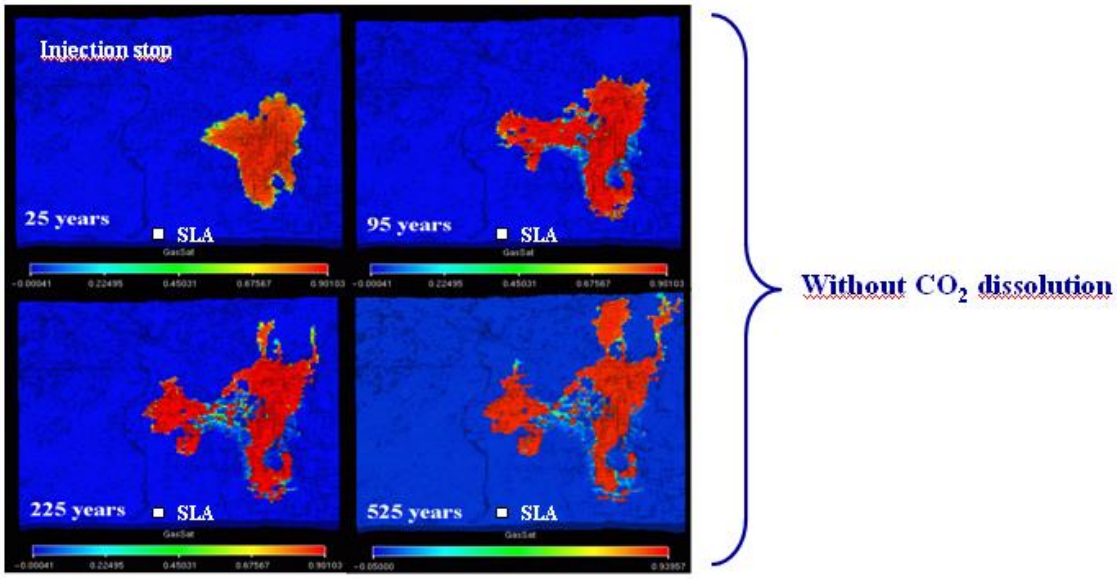

Figure AIV- 8 Simulation results seen from above without taking into account the effect of CO_2 dissolution.

Dependent on the model parameters, most of the free CO_2 will have dissolved into the aquifer after between 5000 and 50000 years.

Note that the CO_2 migrates away from the SLA platform. The migration route is controlled by the topography of the Utsira Formation/cap rock interface. This means that no production wells on Sleipner are exposed to the CO_2 plume.

1.4 Publications and conference presentations

1.4.1 Publications

- **Chadwick, R.A.**; Arts, R.; Eiken, O.; **Kirby, G.A.**; Lindeberg, E.; Zweigel, P.. 2004 4D seismic imaging of an injected CO_2 plume at the Sleipner Field, central North Sea. In: Davies, Richard J., (ed.) *3D seismic technology : application to the exploration of sedimentary basins.* London, UK, Geological Society of London, 311-320. (Geological Society of London Memoir, 29).
- Gale, J., Christensen, N. P., Cutler, A., & Torp, T.A., 2001: Demonstrating the Potential for Geological Storage of CO_2: The Sleipner and GESTCO Projects. Environmental Geosciences, 8 (3), 160 –165.
- Chadwick, A., Holloway, S. & Riley, N., 2001: Deep subsurface CO_2 sequestration - a viable greenhouse mitigation strategy. Geoscientist, vol 11, No 2, Feb 2001, 4-5.
- Zweigel, P. & Gale, J., 2000: Storing CO_2 underground shows promising results.- EOS, Transactions, American Geophysical Union, 81 (45), 529 & 534. (Reprinted with added figure in Earth in Space, 13 (6), 8-9.)
- Carstens, H. (& Torp, T.), 2000: Send CO_2 tilbake til undergrunnen. GEO, 3, (6), 12-15.
- Zweigel, P., Lindeberg, E., & Eiken, O., 2000: 4D seismikk løser gåten. GEO, 3, (6), 16-18.

1.4.2 Conference presentations:

1.4.2.1 Greenhouse Gas Technology-8, Trondheim

- Nooner et al. (in press, 2006): Constraining the density of CO_2 within the Utsira formation using time-lapse gravity measurements. Extended abstract.

1.4.2.2 Offshore Europe, SPE conference 6-9 september 2005, Aberdeen, Scotland

- Hansen, H.,Eiken, O. and Aasum, T.O, 2005: Tracing the path of the carbondioxide from a gas-condensate reservoir, through an amine plant and back into a subsurface acquifer. Case study: The Sleipner area, Norwegian North Sea

1.4.2.3 2nd Annual Conference on Carbon Sequestration, 5-8 May 2003, Alexandria, VA, US

- Gaus, I., Azarounal, M., & Czernichowski-Lauriol, I., 2003: Reactive transport modeling of dissolved CO_2 in the cap rock base during CO_2 sequestration (Sleipner site, North Sea). Abstracts of the 2nd Annual Conference on Carbon Sequestration, 5-8 May 2003, Alexandria, VA, US.

1.4.2.4 6th Petroleum Geology Conference, October 2003, London

- Chadwick, R.A., R.Arts & O. Eiken, 2005, 4D seismic quantification of a growing CO_2 plume at Sleipner, North Sea. In; DORÉ, A.G & VINING, B.A (eds) Petroleum Geology: North-West Europe and Global Perspectives, Proceedings of the 6th Petroleum Geology Conference, 1385-1399

1.4.2.5 6th Greenhouse Gas Control Technologies Conference (GHGT6), October 2003, Kyoto

- Arts; R., Eiken, O., Chadwick, A., Zweigel, P., van der Meer, L., & Zinszner, B., 2002: Monitoring of CO_2 Injected at Sleipner Using Time Lapse Seismic Data. Abstracts of the 6th International conference on Greenhouse Gas Control Technology (GHGT-6), Kyoto, Japan, 1-4 October 2002
- Chadwick, A., Zweigel, P., Gregersen, U., Kirby, G., & Johannessen, P., 2002: Geological Characterisation of CO_2 Storage Sites: Lessons from the Sleipner, Northern North Sea. Abstracts of the 6th International conference on Greenhouse Gas Control Technology (GHGT-6), Kyoto, Japan, 1-4 October 2002
- Czernichowski-Lauriol, C.A. Rochelle, E. Brosse, N. Springer, K. Bateman, C. Kervevan, J.M. Pearce, B. Sanjuan, 2002: Reactivity of injected CO_2 with the Utsira Sand reservoir at Sleipner. Abstracts of the 6th International conference on Greenhouse Gas Control Technology (GHGT-6), Kyoto, Japan, 1-4 October 2002, p 341.
- Lindeberg, E., Bergmo, P., & Moen, A., 2002: The Long-term Fate of CO_2 Injected into an Aquifer. Abstracts of the 6th International conference on Greenhouse Gas Control Technology (GHGT-6), Kyoto, Japan, 1-4 October 2002. Short abstract. Extended abstract
- Torp, T.A. & Gale, J. 2002: Demonstrating Storage of CO_2 in Geological Reservoirs: The Sleipner and Sacs Projects. Abstracts of the 6th International conference on Greenhouse Gas Control Technology (GHGT-6), Kyoto, Japan, 1-4 October 2002

1.4.2.6 EAGE Annual meeting 2002, Florence

- Arts, R., Elsayed, R., van der Meer, L., Eiken, O., Østmo, S., Chadwick, A., Kirby, G., Zinszner, B., 2002: Estimation of the mass of injected CO_2 at Sleipner using time-lapse seismic data. EAGE, Annual meeting 2002, Florence, Italy.

1.4.2.7 Geological Society of London, '3D Seismic Data: Advances in the Understanding of Stratigraphic and Structural Architecture' conference, 14-16 November 2001

- Chadwick, A., Williamson, P., Zweigel, P., Arts, R., Eiken, O., 2001: Time-lapse geophysical monotoring of a subsurface CO_2 bubble in the Utsira Sand, Sleipner, northgern North Sea. Presentation at '3D Seismic Data: Advances in the Understanding of Stratigraphic and Structural Architecture' conferece at the Geological Society of London, Burlington House, 14-16 November 2001.

1.4.2.8 American Association of Petroleum Geologists (AAPG), Annual Meeting, June 2001, Denver

- Eiken, O., Brevik, I., Art, R., Lindeberg, E., Fagervik, K. 2001: Seismic monitoring of CO_2 injected into a marine aquifer. American Association of Petroleum Geologists, Annual Meeting, June 2001, Denver, abstract volume.
- Zweigel, P., Arts, R., Bidstrup, T., Chadwick, A., Eiken, O., Gregersen, U., Hamborg, M., Johanessen, P., Kirby, G., Kristensen, L., & Lindeberg, E., 2001: Results and experiences from the first Industrial-scale underground CO_2 sequestration case (Sleipner Field, North Sea). American Association of Petroleum Geologists, Annual Meeting, June 2001, Denver, abstract volume (CD) 6p.

1.4.2.9 European Union of Geosciences (EUG), XI meeting, April 2001, Strasbourg

- Chadwick, A., Kirby,G., Holloway, S., Zweigel, P., & Arts, R. 2001: The case for underground carbon dioxide sequestration in Northern Europe.- European Union of Geosciences, XI meeting, April 2001, Strasbourg, Abstract volume, 172.
- Czernichowski-Lauriol, I., Rochelle, C.A., Brosse, E., Springer, N., Pearce, J.M., Bateman, K.A., Sanjuan, B., Kervévan, C., 2001: Disposal of CO_2 in deep aquifers: geochemical investigations of water-rock-CO_2 interactions at Sleipner (North Sea) as part of the SACS project. European Union of Geosciences, XI meeting, April 2001, Strasbourg, Abstract volume, 172.

1.4.2.10 5th Greenhouse Gas Control Technologies Conference (GHGT5), August 2000, Cairns

- Arts, R., Brevik, I., Eiken, O., Sollie, R., Causse, E., & van der Meer, B. 2000b: Geophysical methods for monitoring marine aquifer CO_2 storage - Sleipner experiences. 5th International Conference on Greenhouse Gas Control Technologies, Cairns (Australia), August 2000. (PDF 922 KB / 6 pages)
- Chadwick, R.A., Holloway, S., Kirby, G.A., Gregersen, U., & Johannessen, P.N. 2000: The Utsira Sand, Central North Sea - An assessment of its potential for regional CO_2 disposal. 5th International Conference on Greenhouse Gas Control Technologies, Cairns (Australia), August 2000. (PDF 446 KB / 6 pages)
- Lindeberg, E., Zweigel, P., Bergmo, P., Ghaderi, A., & Lothe, A. 2000b: Prediction of CO_2 dispersal pattern improved by geology and reservoir simulation and verified by time lapse seismic. 5th International Conference on Greenhouse Gas Control Technologies, Cairns (Australia), August 2000. (PDF 91 KB / 6 pages)
- Pearce, J.M., Czernichowski-Lauriol, I., Rochelle, C.A., Springer, N., Brosse, E., Sanjuan, B., Bateman, K., & Lanini, S. 2000: How will reservoir and caprock react with injected CO_2 at Sleipner? Preliminary evidence from experimental investigations. 5th International Conference on Greenhouse Gas Control Technologies, Cairns (Australia), August 2000. (PDF 14 KB / 6 pages)
- Van der Meer, L.G.H., Arts, R.A., & Paterson, L. (2000): Prediction of migration of CO_2 after injection in a saline aquifer: reservoir history matching of a 4D seismic image

with a compositional gas/water model. 5th International Conference on Greenhouse Gas Control Technologies, Cairns (Australia), August 2000. (PDF 14 KB / 6 pages)

- Zweigel, P., Hamborg, M., Arts, R., Lothe A., & Tømmerås, A. 2000: Prediction of migration of CO_2 injected into an underground depository: Reservoir geology and migration modelling in the Sleipner case (North Sea). 5th International Conference on Greenhouse Gas Control Technologies, Cairns (Australia), August 2000. (PDF 1170 KB / 6 pages)

1.4.2.11 SEG International Conference 2000, Calgary

- Eiken, O., Brevik, I., Arts. R., Lindeberg, E., & Fagervik, K. 2000: Seismic monitoring of CO_2 injected into a marine aquifer. SEG Calgary 2000 International conference and 70th Annual meeting, Calgary. (PDF 208 KB / 4 pages)

1.4.2.12 EAGE Annual Meeting 2000, Glasgow

- Arts, R. J., Zweigel, P., & Lothe, A.E. 2000a: Reservoir geology of the Utsira Sand in the Southern Viking Graben area – a site for potential CO_2 storage.- 62nd EAGE meeting, Glasgow, paper B-20. (PDF 269 KB / 4 pages)
- Brevik, I., Eiken, O., Arts, R.J., Lindeberg, E., & Causse E. 2000: Expectations and results from seismic monitoring of CO_2 injection into a marine acquifer. 62nd EAGE meeting, Glasgow, paper B-21.
- Gregersen, U, Johannessen, P.N., Chadwick, R.A., Holloway, S. & Kirby, G.A. 2000: Regional study of the Neogene deposits in the southern Viking Graben area - a site for potential CO_2 storage. 62nd EAGE meeting, Glasgow. (PDF 123 KB / 4 pages)

1.4.2.13 AAPG Int'l Conf. & Exhib. 1999, Birmingham

- Zweigel, P., Lothe, A. E., & Lindeberg, E., 1999: Offshore underground CO_2-disposal: Reservoir geology of the Neogene Utsira Formation, Sleipner Field, North Sea.- AAPG Bull., 83, 1346-1347. (Poster at AAPG International Conference, Birmingham, UK, September 1999)

1.4.3 From CO_2STORE project:

Title: Sleipner/Utsira CO_2 Geological Storage Full Field Flow and Geochemical Coupling to Assess the Long Term Fate of the CO_2

Authors: Frangeul, Johann, Long Nghiem, Emmanuel Caroli, Sylvain Thibeau

Conference: AAPG Annual Meeting, Dallas USA, April 18-21, 2004

Publication: AAPG Bulletin Vol. 88 (2004), No. 13 (Supplement)

Abstract: available at AAPG

Website:http://www.searchanddiscovery.com/documents/abstracts/annual2004/Dallas/Frangeu.htm

1.4.4 From Saline Aquifer CO_2 Storage (SACS) project:

1.4.4.1 Geology

- Rock mechanical tests of shale samples from the cap rock of the Utsira Sand in well 15/9-A11 – A contribution to the Saline Aquifer CO_2 Storage (SACS) project. Pillitteri et al. 2003. (PDF 1.7MB)
- Seismic mapping and simulation of CO_2 migration in the upper Utsira sand wedge east of the Sleipner injection site – A contribution to the Saline Aquifer CO_2 Storage (SACS) project. Hamborg et al. 2003. (PDF 1.4MB)
- Studies on the likelihood for caprock fracturing in the Sleipner CO_2 injection case – A contribution to the Saline Aquifer CO_2 Storage (SACS) project. Zweigel & Heill 2003. (PDF 2.0MB)
- The effect of time-depth conversion procedure on key seismic horizons relevant for underground CO_2 storage in the Sleipner field (North Sea). Zweigel & Hamborg 2002. (PDF 2.6 MB).
- SACS, Task 1.4: Evaluation of cap rock sealing the reservoir. Clay mineralogy investigation of core and cuttings from the Ekofisk and Sleipner areas. Lindgren et al. 2002. (PDF 513 KB).
- Characterisation of the Nordland Shale in the Sleipner area by XRD analysis - A contribution to the Saline Aquifer CO_2 Storage (SACS) project. Bøe, R., & Zweigel, P. (Feb. 2001). (PDF 547 KB)
- Reservoir geology of the storage units in the Sleipner CO_2 injection case. Zweigel et al (Dec 2000). (ZIP 13.5 MB). Main report only. (PDF 7926 KB)
- Mineralogical and petrographical characterisation of a 1 m core from the Utsira Formation, Central North Sea. Pearce, J.M., Kemp, S.J., and Wetton, P.D., 1999. BGS Technical Report - Mineralogy & Petrology Series, Report WG/99/24C, 26pp. + 3 plates. (ZIP 23562 KB)
- The biostratigraphical and palaeo-ecological application of calcareous microfaunas from the Utsira Formation in Norwegian Well 15/9-A-23. Wilkinson, I. P., 1999. BGS Technical Report – Stratigraphy Series, Report WH/99/124R, 4pp. (PDF 29 KB / 4 pages)

1.4.4.2 Geochemistry

- Preliminary modelling of the geochemical impact of CO_2 injection on the caprock at Sleipner. Gaus et al. 2002. (PDF 254 KB)
- The solubility of supercritical CO_2 into pure water and synthetic Utsira porewater. Rochelle & Moore 2002. (PDF 1.7 MB)
- Geochemical interactions between supercritical CO_2 and the Utsira Formation: an experimental study. Rochelle et al. 2002. (PDF 4.5 MB)

1.4.4.3 Geophysics

- Multi-component seismic monitoring of CO_2 gas cloud in the Utsira Sand: A feasibility study (Report Work Area 5.6) . Liu et al. (April 2001). (PDF 1586 KB)

2. CO_2 capture from Snøhvit well stream at Hammerfest LNG and storage in the Tubåen and Stø formation

2.1 CO_2 re-injection system and well specification

2.1.1 Location of the CO_2 injection well F-2 H

The CO_2 injection well is located at the F-segment at the western part of the Snøhvit reservoir (Figure AIV-9). The injection pipeline is 152 km long (Figure AIV-10).

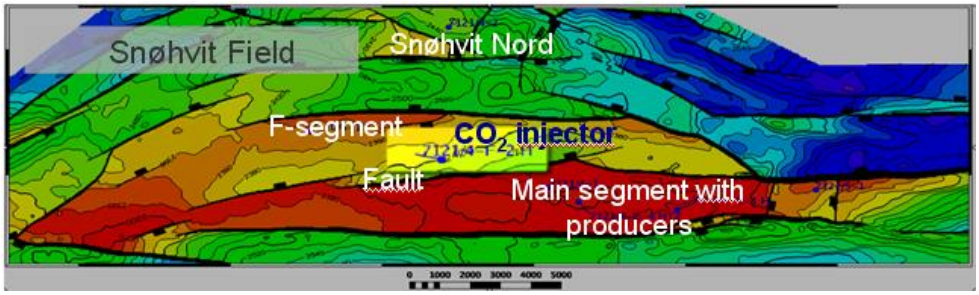

Figure AIV- 9 Location of the CO_2 well at Snøhvit.

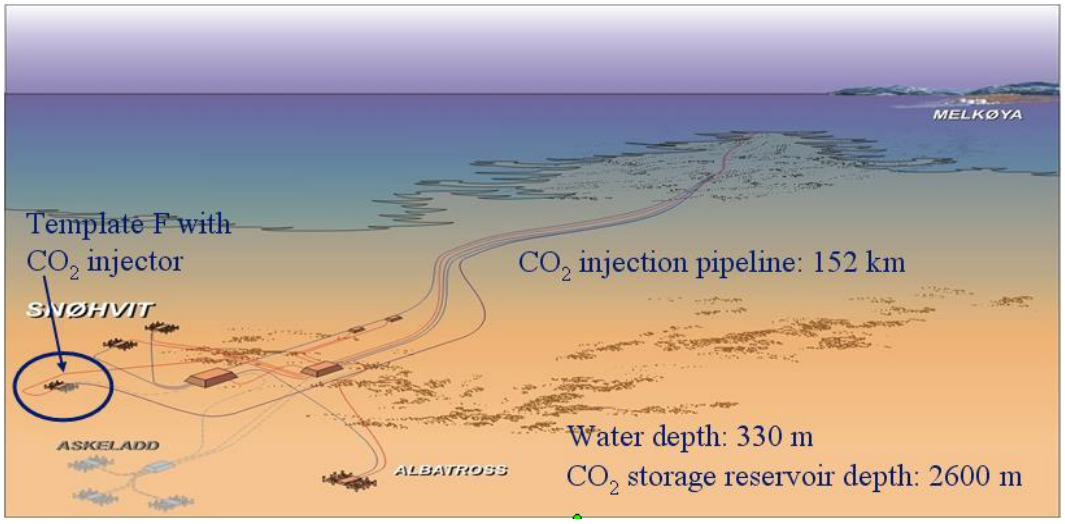

Figure AIV- 10 Field overview.

Table AIV- 1 Key parameters for F-2 H into Tubåen and Stø reservior reservoir.

Key parameters	TUBÅEN	STØ
Initial reservoir pressure	288 bar	255 bar
Initial temperature	98 °C	98 °C
Porosity	10- 16 %	15 %
Permeability	200-800 md	400 md
Reservoir depth	2600 m	2450 m
Water depth at F-template	330 m	330 m
Lenght pipline from Melkøya	152 km	152 km

To keep the CO_2 as deep as possible, it was decided to perforate the mid and lower part of Tubåen as shown in Figure AIV- 11. If injection fails, additional perforations could be added in Tubåen, and/or bottom of Stø could be opened up for injection.

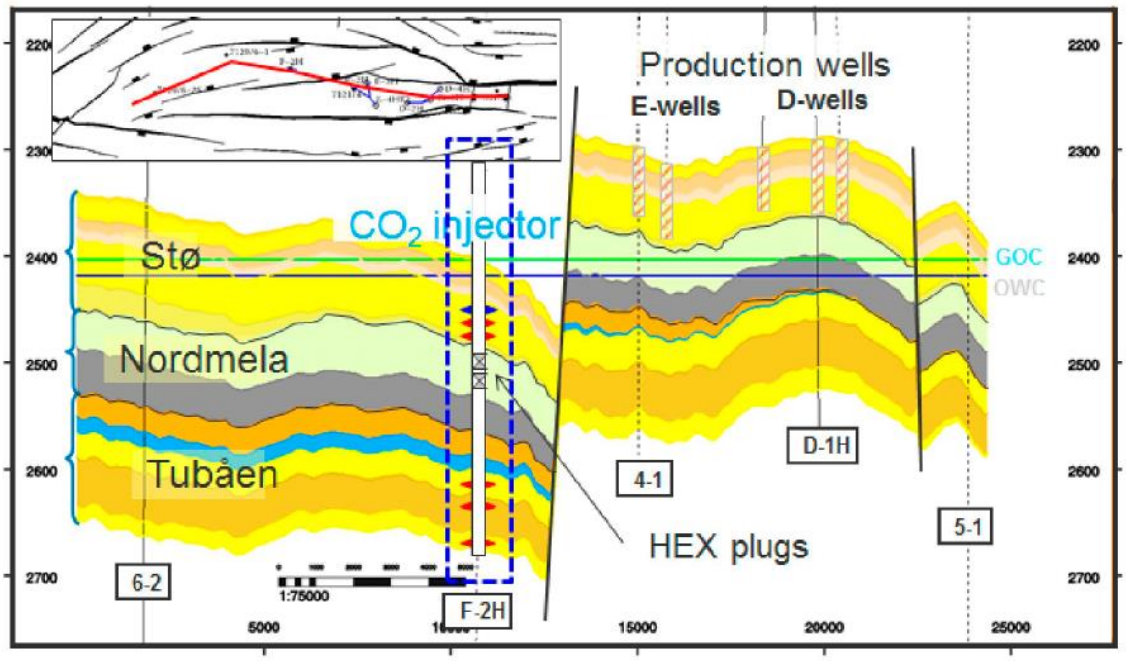

Figure AIV- 11 Cross-section of F-segment where CO_2 is injected.

The completion design basis for the CO_2 injector is a perforated 7" liner. Downhole pressure and temperature gauge is installed. At Snøhvit and Hammerfest LNG, all facilities for separation and injection of CO_2 are placed onshore at the process plant at Melkøya. CO_2 in the feed gas are removed to avoid it freezing out in the downstream liquefaction

process. An amine absorption unit performs this operation. The recovered CO_2 is condensed and recompressed before re-injected into Tubåen.

A schematic of the CO_2 re-injection system is shown in Figure AIV- 12. The indicated physical and measured values are expected initial values. Figure AIV- 13 shows the CO_2 phase diagram. The eight numbers in the phase diagram show CO_2 phase conditions at eight different locations indicated in Figure AIV- 13.

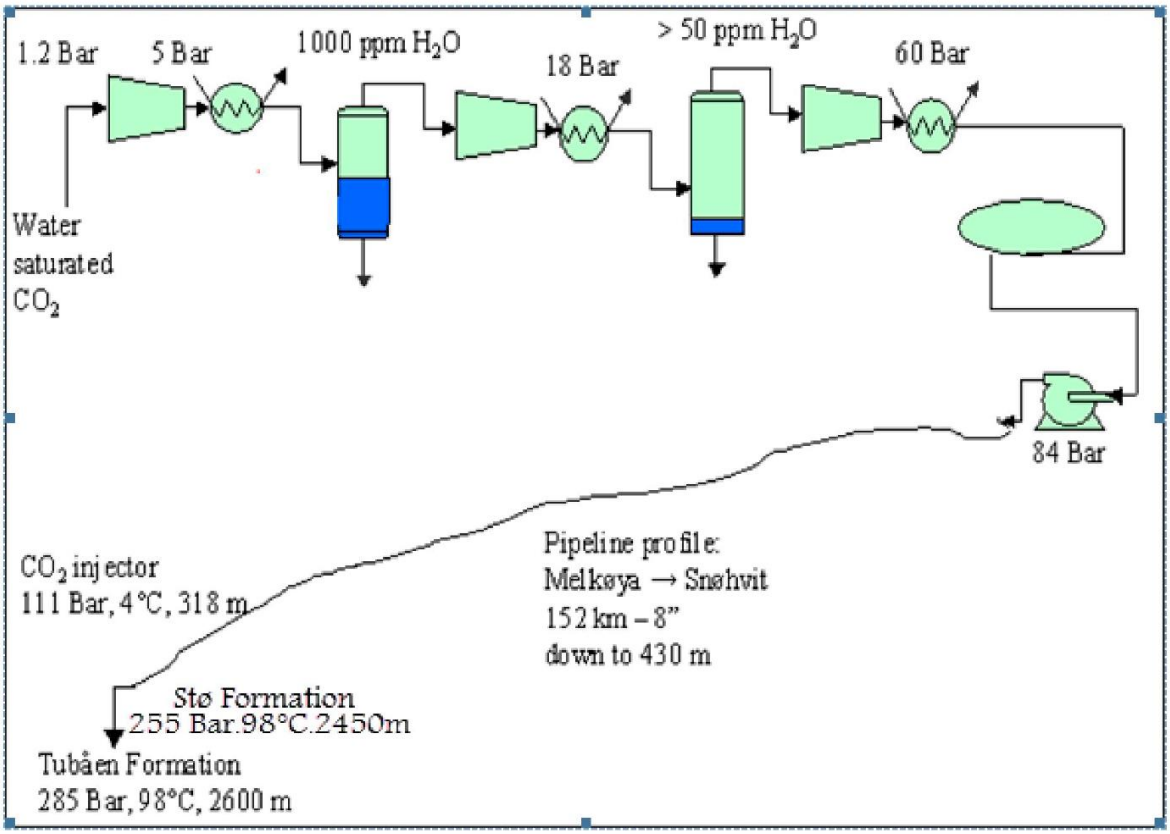

Figure AIV- 12 Schematic of the CO_2 injection system.

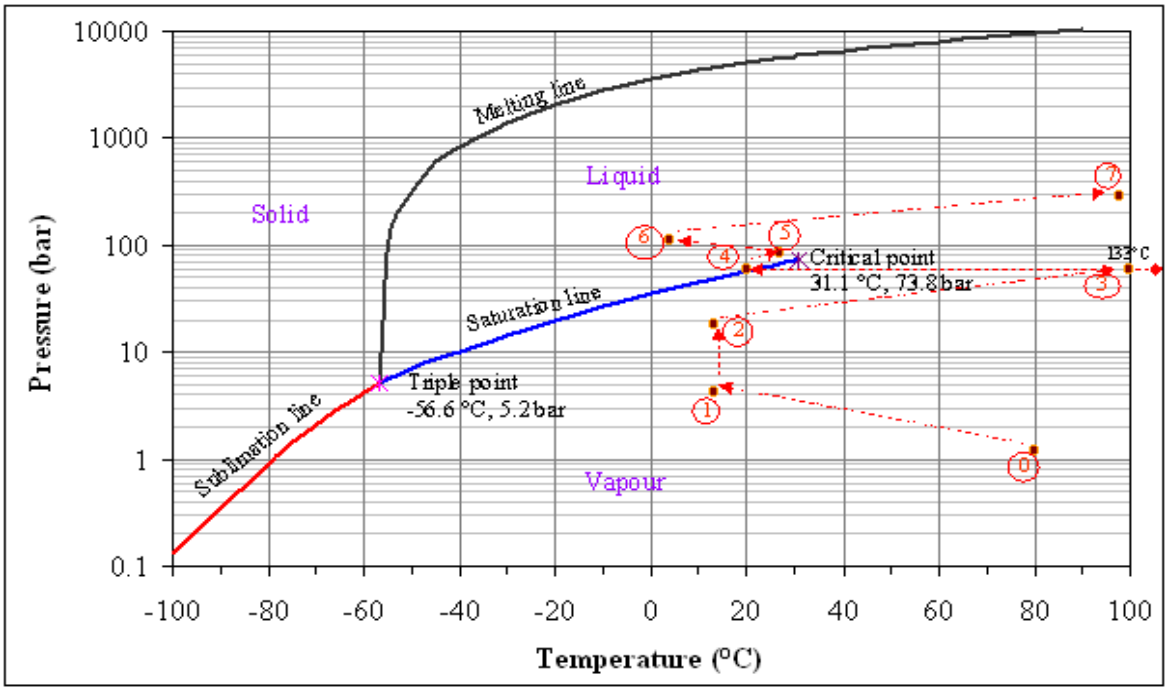

Figure AIV- 13 CO_2 phase diagram with eight phase conditions identified in the injection system in the Snøhvit area.

The figures (Figure AIV- 12 and Figure AIV- 13) show that CO_2 most likely are re-injected as a single phase (liquid condition in the pipeline from the export pump (5) to the well head (6), transformed to supercritical condition in the reservoir where the temperature is higher).

2.1.2 CO_2 well stream specification

- >99% CO_2
- max 100 ppm (mol) H2S
- max 50 ppm (wt) H2O
- traces of HC and N2

2.1.3 CO_2 venting to atmosphere:

CO_2 venting is foreseen in case of shut down of the CO_2 reinjection system. The maximum vent rate is almost equal to the CO_2 removal flow rate. A separate vent stack for the CO_2 is provided at the plant.

2.2 Applied methods for monitoring the injected CO_2

a) Seismic monitoring

- 3D seismic shot in 2003
- 2D line shot in 2006
- 3D/4D seismic monitoring surveys in 2009, 2011, 2012, 2014 and 2019

b) Gravimetric monitoring

- Pre-installed 41 concrete benchmarks across the Snøhvit reservoir in 2007
- The closest is 419 m from the CO_2 well
- Repeat survey carried out in 2011 confirmed the prognoses

Benchmark number 21 is closest to the CO_2 injection well – see Figure AIV- 14.

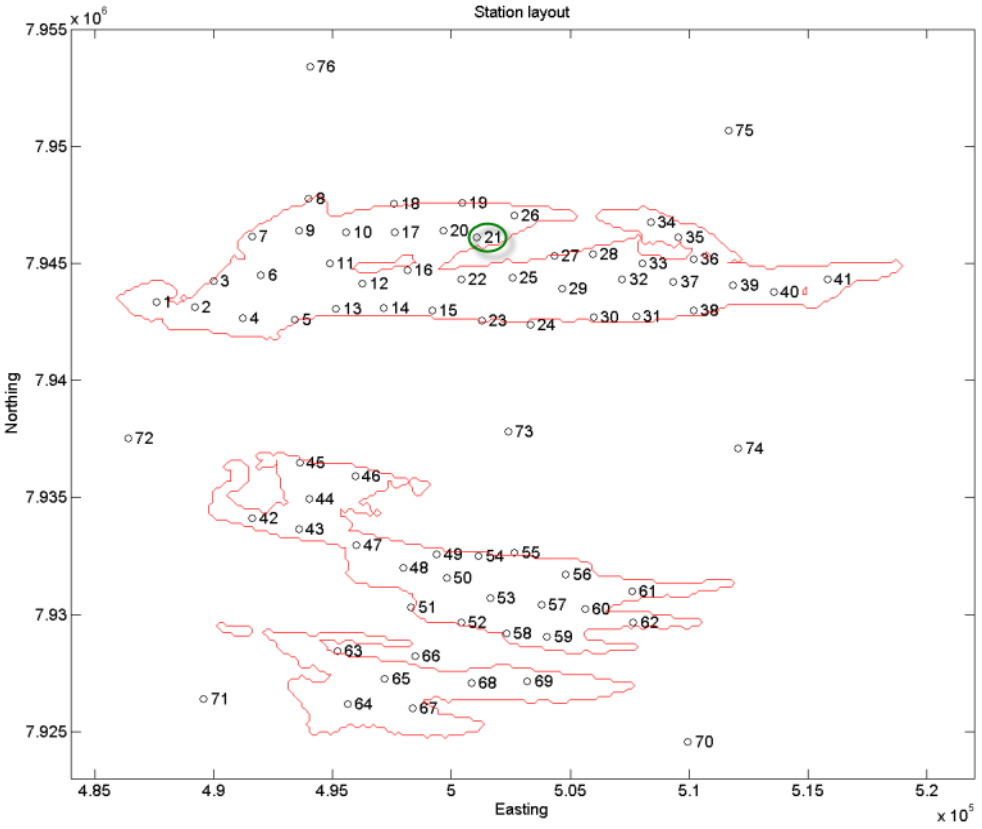

Figure AIV- 14 Benchmarks Gravimetric monitoring CO_2 storage in the Snøhvit area.

c) Pressure measurements

Pressure and temperature gauge is installed in the well 600 metres above top reservoir and the pressure development in the injection well F-2 H is monitored on a daily basis.

Actual bottom hole pressure is estimated based on gauge measurements and CO_2 pressure, volume and temperature properties. Data are used in history matching of the reservoir simulation model.

Annex V: National system in Norway

Last update: 15.04.2022

Preface

According to the decision on Article 5.1 of the Kyoto Protocol all Annex 1 parties that also are Parties to the Kyoto Protocol, must implement a national system for greenhouse gas inventories, which includes (see Annex to decision 19/CMP.1):

> "*all institutional, legal and procedural arrangements made within a Party included in Annex I [to the Kyoto Protocol] for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and for reporting and archiving inventory information*"

A description of the national system was reported as part of a Party's Initial Report to the Kyoto Protocol in line with decision 13/CMP.1. The purpose of the Initial Report was to facilitate the calculation of assigned amount and demonstrate the capacity to account for emissions, removals and assigned amount. Norway's Initial Report was submitted to the Climate Convention in December 2006, and the report on the national system for greenhouse gas inventories was attached to the Initial Report as an appendix.

The report on national system for greenhouse gas inventories was prepared by a project team consisting of representatives from the Norwegian Environment Agency, Statistics Norway, the Center for International Climate and Environmental Research – Oslo (CICERO) and The Norwegian Institute of Bioeconomy Research (formerly The Norwegian Forest and Landscape Institute). Norway's national system has changed over the years, and the changes have been reported annually in the National Inventory Reports. This Annex describes the current national system of Norway.

3. Introduction

A national system for greenhouse gas inventories is introduced in Article 5.1 of the Kyoto Protocol. The objectives of the national system are[2]:

- To enable Annex I Parties to estimate anthropogenic greenhouse gas (GHG) emissions by sources and removals by sinks in accordance with the Kyoto Protocol and decisions made by the Parties
- To assist Annex I Parties in meeting their commitments
- To facilitate review of the submitted information
- To assist Annex I Parties to ensure and improve the quality of their inventories

The Guidelines for national systems are defined in the Annex to COP[3]/CMP[4] decisions 20/CP.7 and 19/CMP.1 (FCCC/CP/2001/13/Add.3). These guidelines describe various functions that need to be in place in the national system but leave the details of implementation to each Party in accordance with their national circumstances. Decision 3/CMP.11 has implications for the guidelines defined in decision 19/CMP.1 and these implications are to the extent possible reflected in this description of Norway's national system.

The functions are described as *general and specific* functions.
The general functions include:

- Establishing and maintaining *institutional, legal and procedural arrangements* necessary to perform the functions defined in the guidelines for national systems
- Ensuring s*ufficient capacity* for timely performance of the functions defined in the guidelines, including data collection and arrangements for technical competence of the staff involved in the inventory development process
- *Preparing national greenhouse gas inventories* and supplementary information *in a timely manne*r in accordance with the Kyoto Protocol and relevant decisions by the Parties
- Providing information necessary to meet the *reporting requirements*

[2] Annex to COP decision 20/CP.7 and CMP decision 19/CMP.1 "Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol" here called "guidelines for national systems".
[3] Conference of the Parties to the United Nations Framework Convention on Climate Change.
[4] The Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol.

The specific functions include:

- Planning
  - Designate a single *national entity*
  - Define and allocate *specific responsibilities* in the inventory preparation and development process including methodological choice, data collection, processing and archiving, and quality assurance and quality control (QA/QC)
  - Elaborate a *QA/QC plan* describing specific QA/QC procedures to be implemented during the inventory preparation and development process, facilitate the overall QA/QC procedures to be conducted, and establish data quality objectives
  - Establish a process for the *official consideration* and approval of the greenhouse gas inventory, including recalculations, prior to submission, and to respond to any issues raised by the inventory review process
- Preparation
  - Identify *key categories*
  - Prepare estimates in accordance with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories[5].
  - Collect sufficient data (activity data and emission factors) to support the selected methods
  - Make a quantitative estimate of inventory uncertainty
  - Ensure that recalculations of previously submitted estimates are made in accordance with the good practice guidance
  - Compile the national emission inventory
  - Implement general QC procedures
  - Consider source-specific QC procedures and provide for a basic review of the inventory of personnel that have not been included in the inventory development
- Management
  - Archive information for each year in accordance with relevant decisions
  - Provide a review team with access to archived information used by the Party
  - Respond to requests for clarifying inventory information resulting from different stages of the review process in a timely manner

Good practice is in the guidelines for national systems defined as *a set of procedures intended to ensure that greenhouse gas inventories are accurate in the sense that they are systematically neither over- nor underestimates as far as can be judged, and that uncertainties are reduced as far as possible.* Guidance on preparing greenhouse gas inventories is given in the 1996 IPCC Revised Guidelines for Inventory Preparation (IPCC 1997b), the IPCC Good Practice Guidance for Uncertainty Management in National Greenhouse Gas Inventories

[5] In the LULUCF sector the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2019) is used in a few cases where default factors are more complete than in the 2006 IPCC Guidance

from 2000 (IPCC 2000) and in the 2006 IPCC guidelines for national greenhouse gas inventories (IPCC 2006). For the land use, land-use change and forestry (LULUCF) sector, the IPCC has prepared a supplementary good practice report in 2003 (IPCC 2003).

The Parties to the UN Framework Convention on Climate Change (UNFCCC) have through decision 24/CP.19 agreed on revised guidelines for reporting data on emissions and removals, building on the guidance from the IPCC. Data are to be reported annually before April 15 to the UNFCCC. Reporting includes tables (using the so-called Common Reporting Format (CRF)), the National Inventory Report (NIR) describing data, methodologies and the main results of the inventory and additional documentation. For LULUCF, reporting under the Kyoto Protocol will be different from that under the UNFCCC.

Decision 24/CP.19 also states that Annex I parties under the Convention should design and operate national inventory arrangements. The national inventory arrangements are similar to the national system of the Kyoto Protocol. This report's description of the functions required for the national system is also a description of the national inventory arrangements in Norway.

4. National responsibilities

1.1 General overview

The Norwegian national system for greenhouse gas inventories is based on cooperation between the Norwegian Environment Agency (the national entity), Statistics Norway and the Norwegian Institute of Bioeconomy Research.

In accordance with the decision on Article 5.1 of the Kyoto Protocol a formalized agreement has been signed between the Norwegian Environment Agency as the national entity and the two other institutions. This ensures the continuation of the national system for greenhouse gas inventories and reporting for the period from 2015 – 2022.

Statistics Norway is responsible for the official statistics on emissions to air, excluding LULUCF. The Norwegian Institute of Bioeconomy Research is responsible for the calculations of emission and removals from Land Use, Land-Use Change and Forestry – LULUCF and for KP-LULUCF. The reporting to the UNFCCC is based on the official statistics on emissions to air and the calculations of emissions and removals from LULUCF.

1.2 Institutional cooperation, responsibilities and agreements

The three institutions of the national greenhouse gas inventory system, the Norwegian Environment Agency, Statistics Norway, and The Norwegian Institute of Bioeconomy Research, work together to fulfill the requirements for the national system. The allocation

of responsibilities for producing estimates of emissions and removals, QA/QC and archiving is presented in chapters 3, 4 and 5. An overview is shown in Figure AV-1.

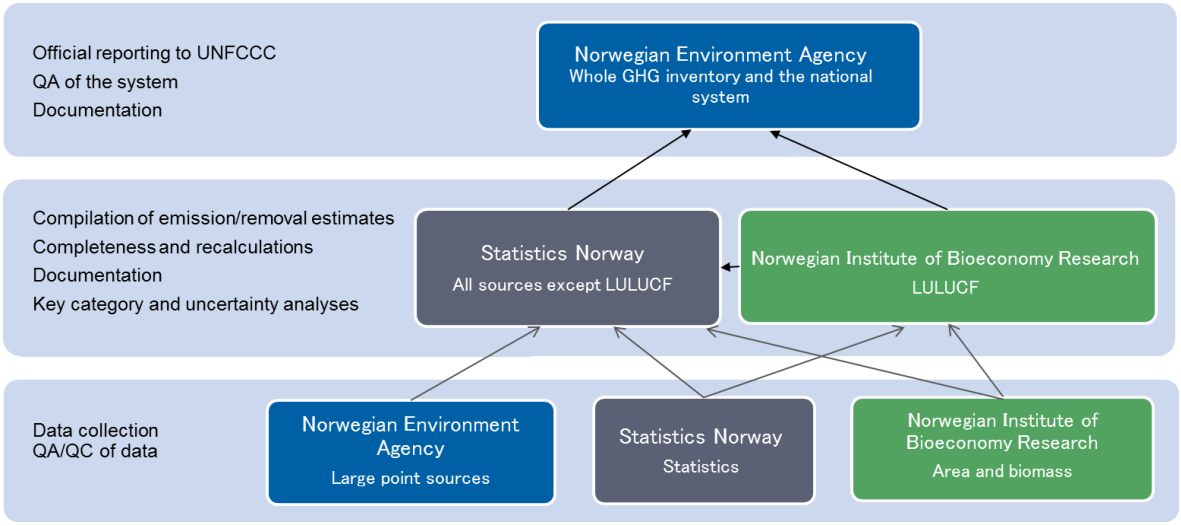

Figure AV-1. Overview of participating institutions, institutional responsibilities, and cooperation

To ensure that the institutions comply with their responsibilities, Statistics Norway and The Norwegian Institute of Bioeconomy Research have signed agreements[6] with the Norwegian Environment Agency as the national entity. The obligations of the Norwegian Institute of Bioeconomy Research are also guided by an annual allotment letter (*tildelingsbrev*) from the Ministry of Agriculture and Food. Through these agreements, the institutions are committed to implementing the QA/QC and archiving procedures, providing documentation, making information available for review, and delivering data and information in a timely manner to meet the deadline for reporting to the UNFCCC.[7]

The establishment of the national system requires close collaboration between the three institutions. The Norwegian Environment Agency as a national entity is responsible for preparing, organizing, and reporting meetings between the three institutions. The purpose of the cooperation meetings is to discuss and agree on methodological issues, prioritize resources (e.g., in light of the review reports) and generally facilitate the implementation of the national system. Normally, two cooperation meetings between all three institutions are held every year. The cooperation meeting makes decisions collectively. In addition, bilateral

[6] New, formalized agreements were made in 2014 between the Norwegian Environment Agency and Statistics Norway and the Norwegian Environment Agency and The Norwegian Institute of Bioeconomy Research which regulates details about the cooperation within the national system

[7] The agreement between the Norwegian Environment Agency and Statistics Norway also includes commitments for data deliveries for reporting under the Convention on Long-range Transboundary Air Pollution (LRTAP).

cooperation meetings are arranged between the national entity and each of the other institutions in the national system.

More specifically the cooperation meetings facilitate that the institutions in the national system:

- Prepare for the annual review and address comments received
- Agree on methodological changes in light of review reports, QA/QC findings, new scientific information and available resources
- Agree to implement new data into the inventory
- Agree to recalculations and appropriate methodologies
- Prioritize source-specific QC and methodology studies to improve the estimates in the short and long-term
- Prioritize and interpret QA-procedures
- Review documentation and QA/QC and archiving systems and point out needs for improvements
- Address other relevant technical issues
- Point out weaknesses in capacity
- Point out problems with the implementation of the national systems (institutional and overall)
- Exchange relevant information, including update on current events from the international climate negotiations
- Report the conclusions from the meetings and flag issues for follow-up to the responsible heads of departments in the three institutions

Most key data are collected by the three institutions, as shown in Annex 1 to this Annex. Additional key data providers include the Norwegian Petroleum Directorate, the Norwegian Petroleum Industry Association, and the Norwegian Road Federation.

1.3 Securing and developing capacity

Norwegian authorities will secure financial and human capacity for the national system to fulfill the reporting obligations and to ensure that the data quality objectives are met. The Norwegian Environment Agency is a government institution. The responsibility for the national system is described in the annual letter from the Ministry of Climate and Environment where the Ministry gives directions on the Norwegian Environment Agency's key priorities and financial resources for the following year. The national system involves several units in the Norwegian Environment Agency. To ensure that the requirements are met, the Section for Emission Inventories and Analysis holds the main responsibility and coordinating role in the Agency.

Statistics Norway is an independent government institution. Statistics Norway is responsible for the official statistics on emissions to air. Statistics Norway is also

responsible for compiling the Norwegian greenhouse gas emission inventory, excluding LULUCF, based on the official statistics on emissions to air. The expenses for production and development of the official statistics on emissions to air and the emission inventory are partly covered by Statistics Norway through its financing from the government budget, and partly through specific project funding from the Norwegian Environment Agency.

The Norwegian Institute of Bioeconomy Research is owned by the Ministry of Agriculture and Food as an administrative agency with special authorization and its own supervisory board. Several units within the institution are involved in the development and production cycle of the LULUCF inventory. The responsibility for coordination, QA/QC and reporting is placed within one of these units; Department of Forest and Climate. The expenses for production and development of the greenhouse gas inventory are partly covered by the Norwegian Institute of Bioeconomy Research through funding from the Ministry of Agriculture and Food and partly through specific project funding from the Norwegian Environment Agency.

Each institution is obliged to implement internal procedures to fulfill the requirements of the national system, particularly with respect to meeting deadlines, implementation of QA/QC procedures and archiving. Each institution is also obliged to develop the competence of their staff as required.

The three institutions meet regularly to discuss and share experiences with respect to key topics like QA/QC, uncertainty assessment, archiving and the Kyoto Protocol. These meetings are used to increase the capacity in the project groups in the three institutions. The institutions of the national system may also need to seek partners from other technical authorities or expert institutions to participate in a Tier 2 QA/QC and to improve methodologies and data quality, for example with respect to industrial processes technology, agriculture, soil processes and waste.

1.4 Legal basis

The data collection and data management are secured on a legal basis through three main acts, the Pollution Control Act (forurensningsloven), the Greenhouse Gas Emission Trading Act (klimakvoteloven) and the Statistics Act (statistikkloven).

The *Pollution Control Act* gives the Norwegian Environment Agency the authority to collect and review emission data from large industrial plants (http://www.regjeringen.no/en/doc/laws/acts/pollution-control-act.html?id=171893). Emissions of greenhouse gases are considered part of the Pollution Control Act. The Pollution Control Act is a typical enabling act. This means that the details in each case are outlined in discharge permits and regulations issued by the pollution control authorities.

The Act was established for the purpose of preventing and reducing harm and nuisance from pollution. This is reflected in the main rule of the act, which says that pollution is forbidden, unless it is specifically permitted by law, regulations or individual permits. Collection and checking of GHG emission data are also covered by the *Greenhouse Gas Emission Trading Act* (https://lovdata.no/dokument/NL/lov/2004-12-17-99?q=klimakvoteloven, http://www.regjeringen.no/en/doc/laws/acts/greenhouse-gas-emission-trading-act.html?id=172242). The implementation rules are stipulated in a regulation (https://lovdata.no/dokument/SF/forskrift/2004-12-23-1851?q=klimakvote). Statistics Norway is a professional independent institution, which through The Statistics Act (https://lovdata.no/dokument/NL/lov/1989-06-16-54?q=statistikkloven) has been given "the right to impose upon any person an obligation to provide information necessary for the production of official statistics in so far as any legally prescribed obligation of secrecy is no obstacle thereto". The Statistics Act gives Statistics Norway access to public administrative data-processing systems and to choose the statistical methods which form the basis for the preparation of official statistics. Statistics Norway is responsible for how and when official statistics are published. The Ministry of Finance is administratively responsible for Statistics Norway, and the fiscal budget for its business is set by the Government and the Norwegian parliament.

1.5 The Norwegian Environment Agency's responsibilities as a national entity

The Norwegian Environment Agency has been appointed by the Ministry of Climate and Environment as the national entity through the budget proposition to the Norwegian parliament (Stortinget) for 2015, which states that "*The Norwegian system will build on existing organization and cooperation between the Norwegian Environment Agency, Statistics Norway and the Norwegian Institute of Bioeconomy Research. These three institutions are held individually responsible that their own contributions to the national system are in line with the guidelines from the climate convention on the calculation and archiving of emissions and removals of greenhouse gases. The Norwegian Environment Agency is still appointed as a national entity with overall responsibility for the inventory and reporting*". (St. prop. Nr. 1 (2014-2015)). This point of the proposition was accepted by the Norwegian parliament without any remarks. The Norwegian Environment Agency as the national entity is responsible for:

- Reporting the greenhouse gas inventory to the UNFCCC, including the National Inventory Report and CRF tables
- Completing the National Inventory Report
- Implementation of a QA/QC plan
- Preparing for UNFCCC inventory reviews and coordinating the communication with the expert review team, including responses to review findings
- Coordinating the cooperative work between the institutions of the national system, including the establishment of formal agreements

- Informing the cooperating institutions about relevant decisions and meetings
- Informing national institutions (e.g., ministries and data providers) about the requirements of the national system and ensuring that existing information in national institutions is considered and used in the inventory where appropriate
- Working to secure adequate funding for all parts of the national system in collaboration with the Ministry of Climate and Environment, The Ministry of Agriculture and Food, and the Ministry of Finance.

1.6 Official consideration and approval of the inventory

The Norwegian Environment Agency as the national entity is in charge of approving the inventory before official submission to the UNFCCC. As a basis for approving the inventory, the Norwegian Environment Agency will consider the completion of the inventory and the National Inventory Report. The Norwegian Environment Agency will also review:

- The QA/QC report from the QA/QC responsible in the Norwegian Environment Agency, attaching QA/QC reports from the institutions of the national system
- Methodological changes and recalculations
- Minutes from the cooperation meetings between the institutions
- Other matters of relevance for the approval of the inventory

1.7 Inventory production plan

The institutions have agreed on a "milestone" production plan (Table AV-6). The plan is supplemented by internal production plans in the three institutions. Figure AV-2 gives an overview of the inventory preparation cycle.

Table AV-1 Milestone inventory production plan (indicative dates).

	Responsible	Deadline
Consideration of methodological changes needed for the next year's reporting, including those based on the review report from last year's reporting cycle	Norwegian Environment Agency	February 1st
Agreement on major methodological changes needed for next year's reporting	All	May 15th
Emission data from large industrial plants sent to Statistics Norway	Norwegian Environment Agency	October 15th
All non-LULUCF data collection completed	Statistics Norway	November 1st
LULUCF area data collection for the previous calendar year completed	Norwegian Institute of Bioeconomy Research	December 1st
National publishing of official statistics on emissions to air[1]	Statistics Norway	December
QA/QC of the emission estimates from the official statistics to air for use in the emission inventory	Norwegian Environment Agency	January 15th

All data entered into the CRF software	Statistics Norway and Norwegian Institute of Bioeconomy Research	February 1st
Review of documentation and necessary updates made[2]	All	March 15th
QA/QC of emission inventory in the CRF software completed	All	March 15th
NIR first draft	All	March 15th
QA/QC reports sent to the Norwegian Environment Agency	All	March 30th
NIR finalized	Norwegian Environment Agency	April 13th
QA/QC report finalized	Norwegian Environment Agency	April 13th
Formal approval of the inventory for the purpose of reporting	Norwegian Environment Agency	April 13th
Reporting	Norwegian Environment Agency	April 15th

[1] *The official statistics on emissions to air have a different aggregation of emissions than the greenhouse gas emission inventory reported to the UNFCCC. However, the activity data, emission factors and calculation methodologies are the same.*

[2] *This point includes internal documentation in all institutions as well as external documentation in the Norwegian Institute of Bioeconomy Research and Statistics Norway*

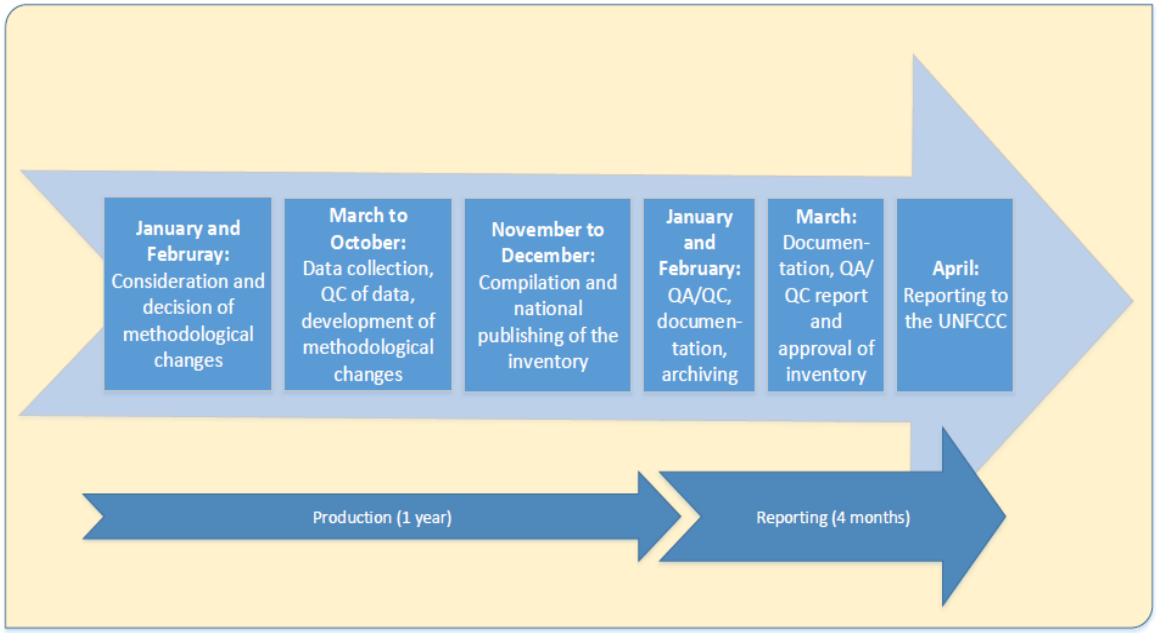

Figure AV-2. The inventory preparation cycle

5. QA/QC-plan

5.1 Data quality objectives

Good practice defines the data quality objectives to be *transparency, completeness, consistency, comparability, and accuracy*. These objectives are used as a foundation of the

QA/QC system implemented in Norway. In addition, we consider *timeliness* as part of the data quality objectives. Below we describe the objectives in more detail as they have been elaborated for the national system in Norway.

Transparency implies:

- Availability of sufficient documentation to enable estimates to be replicable from emission factors, activity data or plant emission measurement[8] for emission/removal data, irrespective of which institution or company made the estimates. This includes appropriate references to supplementary information (e.g., scientific literature)
- Availability of supplementary documentation (in English if practical) of models to enable a review, including a description of main assumptions and sources of data
- Availability of supplementary documentation (in English if practical) of data collection of key activity data
- Availability of sufficient documentation of methodological choices, including choice of measurement methods
- Explanation of reasons for not estimating an emission or removal occurring in Norway, for example an explanation of why an estimate is considered insignificant, see NIR chapter 1.7
- Documentation of QA/QC procedures

Completeness implies that:

- Estimates are made for all sources and sinks identified unless it can be documented that emissions/removals are insignificant
- Notation keys are used for all cells to be reported in the CRF
- Regular evaluation assessing potentially new sources and include these in the inventory

Consistency implies that:

- The same data sources and assumptions are used across gases, sectors and years of the inventory
- The same methodology has been used for all years of a time-series
- Data (activity data and measured data) have been collected using the same method for all years of the time-series
- Appropriate splicing techniques in accordance with the good practice guidance have been applied in cases of inconsistencies of time-series or changes in methodologies

Comparability implies that:

[6] This criterion can be difficult to fulfill in cases where complex models are used.

- Methodologies are consistent with the IPCC Guidelines and the good practice guidance
- Reporting guidelines are followed
- Emissions and removals are allocated to appropriate categories of the CRF as described in the IPCC Guidelines and good practice guidance

Accuracy implies that:

- Uncertainties are reduced by selecting higher tiers for key categories or increased sampling/frequency of surveyed data and emission measurements (taking costs into account)
- Data collected are checked to assess their reliability and possible over- or underestimates and identified biases are reduced
- Uncertainty estimates are collected or calculated and reported for all data
- Data are compared with independent information where possible

Timeliness implies that:

- Data are collected, processed, and reported in accordance with a timetable that allows reporting within the official deadline for submission to the UNFCCC

5.2 QA/QC responsibilities

All three institutions are responsible for implementing QC procedures to meet the data quality objectives of the data they collect. Each institution is also responsible for implementing QA procedures on method implementation and of data originally collected by another institution in addition to reviewing the QC performed on these data by the institution collecting the data.

The Norwegian Environment Agency as the national entity is responsible for overall QC and in charge of checking that the appropriate QC procedures are implemented internally at the Norwegian Environment Agency, Statistics Norway, and the Norwegian Institute of Bioeconomy Research. Statistics Norway and the Norwegian Institute of Bioeconomy Research are responsible for the QC of their respective data in the emission inventory. In addition, the Norwegian Environment Agency performs QC on the complete inventory, including the estimate of total emissions. The Norwegian Environment Agency checks the QC reports and may request Statistics Norway or the Norwegian Institute of Bioeconomy Research to revise the inventory if the QC report is not satisfactory, if errors in the inventory are identified, or if any of the methodologies used are not as agreed by the cooperation meeting. In the event of a disagreement between the Norwegian Environment Agency and Statistics Norway on any numbers in the emission inventory, the Norwegian Environment Agency may change the estimates in the CRF. They will inform Statistics Norway about this decision and the reasons for it, and they will document in the NIR why the data in the CRF are different from those of the national inventory compiled by Statistics Norway.

Each institution is responsible for the annual reporting on their completion of the QC procedures before the inventory submission to the UNFCCC. The reporting is based on a general and a source-specific QC checklist and a textual description of possible recalculations, issues to be followed up before the next submission and other relevant information. The QC reports are sent to the Norwegian Environment Agency.
The Norwegian Environment Agency, as the national entity, is responsible for the overall QA of the national system, including the UNFCCC reviews and any national reviews undertaken.

5.3 QC procedures

The input data used in the Norwegian national inventory are classified as emission factors, model and other estimation parameters, activity data (statistical data) and emissions from industrial and large plants (point sources). The output is classified as estimated emissions and removals, CRF tables and NIR information. QC procedures are established for each element of input data and output.

Chapter 6 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 1 (IPCC, 2006) gives guidance on QC.
QC is defined *as a system of routine technical activities, to measure and control the quality of the inventory as it is being developed*. The QC system is designed to:

i) Provide routine and consistent checks to ensure data integrity, correctness, and completeness
ii) Identify and address errors and omissions
iii) Document and archive inventory material and record all QC activities

The IPCC Guidelines distinguishes between *general* and *category-specific* QC procedures. The general procedures focus on the processing, handling, and documentation procedures that are common to all inventory source categories. The category specific QC procedures are directed at specific types of data used in the methods for individual categories and require knowledge of the category, the types of data available and the parameters associated with emissions.

5.3.1 General QC procedures

The general QC procedures are performed annually for all data collected and all estimated data. For all sectors except LULUCF, most of these checks are performed automatically through use of Statistics Norway's emission model. However, checks are also performed manually on some data, for example, emission data collected from plants and activity data, emission factors and other estimation parameters for key categories. Identified problems are normally corrected before the final submission or flagged for correction in the next

submission. For the LULUCF sector, the QC measures are also described in chapter 6 of the NIR.

Reported emissions, emission factors and activity data for the latest inventory year are routinely compared to those of the previous inventory year. For non-LULUCF, changes larger than 50-185 %, depending on gas and source, are automatically flagged for further manual QC. In addition, implied emissions factors (IEF) are calculated for emissions from stationary combustion and IPPU at point sources. The IEFs are subjected to the same comparison between the current and previous inventory year. The most thorough checks are made for the gases and categories with the largest contribution to total emissions. Result control routines include comparison of emission estimates at the level of reporting to the UNFCCC and LTRAP convention (NFR[9]).

The general checks for the three institutions are summarized in Tables AV-2 to Table AV-4

Table AV-2 General annual QC checks for the Norwegian Environment Agency

	Check	Responsible
Time-series and inventory version comparisons to detect problems with units, computational errors as well as other human errors.		
	Compare all emissions reported from industrial and other large plants to those of the previous inventory year and flag changes of more than 20% (10% for plants included in emission trading) for further QC in collaboration with the plant.	NEA
Completeness checks		
	Identify large plants previously included in the inventory that no longer are included (and explain the reason for exclusion) and new plants included in the inventory (including an explanation of whether this plant is new) and communicate this information to SN.	NEA
Consistency checks		
	Checks for time-series consistency in cases where emissions from plants collected by the Norwegian Environment Agency only are available for parts of the time-series.	SN + NEA
	Checks for time-series consistency where activity data are only available on a non-annual or cyclical basis.	NIBIO (SN and NEA)
	IEF checks of input data: Checking derived emission factors for individual plants (reported emissions divided by energy consumption, production or other activity data), flagging plants whose IEFs deviate significantly from the default values for further investigation. The investigation of flagged observations is prioritized based on magnitude of emissions and deviation from default IEFs, focusing on correcting obvious errors.	SN, NEA
Recalculations		
	Check that appropriate recalculations are made, if needed, whenever methodologies or data sources have changed.	All
	Check that appropriate recalculations are made when preliminary data have been replaced with final data.	All (NIBIO in particular)
	Check that when recalculations are performed these are made consistently throughout the time-series.	All

[9] Nomenclature for reporting of air pollution data to UNECE under the LRTAP convention.

	Check that where splicing techniques are needed, these are applied in accordance with good practice and are documented.	All
Documentation		
	Check documentation for completeness and need for general revisions	All

Acronyms: NEA: Norwegian Environment Agency, SN: Statistics Norway, NIBIO: The Norwegian Institute of Bioeconomy Research

Table AV-3 General annual QC checks for Statistics Norway

	Check	Responsible
Input data control		
	Identification and correction of input data with non-acceptable categories and values, double counting, inconsistencies, etc. Computerized flagging. Manual correction. Level of control: Data entry level. Accuracy.	Category experts
	Possible missing data for the most recent inventory year (n): Flagging of sources where input data exist for previous years, but not for the most recent inventory year. Computerized flagging. Manual correction. Level of control: Data entry level. Accuracy, consistency and completeness.	Category experts
	New sources for the most recent inventory year (n) or missing data previous years: Flagging of sources where there is input data for the most recent inventory year (n), but data is lacking for the precious years (n-1, n-2, n-3). Computerized flagging. Manual correction. Level of control: Data entry level. Accuracy, consistency and completeness.	Category experts
	Checking for extreme values in time series: Computerized control with flagging of input data where: 1. The change from latest inventory year (n) and the previous year (n-1) is above or below certain limits. 2. The value in latest inventory year (n) is above or below limits when compared with the average value for the three previous years (n-1, n-2 and n-3). 3. The absolute change in value between latest inventory year (n) and the previous year (n-1) is larger than the third largest change in the whole time series. Limits of controls: Flagging when value outside X-Y per cent of reference value: CO2, NOx, NMVOC and CO: 70-135 per cent CH4, N2O: 50-177 per cent HFC, PFC, SF6: 20-343 per cent	Category experts

	Computerized flagging. Manual correction. Level of control: Data entry level. Accuracy and consistency.	
Control of estimated emissions (results) – most recent inventory year (n=2015)		
	Identification and correction of input data with non-acceptable categories and values, double counting, inconsistencies, etc. Computerized flagging. Manual correction. Level of control: Estimated emissions. Accuracy.	Category experts
	Possible missing data for the most recent inventory year (n): Flagging of sources where emission data exist for previous years, but not for the most recent inventory year. Computerized flagging. Manual correction. Level of control: CRF-category times gas, and sources as published by Statistics Norway times gas. Accuracy, consistency and completeness.	Category experts
	Checking for extreme values in latest inventory year: Flagging of emission data where the change from previous inventory year (n-1) to the latest inventory year (n) is above or below certain limits: 1. A change of more than 50 per cent up or 33,33 per cent down for a particular GHG and category 2. A change of more than 0,1 per cent compared with total emissions from all sources of that particular GHG Computerized flagging. Manual correction. Level of control: CRF category for each individual GHG. Accuracy and consistency.	Category experts
	Implied emissions factors for energy categories. Computerized flagging. Manual correction. Level of control: CRF category for each individual GHG. Accuracy and consistency.	
Control of estimated emissions (results) – recalculations (1990-2014)		
	Checking of recalculations for whole time series: Flagging of emission data where values have changed more than certain limits compared with value in previous submitted inventory. 1. A change of more than 0,001 per cent for a particular GHG and category 2. A change of more than X compared with total emissions from all sources of that particular GHG Computerized flagging. Manual correction. Level of control: CRF category for each individual GHG. Performed on whole time series except latest inventory year. Accuracy and consistency.	

	Are all recalculations documented in NIR?	Category experts
Control of recalculations		
	Check that appropriate recalculations are made, if needed, whenever methodologies or data sources have changed.	Category experts
	Check that appropriate recalculations are made when preliminary data have been replaced with final data.	Category experts
	Check that when recalculations are performed these are made consistently throughout the time-series.	Category experts
	Check that where splicing techniques are needed, these are applied in accordance with good practice and are documented.	Category experts

Table AV-4 General annual QC checks for the Norwegian Institute of Bioeconomy Research (NIBIO)

Check performer	***Type of check***	***Check Done***
Checks for errors in time-series, units, computational and human errors		
All source-responsible	Evaluate emissions or removals from the whole time series for each category by: (1) comparing the current estimate to previous estimate(s) as appropriate, (2) re-checking and explaining to the extent possible the reason(s) behind trends or individual year estimates that significantly depart from the expected trend, and (3) checking the value of the implied emission (IEF) factors across the time series for outliers, or if IEFs are static, that the changes in emissions or removals are being captured.	
LULUCF compiler and area expert(s)	Analyse area changes in land use and evaluate if trends and the range of annual changes seem reasonable.	
NIBIO & SSB		
Qualified NIBIO person	Consistency check of areas reported in CRF tables for convention and KP.	
LULUCF compiler	The area used for peat extraction is estimated by external data and it must be implemented manually in the area data derived from NFI. Correct reporting of managed and unmanaged wetlands in CRF tables is cross-checked.	
Completeness checks		
LULUCF compiler		
LULUCF compiler	Check that all mandatory and chosen emission/removal sources are included.	
LULUCF compiler	All LULUCF and KP tables in CRF are inspected for missing annual values.	
Recalculations		
All source-responsible		

LULUCF compiler	Check of the consistency in the descriptions (NIR): All recalculations made are described in the NIR in chapter 6 *LULUCF* and 11 *KP-LULUCF* and repeated for LULUCF in chapter 10 *Recalculations.*	
LULUCF compiler	Comparisons between the current and previous submission for the year 1990 and the last common year (in the reported time series) respectively are made based on a manual inspection.	
Documentation		
LULUCF compiler	Check that new methods are described in detail (in the NIR or in publications referred to in the NIR) and that the documentation is stored properly and can be made available upon request during review.	
All source-responsible	Store all source/sink specific information on: T:\Aktive\DSU\3535\351015_LULUCFrapportering\Rapportering After the submission deadline all data is in addition stored on a locked folder locally: T:\Aktive\DSU\3535\351015_LULUCF_Rapportering_historisk	

5.3.2 Category-specific QC

These checks are normally not performed on an annual basis but are performed regularly and in addition to the general QC checks, often in conjunction with improvement projects. The goal is to perform a category-specific QC, including an updated uncertainty analysis, within cycles of approximately 5 years for key categories and potential key categories, and at least every 10 years for other categories. An annual and long-term prioritization will be made annually by the Norwegian Environment Agency, Statistics Norway, and the Norwegian Institute of Bioeconomy Research, in collaboration with other relevant authorities, as a part of the improvement plan (with the Norwegian Environment Agency in charge) (see Section 3.6). For example, the review reports, QA/QC conclusions and need for improved emission data for emission reduction plans will be important for a final prioritization. QC findings are followed up by revising emission factors, activity data, other estimation parameters or the methodologies. The changes are approved in the autumn meetings between the Norwegian Environment Agency, Statistics Norway, and the Norwegian Institute of Bioeconomy Research.

5.3.2.1 Estimated emissions and removals

The QC checks on emission and removal estimates come in addition to those undertaken on the input data as described below.

The QC checks of estimates include:

- A comparison of the methodologies used to estimate emissions and removals with those recommended in the latest IPCC Guidelines
- A review of availability of data and resource requirements for selecting a higher tier
- A review of alternative methodologies
- A comparison of (higher tier) estimates with lower tiers when appropriate
- A comparison of estimates to those of inventories from countries with similar national circumstances using appropriate drivers
- An assessment of time-series consistency (for example, that the same method has been used for all years of the time-series) and use of splicing techniques (where relevant)
- A review and documentation of model assumptions
- A review and update of documentation, including archiving of supplementary documentation
- A check of whether the allocation to categories in the CRF is correct

QC checks for completeness include:

- A review of relevant emission sources not included in the inventory (the IPCC Guidelines, inventories from countries with similar national circumstances and literature)
- A review of methodologies and data availability for these potential sources
- A documentation of reasons for not including a source in the inventory

5.3.2.2 Emission data reported from industrial plants

Plant emission data that are used in the EU emission trading system undergo annual QC checks through third party verification. The Norwegian Environment Agency also performs source-specific QC checks for other plants, with special emphasis on large point sources within key categories. Statistics Norway is responsible for reporting the results of the key category analysis to the Norwegian Environment Agency, while the Norwegian Environment Agency performs the assessment of the “key plants” within a category.

The QC checks include:

- An assessment and documentation of measurements and sampling
  - Measurement frequency
  - Sampling
  - Use of standards (e.g., ISO)
- An assessment and explanation of changes in emissions over time (e.g., changes in technology, production level or fuels) (annual check)
- An assessment of time-series consistency back to 1990 in cooperation with Statistics Norway[10] (if plant emission data are missing for some years and estimates are made using aggregate activity data and emission factors)
- A comparison of plant emissions to production ratios with those of other plants, including explanations of differences
- A comparison of the production level and/or fuel consumption with independent statistics (in collaboration with Statistics Norway)
- An assessment of reported uncertainties (including statistical and non-statistical errors) to the extent this has been included in the reporting

The QC checks should be made in close cooperation with the emission reporting plants. Further details about plant specific QC are given in Annex VIII of this NIR.

5.3.2.3 Emission factors & other estimation parameters

The category specific QC is performed by the Norwegian Environment Agency, Statistics Norway, the Norwegian Institute of Bioeconomy Research and/or another institution with expertise in the category subject to review. It can address a single category or several related categories (e.g., road transportation and agriculture) and will include an assessment of the emissions factors currently in use and conclude on the need for revisions.

This QC will include the following elements:

- A comparison of the emission factor with those
  - recommended in the IPCC Guidelines
  - identified through a literature search (peer reviewed literature and other reports)
  - identified by national source-experts (e.g., industry organizations and researchers)
  - that can be derived from emission data reported from the plants

[10] For plants included in the emission trading scheme historical data are derived in cooperation with the industry organization

- An assessment of the representativeness of the emission factors used for national circumstances (particularly when they are based on default emission factors and international research)
- A quantification of the uncertainty (addressing statistical and non-statistical errors)
- An assessment of the content of documentation, including technical documentation
- An assessment of the availability (archiving) of documentation, including technical documentation
- An assessment of changes in emission factors over time due to changes in technology and/or management

5.3.2.4 Activity data

The category specific QC is performed by the Norwegian Environment Agency, Statistics Norway and The Norwegian Institute of Bioeconomy Research for the data collected by each institution. Some activity data are originally collected by another institution. In these situations, the Norwegian Environment Agency, Statistics Norway, or the Norwegian Institute of Bioeconomy Research (as appropriate) are responsible for assessing the QC applied on these data and perform their own additional QC on aggregate data.

The activity data QC will include the following elements:

- An evaluation and documentation of the QC routines applied at the survey level (at the point of interview/field work and the data checking/processing level)
- An evaluation of the techniques used to obtain annual data (if applicable)
- An assessment of sampling and representativeness, including an evaluation of possible bias for application of the data in inventories (for LULUCF area data and for statistical survey data)
- An assessment of the classification of land areas and assumptions needed to apply data from the national forest inventory (NFI)
- A review and assessment of alternative data sources
- A comparison with independent data sources (if possible)
- A quantification of uncertainties (including statistical and non-statistical errors)

5.3.2.5 Documentation

For each category, a review and update of the documentation is performed if needed. The requirements for documentation will be highest for key categories. The QC should include:

- An assessment of whether the documentation is sufficient to understand the data, methods, and assumptions behind an estimate of emissions or removals
- A recording of changes that have been made as a response to the QC checks
- A description of consequences for the time-series of changes in data or methods
- Writing and archiving of additional technical documentation as needed (in English if practical or in Norwegian) to enable the replicability of estimates for a reviewer, in

some cases running the calculation scripts is necessary to reproduce numbers due to high complexity particularly for LULUCF.

5.3.3 Common Reporting Format (CRF) tables

After the implementation of reporting with the CRF software, Statistics Norway and the Norwegian Institute of Bioeconomy Research transfer emission data using Excel imports. Separate datasets for activity data and notation keys have been developed. QC consistency checks are built-in features in the new CRF, and these are used actively.

Statistics Norway and the Norwegian Environment Agency are responsible for additional checks on an annual basis:

- Check of total emissions against those of the emission model
- Check of sectoral totals against those of the emission model
- Check of notable changes from previous submissions for individual categories
- Check of correct use of notation keys
- Check of exported CRF tables to ensure that they are in accordance with the results of the emission model

The Norwegian Institute of Bioeconomy Research is responsible for checking all LULUCF entries with data from its database. Exported CRF tables are checked to ensure that they are in accordance with the LULUCF database.

The Norwegian Environment Agency is responsible for a final check of the CRF for completeness and for checking that Statistics Norway and The Norwegian Institute of Bioeconomy Research have completed the QC checks they are responsible for. The Norwegian Environment Agency is responsible for making the final approval of the CRF tables.

5.3.4 National Inventory Report (NIR)

The Norwegian Environment Agency is responsible for the annual QC of the NIR. This includes checking that:

- All figures on emissions and removals (including the key category analysis) in tables and text are consistent with those reported in the CRF
- Trends in emissions and removals are explained
- All methodological changes since the previous NIR are explained
- All recalculations are explained and the effect on time-series consistency reported
- The textual description reflects methodologies used and are sufficient to understand estimation procedures
- Responses to the review report are reflected
- Priorities for improvements are described in accordance with decisions
- All other information is correct (including QA/QC plan, uncertainties and completeness)

5.3.5 Timeliness

The Norwegian Environment Agency, Statistics Norway and the Norwegian Institute of Bioeconomy Research have agreed on a timetable to enable the Norwegian Environment Agency to report to UNFCCC by April 15 (see Table AV-6). It is the responsibility of the Norwegian Environment Agency, Statistics Norway, and the Norwegian Institute of Bioeconomy Research to make this timetable known in their respective institutions to ensure that the internal deadlines for data collection and processing in each institution as far as possible follow the emission inventory production cycle.

5.3.6 QC documentation

The members of the inventory team working with individual sectors or part of a sector go through their submissions included quality controls with the relevant coordinator/inventory compiler. Based on this a QC check list is completed and reported to the person in charge of QC for the national system. These written reports include a description of the general and source-specific tests that have been conducted, and whether these have or will be used to correct any data. The list of general and category-specific QC tests described above will be used as a checklist for the QC reports.

5.4 QA procedures

According to the 2006 IPCC Guidelines (IPCC, 2006), “Good practice for QA procedures includes reviews and audits to assess the quality of the inventory, to determine the conformity of the procedures taken and to identify areas where improvements could be made”. QA involves reviewers that have not been involved in preparing the inventory. They should be independent from the institutions involved in the national system, or not closely involved in the inventory compilation. We distinguish between QA of input data and of the entire inventory.

5.4.1 Statistical data and emissions reported from plants

5.4.1.1 Emissions reported from plants

Emissions reported from industrial sites are always checked by the Norwegian Environment Agency (see section 3.3.2) by the department in charge of evaluating emission permits. Also, the Department of Inspection and Environmental Data in the Norwegian Environment Agency, includes two units responsible for chemicals and product control, and industrial and offshore control. These sections work independently from the units responsible for the evaluating of emissions permits. They inspect and monitor industrial sites, including underlying documentation for the emission estimates.

There are two types of controls, one is a *frequency-based control* and the other is a *specific campaign control*.

The frequency-based control is as shown in Table AV-5.

Table AV-5 Independent control frequency of industrial plants

Control class[1]	Inspection	Audit	Self-reporting
1	Every four years	Every four years	Annually
2	Every six years	Every six years	Annually
3	Every 3-4 years	-	Annually
4	If needed	-	If needed

[1]*Industrial sites are divided into four control classes. Those that have the largest potential to generate pollution are included in class 1. Those that are included in class 4 have a relatively limited potential to generate pollution. The potential to generate pollution is determined by the hazard of their emissions and discharges, the quality/sensitivity of the recipient and the use of hazardous chemicals.*

There are three main methods of determining compliance at industrial sites:

- *Inspections* are normally a one-day unannounced visit at the site. An inspection is a useful method to verify compliance with the specific requirements
- *Audits* and source testing of emissions: Environmental audits and source testing are used not only to monitor compliance but also to evaluate the environmental management system in the enterprise. These audits are more comprehensive than inspections and are planned well in advance in cooperation with the industrial site
- *Self-reporting* of data: For enterprises in control class 1, 2 and 3, the permit includes a requirement to establish and maintain a well-defined self-monitoring program. Once a year they must submit an account of their emissions to the Norwegian Environment Agency. This report should include their total emissions, any discharges exceeding the discharge limits or other violations. The reasons for violations must be given together with an explanation of corrective actions taken to

avoid recurrence. This self-reported data is often checked during inspections and audits

An inspection is a one-day on-site control, while an audit may take 3-5 days. The focus of a control/revision may vary. The administrative department in charge of evaluating emission permits can suggest topics for focus of the controls.

Control campaigns take place after a consideration of experiences and results of previous campaigns. Typically, such campaigns will be used to check reported emissions.
The Norwegian Environment Agency has several possibilities for sanctions and other enforcement instruments to ensure compliance at industrial sites. They include the requirement to provide information to the authorities, coercive fines, withdrawal of the permit, and reporting violations to the prosecuting authorities.

Particular controls are directed to the plants included in the emission trading system to check that reported emissions are in compliance with the emission trading regulation (Annex 3). The reported emissions are subject to a third-party verification, performed by institutions formally approved for such verification. In addition, the Norwegian Environment Agency conduct audits at about 5-10 EU ETS installations each year. These audits evaluate the installations emissions monitoring systems and procedures and are carried out in addition to the third-party verification.

For the purpose of the inventory, additional QA is undertaken by the Section for Emission Inventories and analysis in the Norwegian Environment Agency before the data are sent to Statistics Norway. These QA checks include consideration of time-series consistency and a comparison of emissions per unit produced.

5.4.1.2 Statistical data

All data collected by institutions not included in the national system undergo a QA performed by the Norwegian Environment Agency or Statistics Norway or the Norwegian Institute of Bioeconomy Research as appropriate. Furthermore, when possible, the inventory teams perform a QA of data collected in their institutions in addition to the QC performed by the units responsible for the data collection. For example, Statistics Norway, compares energy use reported from the plants to Statistics Norway (used in the energy balance) with energy use reported by the same plants to the Norwegian Environment Agency within the EU ETS system or reports submitted due to the regular permits.

For some sources, activity data used in one sector are examined by experts from another sector. For example, during the production of the emission inventory, there is a data

exchange between the LULUCF and the agricultural sectors. Thus, there is a two-way QA of data for these sectors.

At Statistics Norway, the statistics that form the basis for the emission inventory is produced in conjunction with the NAMEA statistics (emissions distributed on economic activities). This alternative aggregation of emissions gives a different perspective and will thus in some cases show needs for improvement. The statistics are evaluated, combined with information from the national accounts, and published by experts at Statistics Norway not involved in the production of the emission inventory. The emission statistics are also used by the research department at Statistics Norway.

5.4.1.3 Methodologies

In some cases, experts from other institutions carry out emission estimates themselves, and discrepancies with the emission inventory lead to scrutiny of both the inventory and the external emission calculations. One such example is within agriculture.

5.4.2 The entire inventory

5.4.2.1 UNFCCC review

The annual review of the inventory and NIR under the UNFCCC is considered to be part of the QA. This review is performed by a team of experts (sector experts and generalists) from other Parties. Their tasks include examining the data and methods used by Norway along with the documentation and concluding whether they are in accordance with current guidelines. The review results in a review report which indicates specific areas where the inventory is in need of improvements.

5.4.2.2 Expert peer review

The inventory and its documentation is published annually, and industry associations, relevant research institutions, directorates and environmental organizations may review and suggest improvements to the inventory. Any results of this review will be used by the cooperating institutions to improve the inventory.

It is a priority for the Norwegian LULUCF reporting team to invite external experts as consultantsfor QA purposes when new estimation methods are developed. The resulting QA reports are referred to and listed in the NIR in the appropriate context.

5.4.2.3 Audits

The Norwegian Environment Agency, Statistics Norway and the Norwegian Institute of Bioeconomy Research are audited by the Auditor General of Norway. In addition to financial audits, the auditor general also performs performance audits, which consist of a systematic analysis of the economy and an evaluation of the efficiency and effectiveness of the government administration on the basis of the decisions and intentions of the

Norwegian parliament. The Office of the Auditor General uses performance audits to shed light on specific areas within the government administration where there is a risk of noncompliance and/or deficiencies in relation to the resolutions and intentions of the Norwegian parliament. An audit of the national system may be initiated as a part of this. The usefulness of having a private company conduct an independent audit of the implementation of the national system will be considered at a later stage.

5.4.2.4 QA through usage of data

QA is performed by experts as part of the usage of the emission inventory. One such activity is the evaluation of policy in mitigation analyses where emission figures are used at a very detailed level, which may reveal shortages in e.g. the level of detail of the inventory. Mitigation analyses are performed by experts in the Norwegian Environment Agency and other institutions, and there is a close collaboration with the emission inventory team. Thus, information regarding lack of accuracy or transparency easily reaches the inventory team, and possibilities for improvements are considered. A similar usage of the inventory is found in the production of future projections of emissions and removals in scenario analyses.

5.4.2.5 International collaboration

Contact with other countries gives important input and QA to the Norwegian Emission Inventory. Norway has since 2013 participated in Nordic meetings, where specific issues in the inventories are raised, and the approaches in different countries have been discussed. These collaborative meetings were first started in the LULUCF sector and other sectors joined later. This gives important new perspectives that is being considered in the Norwegian emission inventory team. Also, bilateral projects, with e.g., Latvia and Lithuania (Norwegian Grants projects) and South Africa gives valuable input to the Norwegian emission inventory.

5.5 Implementation of QA/QC procedures

The institutions of the national system have implemented the QA/QC plans by establishing internal procedures. These procedures assign internal responsibilities for the QA/QC checks suggested in chapter 3.3 and facilitate input to the QA/QC report. The QA/QC procedures are under continuous development, and inventory compilers in all institutions of the national system are informed about the data quality objectives of the national system, as well as any priority areas related to the development of the QA/QC procedures.

5.6 Plan for improving the data

The inventory may, for some source categories, need to be further developed before it can fulfill the data quality objectives. The three institutions collectively produce plans for improving the data. The plans are based on the key category analysis, the UNFCCC review, QA/QC activities, new information and other needs, for example, needs for better data for

the development of emission reduction strategies (mitigation analyses) and regional statistics.
The cooperating institutions produce a plan for improvements of the inventory. This plan may also point out needs that cannot be handled through ordinary inventory projects, because more in depth research projects are required.

6. Production of emission data

Details of the methods and framework for the production of the emission inventory are given in the annual National Inventory Report chapters 1-9, including references therein.

Norway has an integrated inventory system for producing inventories of the greenhouse gases included in the Kyoto Protocol and the air pollutants SO_2, NO_x, non-methane volatile organic compounds (NMVOC), ammonia, CO, particulate matter, heavy metals and persistent organic pollutants reported under the LRTAP Convention. The data flow and QA/QC procedures are to a large extent common for all pollutants.

6.1 Assessment of key categories

The key category assessment is made by Statistics Norway using the IPCC Tier 1 and the Tier 2 method, which includes uncertainty estimates. The assessment is updated annually and is made for the level and trend since 1990. Statistics Norway also considers the qualitative criteria for identification of key categories. In accordance with the IPCC good practice guidance for LULUCF (IPCC 2006) the analysis is made in two parts, one excluding LULUCF emissions and removals and another integrating LULUCF with the rest of the inventory. Due to the large LULUCF sink in Norway, the results of these two parts are quite different.

6.2 Data collection

In the agreements, the three institutions of the national system have defined areas of responsibility for data collection. The current division of responsibility for the most important data is shown in Table AV-6. The table focuses on data that are updated regularly and not emission factors that are assumed constant over several years. Emission factors are normally collected through dedicated projects. The institutions may agree to reallocate responsibilities through the cooperation meetings.

Table AV-6 Main responsibilities for data collection

Norwegian Environment Agency	Emissions and activity data from industrial plants (point sources) (around 70 at present, but some of these do not report GHG emissions)	Norwegian Environment Agency

	Emissions from offshore activities, including drilling activities, fugitive emissions, well-testing oil burning and emission factors for crude oil loading	The Norwegian Petroleum Directorate and the Norwegian Environment Agency
	Methane recovery from landfills	Norwegian Environment Agency
	Amounts of waste incinerated	Norwegian Environment Agency
	Data on Industrial wastewater	Norwegian Environment Agency
	Import of HFCs, PFCs and SF_6 by application. Import HFCs, PFCs and SF_6 in products	Norwegian Environment Agency and Statistics Norway
		The Norwegian Tax Administration
Statistics Norway	Energy balance/account (energy use by sector and application), energy use in point sources. These statistics are building on a number of primary data sources (surveys, registers and censuses)	Statistics Norway
	Production data, import and export	Statistics Norway
	Vehicle registrations	Statistics Norway
	Transport statistics	Statistics Norway, Institute for Transport Economics (TØI), Norwegian Road Federation
	Agriculture statistics, including cultivated area, animal population and manure management	Statistics Norway, Cow Recording System at TINE BA, Norwegian Institute of Bioeconomy Research
	Fertilizer use and lime application	Norwegian Food Safety Authority (Mattilsynet)
		Norwegian Environment Agency
	Waste disposal and waste characteristics	Statistics Norway
	Wastewater statistics	Statistics Norway
	Biological treatment of waste	Statistics Norway
The Norwegian Institute of Bioeconomy Research	Area statistics from the national forest inventory and national land resource surveys	Norwegian Institute of Bioeconomy Research
	Data needed to estimate changes in biomass stocks from the national forest inventory	Norwegian Institute of Bioeconomy Research
	Area and other activity data/statistics from administrative sources, i.e., agriculture statistics	Statistics Norway

	Climate and meteorological data needed to calculate soil carbon	SeNorge; Norwegian Meteorological Institute, The Norwegian Water Resources and Energy Directorate (NVE)
	Activity data for HWP	FAO
	Fertilizer use on forest land	Statistics Norway
	Extracted peat volume	Norwegian Food Safety Authority (Mattilsynet) and Norwegian Institute of Bioeconomy Research
	Forest fires	Directorate for Civil Protection and Emergency Planning

6.3 Uncertainty calculations

Norway has quantified uncertainties in input data (activity data and emission factors) and in total emissions and its trend. The uncertainties in input data have been made in consultation with sector experts, combining expert judgments by source experts, information in the IPCC 2006 Guidelines (IPCC 2006) with other sources of information. The uncertainties are combined using the IPCC approach 2 method (bootstrap techniques). The uncertainty analysis of the total inventory is performed annually on emission data for 1990 and the last year of the emission inventory. Uncertainty estimates for sources are also updated annually when the estimation methods or data sources are being changed.

Uncertainties in the LULUCF sector are based on the uncertainty of an activity estimate – typically an area estimate - combined with the uncertainty of the emission or removal per unit activity – typically a carbon stock change estimate. Uncertainties in the area estimates are based on sampling methodology. Uncertainties in the carbon stock change estimates are based on a variety of methodologies. Sampling methodology is applied for tree living biomass, which is the largest sink or source category, while other sources are based on default factors, peer-reviewed studies, and expert judgments. In cases where the methodology for calculating the uncertainties are too complex for standard error propagation methods (Approach 1), Monte Carlo simulation (Approach 2) is instead performed.

6.4 Recalculations

In accordance with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 1, chapter 5 (IPCC 2006) Norway routinely evaluates whether recalculations of historical data are needed. Recalculations are made if there have been methodological

changes influencing emissions in previous years or changes in data due to correction of errors or changes in preferred data sources.

When data sources are not available for the whole time series since 1990, one of the proposed methods from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 1, chapter 5 (IPCC, 2006) is used to splice data (or more sophisticated methods if relevant). Normally extrapolations using drivers correlated with emissions or the overlap method is used. Smaller emission sources may be linearly extrapolated (or kept constant). The method is chosen on the basis of available data and suitability of drivers.

Data from the National Forest Inventory are collected over a period of five years. Each year provides a statistically representative coverage of Norwegian forests, but with only 1/5 of the statistical support of the full inventory. Annual reports can be issued based on the annual data but are known to result in large inter-annual variations. Plotwise interpolation is used to gap-fill the area for the missing years between two observations. And plotwise extrapolation of the area based on the trend for the last 10 years, is used to gap-fill the last years of the timeseries (only required for 4/5ths of the plots). All carbon stock change (CSC) estimates based on area estimates use the full plotwise interpolated-extrapolated area dataset to provide yearly CSC estimates for each plot.

6.5 Emission calculations

6.5.1 The main emission model for non-LULUCF emission sources

The model was developed by Statistics Norway (1992, 1994). It was redesigned in 2003 in order to improve reporting to the UNFCCC and LRTAP, and to improve QA/QC procedures. The model is programmed in SAS system software and is flexible with respect to output, i.e. it can produce tables (input and output) in accordance with different aggregation levels and parameters. Furthermore, it has been designed to fit the availability and aggregation of input data and is flexible with respect to changes. Emission factors can be entered for groups of years.

Several emission sources – e.g., road traffic, air traffic, waste, and solvents – are covered by more detailed supplementary side models. Aggregated results from the side models are used as input to the general model.

The general emission model is based on equation (1).

(1) $$Emissions\ (E)\ =\ Activity\ level\ (A)\ \times\ Emission\ Factor\ (EF)$$

For emissions from *combustion*, the activity data is based on energy use. In the Norwegian energy balance/accounts, the use of different forms of energy is distributed

by industries (economic sectors). In order to calculate emissions to air, energy use must also be allocated to technical sources (e.g., equipment). After energy use has been allocated in this way, the energy accounts may be viewed as a cube in which the three axes are fuels, industries, and sources.

The energy use data are combined with a corresponding matrix of emission factors. In principle, there should be one emission factor for each combination of fuel, industry, source, and pollutant. Thus, the factors may be viewed as a four-dimensional "cube" with pollutants as the additional dimension. However, in a matrix with a cell for each combination, most of the cells would be empty (no consumption). In addition, the same emission factor would apply to many cells. There are about 25 fuels and about 25 technical sources used for energy combustion.

Emissions of some pollutants from major manufacturing plants (point sources) are available from measurements or other plant-specific calculations (collected by the Norwegian Environment Agency). When such measured data are available, the estimated values are replaced by the measured ones:

(2) $$Emissions\ (E)\ = [\ (A\ -\ A_{PS})\ \times\ EF] \ +\ E_{PS}$$

where A_{PS} and E_{PS} are the activity and the measured emissions at the point sources, respectively. Emissions from activities for which no point source estimate is available ($A-A_{PS}$) are still estimated with the regular emission factor.

Non-combustion emissions are generally calculated in the same way, by combining appropriate activity data with emission factors. Some emissions are measured directly and reported to the Norwegian Environment Agency, and some may be obtained from current reports and investigations. The emissions are fitted into the general model using the parameters industry, source, and pollutant. The fuel parameter is not relevant here. The sources for non-combustion emissions and for combustion without energy use are based on EMEP/NFR and UNFCCC/CRF categories, with further subdivisions where more detailed methods are available.

The model uses approximately 130 *industries* (economic sectors). The classification is almost identical to that used in the National Accounts, which is aggregated from the European NACE classification (Statistics Norway, 2008). The large number of sectors is an advantage in dealing with important emissions from manufacturing industries. The disadvantage is an unnecessary disaggregation of sectors with very small emissions. To make the standard sectors more appropriate for calculation of emissions, a few changes have been made, e.g., "Private households" is defined as a sector. Information about the geographical distribution of emissions is useful for modelling and control purposes and constitutes a fifth axis.

6.5.2 The LULUCF model

(Smith 2016; Smith 2014)

The Norwegian Institute of Bioeconomy Research is in charge of estimating emissions and removals from Land use, Land-Use Change and Forestry (LULUCF) for all categories where area statistics and living biomass are used for activity data. A software-based calculation system that primarily uses R (R Core Team, 2020), in an environment with version control (Gitlab), and microsoft excel has been developed for the implementation of the IPCC good practice guidance for the LULUCF sector. The systems use input data from different sources and create final output datasets. These final datasets include all data needed for the tables in the common reporting format (CRF) for both the Climate Convention and the Kyoto-protocol.

The National Forest Inventory (NFI) database contains data on areas for all land uses and land-use conversions, carbon stocks in harvested/dead and living tree biomass and field observations necessary to apply a range of estimation methods based on the IPCC GPG. The NFI is used to estimate the total area of forest, cropland, grasslands, wetlands, settlements, other lands and the land-use transitions between these. The data from the NFI is complemented with many other datasets in order to produce emission/removal estimates for all relevant land use categories (Table AV-6). Details on all methods and datasets in use are provided in the annual NIR and references therein.

The sampling design of the NFI is based on a systematic grid of geo-referenced sample plots covering the entire country. The NFI is a continuous forest inventory in which 1/5th of the sample plots are revisited each year. This results in a 5-year cycle in which all permanent plots are revisited (See details in section 6.3). Up until 2010 the estimates were based on detailed information from sample plots in lowlands outside Finnmark county. To confirm the land use and the extent of the area of forest and other wooded land at higher altitudes and in Finnmark County, the NFI conducted a complete forest inventory during 2005–2010 for these areas. All areas were for the first time included in the estimates for the LULUCF sector in the 2012 submission. The estimates of land use, land-use change, and carbon stock change above the coniferous limit and in Finnmark County, have been back-casted to close the gap from the start of the National Forest Inventory (1986-1993) to the beginning of the supplementary inventories (Finnmark, forest above the coniferous limit) (see detail in the annual NIR).

7. Handling of data

7.1 Archiving

The guidelines for the national system specify the requirements for archiving. Archiving shall include:

- Disaggregated emission factors
- Activity data
- Documentation of data collection, assumption and aggregation
- Internal documentation on QA/QC procedures
- External and internal reviews
- Documentation on annual key sources
- Planned inventory improvements

All three institutions are responsible for archiving the data they collect and the estimates they calculate with associated methodology documentation and internal documentation on QA/QC. The Guidelines for National Systems, however, state that "Annex I Parties should make the archived information accessible by compiling it at a single location".
Due to the differences in the character of data collected, Norway has chosen to keep archiving systems in the three institutions, which means that not all information is archived at a single location, see Table AV-7 for an overview.

These archiving systems are, however, consistent. Although the data are archived separately, all can be accessed efficiently during a review. However, data archived at Statistics Norway are subject to rules of confidentiality, and this must be taken into consideration during reviews. In addition, the Norwegian Environment Agency is continuously collecting physical copies of the most important methodology reports, based on the reference list of the NIR. Electronic copies of the most important methodology reports are also collected. This is systematized in a catalogue in the agency's achieving system (Elements) and in an EndNote library. URLs are also included if available. Some of the older methodology reports have been scanned to make them more easily available.
The archiving systems in all three institutions were developed for the implementation of the national system, see section 7.3.

The common rules for archiving of data are the following:

- Data and information are archived for each submission year
- Data and information are archived in a single location within each institution (this may imply double archiving)
- Archiving for a submission year includes:
    - All input data
    - All estimated emissions
    - All partly filled-in or final CRF
    - All technical documentation
    - Recalculations of previous estimates, if any
    - The NIR (where relevant)
- The file structure is documented
- The platform at which the data and information is archived undergoes a daily backup and the backup is securely saved

Confidentiality is an issue for the data collected by Statistics Norway when there are few entities reporting for a source category. Confidential data previously used in the inventory are for many sources replaced by non-confidential data collected by the Norwegian Environment Agency. In order to comply with confidentiality issues, emission estimates for these sources are aggregated. This is especially prominent in source category 2F, where emissions from 2F2-5 are aggregated in category 2F6 due to confidentiality.

Table AV-7 Responsibilities for archiving information.
Capital, bold X indicates archiving also of datasets sent from the other institutions.

	Norwegian Environment Agency	Statistics Norway	Norwegian Institute of Bioeconomy Research	Comments
Disaggregated emission factors	x	**X**	x	All EF except LULUCF are archived by Statistics Norway
Activity data	x	**X**	x	
Emission data collected from large plants	**X**	**X**		Statistics Norway does not collect these data, but archived as part of the emission model
Documentation of data collection, assumption and aggregation	**X**	**X**	x	Norwegian Environment Agency is developing a library of all important reports (including background reports)
Internal documentation on QA/QC procedures	x	x	x	
External and internal reviews	**X**	x	x	
Documentation on annual key categories		x		
Planned inventory improvements	**X**			
Estimated emissions (model output)		**X**	x	
CRF	**X**	(x)		
NIR	**X**			
Recalculations	**X**	**X**	x	

7.2 Access to archived data during a review

By systematic archiving as described above, all information can be made available to a review team. The most relevant documentation is available in the central archive of the Norwegian Environment Agency. Comprehensive documentations for LULUCF and other

emission sources are available in English. Additional technical documentation may be in Norwegian only, as will the emission reports from the plants. The Norwegian Environment Agency, Statistics Norway and The Institute of Bioeconomy Research are responsible for having competent personnel on duty during a review to access data if requested. Confidential information from Statistics Norway can be made available to the review team when the revision takes place in Statistics Norway's premises and after a confidentiality declaration is signed.

7.3 Allocation of responsibilities during a review

The Norwegian Environment Agency has the main responsibility for coordinating the review. Statistics Norway and the Norwegian Institute of Bioeconomy Research are allocated specific responsibilities during the review. The Norwegian Environment Agency is responsible for informing the experts at all three organizations about the timing of the review at least two months before it takes place to ensure their availability.

Table AV-8 Main responsibilities during a review (lead in capital)

	Norwegian Environment Agency	Statistics Norway	Norwegian Institute of Bioeconomy Research
Preparation and coordination	X		
General, national system and cross-cutting issues	X	x	
Energy	X	X	
Industrial processes and product use	X	X	
Agriculture	X	X	
LULUCF	X		X
Waste	X	X	
Direct communication with UNFCCC Secretariat	X		

8. References

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9. Annexes

9.1 Annex 1. Key data providers

Table AV-3 Data providers and sources for the emission inventory ranked by their importance.

	Very important	Important	Less important
1. Data from Statistics Norway			
Energy statistics	X		
Consumer surveys			X
Living condition survey			X
Foreign trade statistics		X	
Production statistics			X
Petroleum statistics	X		
Agriculture statistics	X		
Waste statistics		X	
Waste water statistics			X
Vehicle registry		X	
Transport statistics		X	
2. Other institutions			
The Norwegian Institute of Bioeconomy Research	X		
Norwegian Environment Agency	X		
Forurensning (pollution)	X		
Footprint (previously EEH and Environmental Web (including data from the Norwegian Petroleum Directorate))	X		
FAOSTAT (Food and Agriculture Organization of the United Nations, Statistics division)	X		
Norwegian Meteorological Institute	X		
Norwegian Petroleum Industry Association (NP, norsk petroleumsinstitutt)			X
Norwegian Petroleum Directorate (NPD) (Oljedirektoratet)		X	
Institute of Transport Economics (TØI)			X
Norwegian Road Federation (Opplysningsrådet for veitrafikk)		X	
Norwegian Food Safety Authority (Mattilsynet)			X
The Directorate for Civil Protections and Emergency Planning (DBS)		X	
Directorate of Customs and Excise		X	

SRG (Stiftelsen Returgass)			X

9.2 Annex 2. QC of activity data – existing routines

9.2.1 Statistics Norway

Documentation of the statistics and routines is available on web (www.ssb.no/en, for each statistic click at "about the index"). An example from the energy statistics is given below. As a part of the statistical production reported data are checked and the primary data providers are contacted for explanations/revisions if needed.

EXAMPLE: ENERGY USE IN THE MANUFACTURING SECTOR

The purpose of the statistics is to give information about energy use in mining and manufacturing. Since the 70's the energy use data have been collected as a part of the structural business statistics for manufacturing. From the reference year 1998 the energy use data are collected in a single survey, as a part of an ongoing project between Statistics Norway and the Norwegian Water Resources and Energy Directorate (Enova SF from 2003). The purpose of this is to improve the quality of the energy use information and to develop and produce some new statistics products.

Population

From the reference year 1998 the statistics cover all existing local kinds of activity units within mining and manufacturing, which means division 10, 12-37 in the Norwegian Standard Industrial Classification. Statistics Norway collects data for a sample. For the other units the energy use data are estimated. The estimation is based on turnover and information from the sample. There are about 18000 units in the population (2013). Until the reference year 1997 enterprises with individual proprietorship where the owner is working alone (one-man-enterprise), and other local kind of activity units with employment less than half a man-year worked, are not included. The change in the population from the reference year 1998 leads to a break in the statistics.

Data sources

Data of energy use are collected from a sample of local units in manufacturing, mining and quarrying. Turnover data from the short-term turnover statistics (by preliminary figures) and energy costs from the structural data for the manufacturing sector (by final figures) are used by estimating energy use data for units outside the sample. Information on activity codes, addresses and other information are also collected from the Central Register of Establishments and Enterprises of Statistics Norway.

Sampling
The survey has a sample of 2 200 local kind of activity units. The sample consists of the biggest units in each subgroup, chosen by number of employees in each subgroup, and some small and medium sized units. Each industry is represented with as many units as possible. Small units are chosen randomly from a stratified sample. The units in the sample cover about 94 per cent of the total energy use and about 86 per cent of the total energy costs in the mining and manufacturing sector.
Collection of data
The survey is based on questionnaires that are sent out in January the year after the reference year. It is possible to choose between paper forms and electronic forms. The Statistics Act is used, and the units are required to respond. The deadline is in February. There are three reminders. Units that have not responded after the third reminder have to pay a fine. Even if the units pay the fine, they still have to respond.
Control and revision
When we receive the data we first have a consistence check against the previous year to identify serious errors. If we detect serious error we correct the data. Afterwards we are doing a more intimate control of the units with the largest energy consumed. The units are classified after this criterion:
Group 1: Energy use > 50 GWh (103 units in 2014)
Group 2: 10 GWh < energy use < 50 GWh (247 units in 2014)
Group 3: Energy use > 5 GWh or/else energy cost. > 1 mil. NOK (600 units)
Group 4: Energy use < 5 GWh or/else energy cost. < 1 mil. NOK (1 100 units)
The local activity units in group 1 have highest priority and will be controlled first. Then we continue with the units in groups 2 and 3. Here we have a more intimate consistence check against the previous year and against energy costs in the Central Register of Establishments and Enterprises. If we detect errors in the data, we contact the local activity units. At the end of the control, we have a consistence check of total energy use and costs in each industry against the previous year.

Estimation
Turnover data from the short-term turnover statistics (by preliminary figures) and energy costs from the structural data for the manufacturing sector (by final figures) are used by estimating energy use data for units outside the sample.
Frequency and timeliness
Preliminary figures are published within 6 months after the end of the reference year. Final figures are published within 18 months after the end of the reference year.
Legal authority
The Statistics Act §§2-2 and 2-3

9.2.2 The Norwegian Environment Agency

Emission data reported from the plants to the Norwegian Environment Agency are entered into the database Forurensning and the information is forwarded to an officer in charge. The officer in charge will check the following:

- That the data in Forurensning are registered as reported from the plants and appropriate corrections are made
- The methodology that was used for estimating emissions
- Emission in comparison to the emission level reported for the previous year. Emissions are displayed graphically. In the case of large deviations the plant is contacted to provide an explanation.
- Emission relative to the production level. In the case of large variations in this ratio the plant is contacted to provide an explanation.
- The emissions seen in relation to other factors, for example changes in production technologies, control technologies or fuels

The Section for Emission Inventories and Analysis in the Norwegian Environment Agency are performing additional checks of data before they are sent Statistics Norway, including assessment of time-series consistency and consistency of data reported from plants using comparable technologies.

9.2.3 The Norwegian Institute of Bioeconomy Research

9.2.3.1 Survey level

The Norwegian Institute of Bioeconomy Research is responsible for the Norwegian National Forest Inventory (NFI). The NFI has long traditions and the attributes assessed or measured in the field are subject to frequent revisions, while at the same time an attempt is made to preserve the long time series of key attributes. The main objectives of the NFI are to provide updated forest information to national forest administrations, to be able to report adequately to international forest resources assessments and to provide data for special studies.

Prior to every field season, all field workers are gathered for one week of briefing on the inventory work. New attributes or altered definitions of attributes will especially be emphasized. The course includes practical training and exercises, under which the assessments and measurements made by each of the fieldworkers will be compared and discussed in plenary.

During the field season, each field worker will usually be visited by a supervisor from the head office. The supervisor will join the field worker on some sample plots in the field, giving an opportunity to discuss possible problems and misunderstandings with regard to classifications and measurements. Normally an assessment check will also be performed, i.e. a subset of the sample plots will be measured a second time by an independent control team. Normally the proportion of plots selected for checking constitutes about 5% of the plots. The results from the assessment check will not be used to replace or adjust the original data, but only to assess data quality, detect misunderstandings and incorrect working techniques. Thus, it may lead to improvement of field instructions and training.

Data is being entered directly into a handheld data logger during the inventory work. A number of consistency checks has been built into the data logger, e.g. to ensure that the correct attributes will be assessed under the current area class. Data from the previous inventory cycle will be stored in the data logger and a warning will appear if the data are not in accordance with what has been assessed before. That also includes single tree data where current diameter and tree height will be checked against the one measured 5 years earlier, in order to detect an unlikely increment rate or any confusion with identifying trees. Every week the data are transferred to the head office via e-mail. Further testing for correspondence between different attributes will also be carried out and detected errors or inconsistencies will be returned to the field crew for clarification. Transitions between land use categories are checked for consistency.

9.2.3.2 Data processing

After calculation of volume and annual increment of each sampled tree, the estimates are aggregated to geographical regions and the whole country. One sample plot in the 3x3 km grid represents an area close to 900 ha. After having made the appropriate summaries, the results are compared with corresponding data from the last inventory and the entire time series of data.

9.3 Annex 3. Archiving – development of routines

9.3.1 Statistics Norway

Archiving of the emission inventory in Statistics Norway takes place at several levels:

1) The inventory is a part of Statistics Norway's central data archiving system. All input data to and results from the general emission model from every publication cycle are stored and documented in this system. Archiving is made after each inventory calculation has been finalized.
2) Input data received as spreadsheets, mail, etc, are stored in folders for every publication cycle. These folders also include preliminary calculations before data are entered into the general emission model.
3) Several input data are used in preliminary calculations before entering into the general Norwegian emission inventory model. This includes satellite models such as road traffic and waste, as well as a number of simpler calculations that do not fit into the framework of the general model. The preliminary calculations are not included in the central archiving system, which is not suited for such a diverse collection of data. For some satellite models there is an established archiving routine where all input data and results from every calculation cycle are stored.
4) During improvement projects, adaptation of activity data or calculations of emission factors are often performed. Examples are emission factors for flaring and air traffic. These improvement projects are not archived as part of the annual

folder system but are stored in separate folders. They are not overwritten when new methodologies, emission factors or activity data are implemented.

Statistics Norway will improve its archiving system in line with the requirements for the national system. This will include improved archiving of input and output from side models (satellite models). These will be archived in one place and the storage of revised versions due to recalculations will be improved as will the documentation of recalculations. Recalculations are documented for internal use. This document will receive increased status and its accessibility will be improved.

9.3.2 The Norwegian Environment Agency

9.3.2.1 Emissions from large industrial plants

Reports with emission data and QA control from large industrial plants are sent to the Norwegian Environment Agency and archived in Elements. Elements is an electronic recordkeeping tool that meets the specifications set by the Noark Standard. The Noark Standard is a specification of functional requirements for electronic recordkeeping systems used in public administration in Norway and has been approved by the Norwegian National Archives. These data reported from the plants are then stored in the Forurensning database[11]. All written correspondence between the plants and the Norwegian Environment Agency is archived in Elements. If a plant submits additional information as a result of the QA/QC, this information will also be archived in Elements and Forurensning will be corrected accordingly. The Forurensning database does not currently have the functionality to store the original emission data if previously reported data are corrected, but this functionality may be developed. After QA/QC described in 3.3.2, the data (with supplementary notes) for the large industrial plants are stored and archived in a designated file on the Norwegian Environment Agency's server, before being sent to Statistics Norway.

9.3.2.2 Emissions from offshore activities

Emission data from offshore activities are archived in EPIM Environment Hub (EEH). This is a database operated by the Norwegian Petroleum Directorate, the Norwegian Environment Agency and the Norwegian Oil Industry Association. The Norwegian Environment Agency aggregates data from the EPIM Environment Hub (EEH). The data are stored and archived in a designated file on the Norwegian Environment Agency's server before being sent to Statistics Norway.

[11] The Forurensning database replaced the previous database INKOSYS in 2006. All data in INKOSYS is transferred to Forurensning.

9.3.2.3 Data on methane recovery from landfills, amounts of waste from incineration plants and wastewater production from industry

Emission data from the landfill owners are sent to the County Departments of Environmental Affairs and are then stored in the Forurensning database. After QA/QC, these data (with supplementary notes) are stored and archived in a designated file on the Norwegian Environment Agency's server before being sent to Statistics Norway

9.3.2.4 Import of HFC/PFC and SF_6

Companies that import *HFC/PFC and* SF_6 in bulk reported this information to the Norwegian Environment Agency annually up to 2009. The reports are archived in Elements. After 2009, Statistics Norway collects the amounts of imported and exported gases from registers at the Norwegian Directorate of Customs and Excise. All import of F-gases is covered in these registers, as Norway lays a tax on the import of F-gases.

The Norwegian Environment Agency have improved its archiving routines for emissions and other data reported from industrial plants and for emissions and other data reported from oil and gas facilities in FORURENSNING.

From 2009 the Norway's official report is uploaded to UNFCCC submission portal. The CRFs tables and NIR are also uploaded to REPORTNET from 2002 and will also be uploaded there in the future. Before 2002 the reports are stored at the Norwegian Environment Agency's server.

9.3.3 The Norwegian Institute of Bioeconomy Research

The tables and data programs etcetera are currently being stored on the institute's server. Every night a new backup copy is made and stored outside the building. This will ensure that no data can disappear due to technical failure. Files that have been left unchanged will, therefore, exist as long as there is a wish to keep them. Even after purposely deleting or changing the data, the files will exist for 2-3 months, or until the data tapes are overwritten with new data.

IPCC (1997): Greenhouse Gas Inventory. Workbook (Volume 2). *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*

IPCC (2000): Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories: Prepared by the National Greenhouse Gas Inventories Programme, J Penman, D Kruger, I Galbally, T Hiraishi, B Nyenzi, S Emmanul, L Buendia, R Hoppaus, T Martinsen, J Meijer, K Miwa and K Tanabe. Published for the IPCC by the Institute for Global Environmental Strategies, Japan

IPCC (2003): Good Practice Guidance for Land Use, Land-Use Change and Forestry: [Penman, J., M.Gytarsky, T. Hiraishi, T. Krug, D. Kruger, R. Pipatti, L. Buendia, K. Miwa, T. Ngara, K. Tanabe and F. Wagner (eds.)]. IPCC National Greenhouse Gas

Inventories Programme. Institute for Global Environmental Strategies, Hayama, Kanagawa, Japan

IPCC (2006): 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan

IPCC (2019): 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Smith, A., Granhus, A., Astrup, R. (2016): Functions for estimating belowground and whole tree biomass of birch in Norway. *Scandinavian Journal of Forest Research*, 31 (6): 568-582

Smith, A., Granhus, A., Astrup, R., Bollandsås, O.M., Petersson, H. (2014): Functions for estimating aboveground biomass of birch in Norway. *Scandinavian Journal of Forest Research*, 29 (6): 565-578.

Annex VI: Registry information

Innhold

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10. Introduction

Previous NIRs have contained supplementary information on registries required under Article 7, paragraph 1 of the Kyoto Protocol. The second commitment period of the Kyoto Protocol is over, but the true up for this still has to take place. Norway therefore reports information related to Kyoto units, the national registry and the Standard Electronic Format (SEF) table in this Annex.

11. Information on accounting of Kyoto units

11.1 Background information

Norway's Standard Electronic Format (SEF) reports for 2021 (for the first and the second commitment period) are reported and will be made available at the UNFCCC website.

11.2 Summary of information reported in the SEF tables

The tables below show the amount of different units (AAUs, ERUs, CERs, tCERs, lCERs and RMUs) from the first commitment period (CP1) and the second commitment period (CP2) within the registry, and on which account type these units are present at the end of 2021.

Table 1. AAUs from CP1		
AAUs	# CP1 UNITS	# CP2 UNITS
Party holding account	5 984 774	406 770 908
Entity holding account	85 225	NO
Article 3.3/3.4 net source cancellation accounts	1 824 462	NO
Other cancellation accounts	8 433 893	
Retirement account	253 134 092	NO
Previous period surplus reserve account (PPSR)		6 069 999
TOTAL amount	269 462 446	412 840 907
TOTAL CP1 + CP2 AAUs	682 303 353	

Table 2. ERUs from CP1 and CP2		
ERUs	# CP1 UNITS	# CP2 UNITS
Party holding account	NO	738 305
Entity holding account	NO	84 848
Other cancellation accounts	1 098 212	
Retirement account	2 605 670	NO
TOTAL amount	3 703 882	823 153
TOTAL CP1 + CP2 ERUs	4 527 035	

Table 3. CERs from CP1 and CP2		
CERs	# CP1 UNITS	# CP2 UNITS

Party holding account	56 484	40 609 864
Entity holding account	654	656 881
Other cancellation accounts	19 716 856	
Voluntary cancellation accounts		581 089
Retirement account	9 260 279	NO
TOTAL amount	29 034 273	41 847 834
TOTAL CP1 + CP2 CERs	70 882 107	

Table 4. tCERs from CP1 and CP2		
tCERs	# CP1 UNITS	# CP2 UNITS
Party holding account	NO	NO
Entity holding account	NO	NO
Other cancellation accounts	35 424	
Voluntary cancellation accounts		NO
Retirement account	NO	NO
TOTAL amount	35 424	NO
TOTAL CP1 + CP2 tCERs	35 424	

Table 5. RMUs from CP1 and CP2		
RMUs	# CP1 UNITS	# CP2 UNITS
Party holding account	NO	NO
Entity holding account	NO	NO
Article 3.3/3.4 net source cancellation accounts	9 947 523	NO
Other cancellation accounts	7 333 333	
Voluntary cancellation accounts		NO
Retirement account	1 824 462	NO
TOTAL amount	19 105 318	NO
TOTAL CP1 + CP2 RMUs	19 105 318	

The registry did not contain any lCERs from CP1 or CP2.

The total amount of the units in the Norwegian registry at the end of 2022 corresponded to 776 853 237 tonnes CO2 eq.

The following account types did not contain any units:

- lCER Replacement Account for Expiry (CP1 and CP2)
- lCER Replacement Account Non-Submission Report (CP1 and CP2)
- lCER Replacement Account Reversal in Storage (CP1 and CP2)
- Mandatory Cancellation Account CP2
- Net Source Cancellation Account CP2
- Non-compliance Cancellation Account (CP1 and CP2)
- Retirement Account CP2
- tCER Replacement Account for Expiry (CP1 and CP2)

The following account types did not exist in the registry:

- Article 3.1 ter and quarter ambition increase cancellation account
- Article 3.7 ter cancellation account
- Cancellation account for remaining units after carry-over

- lCER cancellation account for expiry
- lCER cancellation account for reversal of storage
- lCER cancellation account for non-submission of certification report
- tCER cancellation account for expiry

11.3 Discrepancies and notifications

Table 6. Discrepancies and notifications	
Annual Submission Item	Reporting information
15/CMP.1 annex I.E paragraph 12: List of discrepant transactions	No discrepant transaction occurred in 2022.
15/CMP.1 annex I.E paragraph 13 & 14: List of CDM notifications	No CDM notifications occurred in 2022.
15/CMP.1 annex I.E paragraph 15: List of non-replacements	No non-replacements occurred in 2022.
15/CMP.1 annex I.E paragraph 16: List of invalid units	No invalid units exist as of 31 December 2022.
15/CMP.1 annex I.E paragraph 17: Actions and changes to address discrepancies	No discrepant transactions occurred in 2022.

We have not submitted the R2- R5 reports since none of these events have occurred in the registry, and these reports would thus be empty.

11.4 Publicly accessible information

Information relating to the Norwegian registry, which is deemed to be public information, can be accessed via the Kyoto Protocol Public Reports page in the national registry. The SEF reports may also be downloaded from the registry web site, https://www.miljodirektoratet.no/ansvarsomrader/klima/klimakvoter/public-reports/
In accordance with the requirements of the Annex to Decision 13/CMP.1, all required information for a Party with an active Kyoto registry is provided with the exceptions as outlined below:

Account Information (Paragraph 45) and Account holders authorised to hold Kyoto units in their account (Paragraph 48)
In line with the data protection requirements of Regulation (EC) No 45/2001 and Directive 95/46/EC and in accordance with Article 110 and Annex XIV of Commission Regulation (EU) No 389/2013, the information on account representatives, account holdings, account numbers, legal entity contact information, all transactions made and carbon unit identifiers, held in the EUTL, the Union Registry and any other KP registry (required by paragraph 45 and paragraph 48) is considered confidential. This information is therefore not publicly available.

JI projects in Norway (Paragraph 46)
Norway does not host JI projects. Therefore, no information on Article 6 (Joint Implementation) projects is publicly available.

Holding and transaction information of units (Paragraph 47)

General remarks

Holding and transaction information is provided on a holding type level due to more detailed information on transactions being considered confidential according to Article 110 of Commission Regulation (EU) No 389/2013, ref. paragraph 47(a), 47(d), 47(f) and 47(l). Article 110 of Commission Regulation (EU) 389/2013 provides that

> "*Information, including the holdings of all accounts, all transactions made, the unique unit identification code of the allowances and the unique numeric value of the unit serial number of the Kyoto units held or affected by a transaction, held in the EUTL, the Union Registry and any other KP registry shall be considered confidential except as otherwise required by Union law, or by provisions of national law that pursue a legitimate objective compatible with this Regulation and are proportionate.*"

Paragraph 47(b)

No AAUs were issued based on the assigned amount pursuant to Article 3, paragraphs 7 and 8 in 2022.

Paragraph 47(c)

Norway does not host JI projects. Therefore, no ERUs have been issued based on Article 6 projects.

Paragraph 47(e)

No RMUs were issued in 2022.

Paragraph 47(g)

No ERUs, CERs, AAUs or RMUs were cancelled based on activities under Article 3.3 and 3.4 in 2022.

Paragraph 47(h)

No ERUs, CERs, AAUs and RMUs were cancelled following determination by the Compliance Committee that the Party does not comply with its commitment under Article 3, paragraph 1 in 2022.

Paragraph 47(i)

116 608CERs were cancelled in 2022. No ERUs, AAUs or RMUs were cancelled in 2022.

Paragraph 47(j)

No ERUs, CERs, AAUs nor RMUs were retired in 2022.

Paragraph 47(k)

6 069 999 AAUs were carried over from the previous commitment period in 2022. No ERUs or CERs were carried over from the previous commitment period in 2022.

Paragraph 47(h) bis

No AAUs were cancelled under Article 3, paragraphs 1 ter and 1 quarter in 2022.

Paragraph 47(h) ter
No AAUs were cancelled under Article 3, paragraph 7 ter in 2022.

11.5 Calculation of the commitment period reserve (CPR)

The reporting of the calculation of the commitment period reserve, pursuant to decision 11/CMP.1, 15/CMP1, 1/CMP.8 and 3/CMP.11 is as follows:
The commitment period reserve is the lower of the two values given by 90 percent of the assigned amount and eight times 100 percent of the total emissions in the most recently reviewed inventory.

The assigned amount for Norway for the Kyoto Protocol's second commitment period has been set to 348 914 303 t CO_2 equivalents through the review of our report to facilitate the calculation of its assigned amount (FCCC/IRR /2016/NOR).

90 % of the assigned amount:
The review report (FCCC/IRR/2016/NOR) determined that with the appropriate rounding rules, 90 % of the assigned amount equals:
= 314 022 874 tonnes CO_2 equivalents

100 % of eight times its most recently reviewed inventory:
The common approach/guidance is that for this approach of calculating the CPR, the most recent inventory submission should be used because, at the end of the review, this becomes the most recently reviewed inventory. Hence, the emissions without LULUCF in 2021 (49 158 818 tonnes CO_2 equivalents) are used. 100 % of eight times the most recently reviewed inventory therefore equals:
= 393 270 542 tonnes CO_2 equivalents

For Norway, the lowest number is equivalent to 90 % of Norway's assigned amount. Norway's commitment period reserve is therefore:
= 314 022 874 tonnes CO_2 equivalents

12. Information on changes in national registry

Table 7 shows the changes to the national registry of Norway that have occurred in 2022.

Table 7. Changes to the national registry of Norway in 2022.

Reporting Item	Description
15/CMP.1 annex II.E paragraph 32.(a): Change of name or contact	None
15/CMP.1 Annex II.E paragraph 32.(b): Change regarding cooperation arrangement	No changes.

15/CMP.1 annex II.E paragraph 32.(c): Change to database structure or the capacity of national registry	There has been 3 new EUCR releases (versions 13.6.1, 13.7.1 and 13.8.2) after version 13.5.2 (the production version at the time of the last Chapter 14 submission). No changes were applied to the database, whose model is provided in Annex A. No change was required to the application backup plan or to the disaster recovery plan. No change to the capacity of the national registry occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(d): Change regarding conformance to technical standards	The changes that have been introduced with versions 13.6.1, 13.7.1 and 13.8.2 compared with version 13.5.2 of the national registry are presented in Annex B. It is to be noted that each release of the registry is subject to both regression testing and tests related to new functionality. These tests also include thorough testing against the DES and are carried out prior to the relevant major release of the version to Production (see Annex B). No other change in the registry's conformance to the technical standards occurred for the reported period.
15/CMP.1 annex II.E paragraph 32.(e): Change to discrepancies procedures	No change of discrepancies procedures occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(f): Change regarding security	No changes regarding security were introduced.
15/CMP.1 annex II.E paragraph 32.(g): Change to list of publicly available information	No change to the list of publicly available information occurred during the reporting period.
15/CMP.1 annex II.E paragraph 32.(h): Change of Internet address	No change to the registry internet address during the reported period.
15/CMP.1 annex II.E paragraph 32.(i): Change regarding data integrity measures	No change of data integrity measures occurred during the reporting period.
15/CMP.1 annex II.E paragraph 32.(j): Change regarding test results	No change during the reported period.

The latest annual review report for Norway is not published at the time of reporting, however the results are mostly ready and have been communicated to the Norwegian inventory team. There are no outstanding recommendations concerning the national registry.

The latest Standard Independent Assessment Reports for Norway are SIAR/2022/NO/1/2 for part 1 (completeness) and SIAR/2022/NO/2/2 for part 2 (substance). There was no recommendation concerning the Norwegian national registry in the SIAR reports.

Table 8 Follow-up to recommendations for the registry.		
Reference	Recommendation description	Response

Two annexes related to the registry are not part of the NIR, but they are reported annually through the UNFCCC submission portal. These two annexes are:

Entity relationship diagram
- Annex A – CSEUR (pdf format)

Detailed information and test cases
- Annex B - Changes in EUCR v11.5 to v13.5.2 (Excel format)

Annex VII: QA/QC of point sources

1. Introduction

Norway has a long experience of using GHG emissions from industrial point sources in the national GHG inventory. The Norwegian Environment Agency has been given the authority to manage and enforce the Pollution Control Act, the Product Control Act and the Greenhouse Gas Emission Trading Act. The Norwegian Environment Agency grants permits, establishes requirements, and sets emission limits, and carries out inspections to ensure compliance. This is the core responsibility of the agency, and this competence and expertise has been built up over the past 50 years.

In 2006, as part of the improvements for the Initial report, the Norwegian Environment Agency performed a major QA/QC exercise on the time series from 1990 to 2004 of greenhouse gas (GHG) emissions from the largest industrial plants in Norway. The following sectors of industry were covered: cement production, mineral fertilizers, carbide industry, production of ferroalloys, production of primary aluminum, anode manufacture, production of iron and steel, nickel production, pulp and paper manufacture, oil refineries, gas terminals, lime production, other mineral production, methanol production, plastics, other chemical industry and production of magnesium. The method and data sources used for the QA/QC exercise undertaken in 2006 is described in chapter 2 of this annex.

Chapter 3 of this annex describes the current QA/QC procedures applied to plant-specific data as the QA/QC procedures have evolved since 2006 and there are new data sources.

2. Method for establishing and verifying data series of emissions 1990-2004

As part of the QA/QC exercise undertaken for the initial report, the following work procedure was established to verify data series:

- For each plant, a first time series of emission data as well as activity data were established with basis on existing sources of data (see section on data sources).
- The first time series of emission data and activity data were presented in both a table format as well as a graphic presentation.
- Based on the table with compiled data and the graphic presentation, it was possible to identify:
    - Lack of emission data and activity data for any year or time series.
    - Possible errors in the reported data. Possible errors were typically identified if there were discrepancies between reported activity data (consumption of raw materials, production volumes etc.) and emissions, or if there were large variations in the existing time series of emissions.
- The emission data where supplemented and/or corrected if possible, by one or more of the following sources of information:
    - Supply of new data from the company
    - Supplementary data from Klif paper archives.
    - Verification of reported emission data by new calculations based on reported activity data.
    - Calculation of missing emissions (if sufficient activity data were present).
- A final time series of greenhouse gas emissions from 1990 to 2004 were established and presented both as a table and a figure. The origin of the data was documented by the use of colour codes.
- The differences between former and new time series of emissions were identified and documented.

There were six main sources of final data to the time series: the Inkosys (today's Forurensning) database, the white books on GHG, new data calculated by the Norwegian Environment Agency based on reported activity data, new data provided by company, and new data based on interpolation between years. Interpolation was typically used as a method to establish data for the year 1991, if the emissions from 1990 and 1992 were given.

2.1 The Inkosys Database (today's Forurensning)

Data from the annual company emission reports were stored in the database Inkosys. The database contained data from 1992 and held emission and activity data from all companies reporting emissions to the agency. The Inkosys database held reported emissions and activity data from Norwegian companies. The companies reported the data according to a manual (SFT, 2004). In the agency, the respective responsible officer undertook a control of the data, before they were inserted in the database.

2.2 The white book on GHG from Norwegian process industry

The white book on GHG from Norwegian process industry was initiated by the Federation of Norwegian Process industry (PIL), Norwegian Chemical Industrial Worker's Union (NKIF) and Norwegian Oil- and Petrochemical Worker`s Union (NOPEF). The work was carried out by DNV and Sintef, who collected, compiled, controlled and verified all emissions of climate gasses from these industrial plants for the years 1990, 1998, 1999, 2000 and 2001. The methods of work as well as the main results are described in the report from this project (Federation of Norwegian Process Industry 2003). The main data files and verification tables from this work have been made available for the agency. The white book includes data from 60 process industry plants.

Since the emission data in this white book has gone through a thorough verification process, these emissions were assumed to be correct, unless any other information proved them incorrect. If several data sources reported different series of emissions, the data series from the white book were used.

2.3 The white book on GHG from Norwegian pulp and paper industry

The white book on GHG from Norwegian pulp and paper industry work was initiated by the Norwegian Pulp and Paper Association, and was carried out by DNV, Sintef and the Norwegian Association of Energy Users and Suppliers. They collected, compiled, controlled and verified all emissions of climate gasses from the relevant pulp and paper plants for the years 1990, 1998, 1999, 2000 and 2001. The methods of work as well as the main results are described in the reports from this project (Norwegian Pulp and Paper Association 2003). The main data files from this work have been made available for the agency.

Since the emission data in this white book has gone through a thorough verification process, these emissions were assumed to be correct, unless any other information proved them incorrect. If several data sources reported different series of emissions, the data series from the white book were used.

2.4 Other sources

Other data sources also available for this work were:

- Annual update of the climate gas inventories based on annual reports from Norwegian industry. Reported to Statistics Norway.
- Annual (paper) reports from industry of emission to air, water and soil (Egenrapportering).
- Applications for CO_2-permits for the Norwegian emissions trading scheme.

The main documentation from the work is contained in Excel spread sheets giving the resulting time series for each plant included in this revision. Each spread sheet includes emission data and activity data from the relevant data sources for each production plant. It includes the time series for the relevant greenhouse gases and states the sources for this information. Relevant information related to the QA/QC process for the specific site is noted as a comment or as a text box for each plant. The work was also published in a documentation report (SFT 2006).

3. Current QA/QC procedures and data sources

There have been some changes in the QA/QC for plant specific emissions in the process industry since the QA/QC exercise undertaken in 2006. In addition, the same QA/QC exercise is undertaken for plant specific data included in the inventory in the Energy sector (Energy Industries, Manufacturing Industries and Construction and Fugitive Emissions from Fuels – Oil and Natural Gas). The inventory compilers in the Norwegian Environment Agency have more data sources for each plant as all plants submit annual reports electronically as required by their regular permit, some are also covered by the EU emission trading system (EU ETS) and some were also covered by a voluntary agreement up to and including 2012. The most important changes since 2006 are described below.

3.1 Documentation of calculations and time series consistency

The main documentation from the work is still contained in Excel spread sheets. The emission reports from the enterprises are submitted in a standardized electronic format directly to the Norwegian Environment Agency by 1 March each year. The EU ETS reports are thoroughly checked by the agency by the Department of Climate, while the Department of Industry is in charge of checking the reports submitted due to regular permits. The agency has personnel with extensive technical competence in the relevant industry processes.

For the purpose of the inventory, additional QA is undertaken by the Section for Emission Inventories and Method before the data are sent to Statistics Norway. These QA checks include consideration of time-series consistency, inter-annual changes and more attention is now given to implied emission factors (IEF). When needed, further QC is undertaken in collaboration with the officer in the agency in charge for the specific plant and/or the plant. New plants and a new sector (gas-fired power plants) have been included. Time series are continuously recalculated if better data/information is gained.

The use of EU ETS data, data from regular reporting and data from the voluntary agreement does not represent a problem for the time series consistency. This is because the Norwegian GHG inventory for a long time (since the early 90ies) has included GHG emissions from industrial point sources (both emissions from processes and combustion). The new data sources provide data of better quality, and these are checked against the emissions reported under the regular permits.

The issue of using data from the EU ETS (see section 5.2) and implications for time-series consistency have been discussed with other Parties. We refer to paragraph 38 in Ireland's ARR 2013 as Norway is in a very similar position: "*Following a recommendation in the previous review report that Ireland report transparently on the use of EU ETS data and improve the use of plant-specific data, the Party has reported verified CO_2 emission estimates from the EU ETS for public electricity and heat production, petroleum refining and manufacture of solid fuels. These emission estimates are more accurate and reliable than the plant-specific data reported prior to the availability of the EU ETS emission estimates for the same categories. Ireland reported that the EU ETS emission estimates are available from 2005 onwards only and that the detailed information that underlies these data cannot reasonably be acquired by the national inventory agency for historical years of the relevant time series. As such, the application of the improved methodology introduces a degree of inconsistency in the time series that is unavoidable in this instance. However, given that the EU ETS emission estimates fully cover the subcategory public electricity and heat production and that these estimates match those reported separately under parallel arrangements that have been in place for many years for the same plants, it is assumed that the time-series consistency is not seriously affected and that the use of the EU ETS data does not affect the emissions trend. The ERT agrees with this assessment and commends Ireland for introducing these improvements.*"

3.2 Data from the EU ETS

The GHG inventory now includes more reported data from the emissions trading system (ETS) from 2005 and onwards. In phase III of the ETS from 2013-2020 the scope of sectors covered was expanded, including with aluminum production, ferroalloy production and intra-EU aviation. The scope of sectors was not expanded when phase IV started in 2021. Starting in 2013 all emission data from installations in the EU ETS are subject to verification from an accredited independent third party. This means that the Norwegian Environment Agency no longer verify the emissions but provide approval of the annual emissions verified by an independent third party. The decisions of approvals of the reports, applications for permits, the permits, the plans for measuring and reporting, the emission reports, allocation level reports, and approvals are all available to the public.

Industrial installations and aircraft operators covered by the EU ETS are required to have an approved monitoring plan, according to which they monitor and report their emissions

during the year. In the case of industrial installations, the monitoring plan forms part of the approved permit that is also required. Installations and aircraft operators must monitor and report their annual emissions in accordance with two European Commission Regulations, the Monitoring and Reporting Regulation (MRR) and the Accreditation and Verification Regulation (AVR). The agency approves the monitoring plan, if we find it of high enough quality and consistent with the Monitoring and Reporting Regulation. The operators must then perform their measurements and calculations according to this plan, and report according to that. The data in the annual emissions report for a given year must be verified by an accredited verifier by 31 March of the following year. The agency then approves the verified data. Plants covered by the EU ETS are divided into 3 categories (A, B and C), depending on their emissions:

- **Category A** installations covers installations with average reported annual emissions over the previous trading period equal to or less than 50 kilotonnes of fossil CO2 before subtraction of transferred CO2
- **Category B** installations covers installations with average reported annual emissions over the previous trading period of greater than 50 kilotonnes and equal to or less than 500 kilotonnes of fossil CO_2 before subtraction of transferred CO_2 and,
- **Category C** installations covers installations with average reported annual emissions over the previous trading period of greater than 500 kilotonnes of fossil CO_2 before subtraction of transferred CO_2.

The agency has developed a web-based electronic reporting template based on the Commissions electronic templates for monitoring plans, annual emission reports. The activity-specific guidelines set out in the Monitoring and Reporting Regulation contain specific methodologies for determining the following variables: activity data (consisting of the two variables fuel/material flow and net calorific value), emission factors, composition data, oxidation and conversion factors. These different approaches are referred to as tiers. The increasing numbering of tiers from one upwards reflects increasing levels of accuracy, with the highest numbered tier as the preferred tier.

The operator may apply different approved tier levels to the different variables fuel/material flow, net calorific value, emission factors, composition data, oxidation or conversion factors used within a single calculation. The choice of tiers shall be subject to approval by the competent authority (in Norway, The Norwegian Environment Agency). Equivalent tiers are referred to with the same tier number and a specific alphabetic character (e.g., Tier 2a and 2b). For those activities where alternative calculation methods are provided within these guidelines an operator may only change from one method to the other if he can demonstrate to the satisfaction of the competent authority that such

change will lead to a more accurate monitoring and reporting of the emissions of the relevant activity.

The highest tier approach shall be used by all operators to determine all variables for all source streams for all category B or C installations. Only if it is shown to the satisfaction of the competent authority that the highest tier approach is technically not feasible or will lead to unreasonably high costs, may a next lower tier be used for that variable within a monitoring methodology.

Norway has transposed the Monitoring and Reporting Regulation into national law.
All documentation like applications for permits, the permits, the plans for measuring and reporting, the emission reports and approvals are all available to the public.

Data for some important sectors have been reviewed as part of the reviews performed at the Norwegian Environment Agency. However, the EU ETS has introduced a new reporting channel with its own, more specific, energy data. This has made it apparent that for some facilities, the reported emissions do not correspond fully to the energy data reported to Statistics Norway. This is one of the reasons that Statistics Norway is introducing a new check in the current inventory cycle. The total emissions from a facility will be compared to emissions calculated from data reported to the energy statistics together with default emission factors. If deviations are found, the comparison will be made at the level of fuel types. The tolerances for allowed differences are to be decided, as we do not know yet the magnitude of the potential deviations.

The differences between the energy data in the EU ETS and Statistics Norway that has been identified typically refers to emissions from fuel streams in chemical industries and gas processing units that are derived from raw materials. These often have deviating, plant specific emission factors and energy contents, and in some cases, they are reported as raw materials use to the energy statistics.

3.3 Data from the voluntary agreement

The first voluntary agreement between industry and authorities came in place in 1997 and included the aluminium production.

The most sector comprehensive agreement came in 2005 and covered all carbon-intensive industries that were not included in the ETS in 2005-2007 or 2008-2012. The most important sectors that reported under the voluntary agreement were production of aluminium, ferroalloys, anodes, ammonia, nitric acid and oil refineries and gas terminals. Separate and detailed rules for calculation of emissions and for reporting from industries that were part of the voluntary agreement were developed. A common reporting template

was used and there was a guidance document (only in Norwegian). This has led to that the reporting requirements are stricter than before, and QC performed by the inventory compilers in the agency before handing over the data to SN is as described in section 5.1. The required methodology for estimating emissions in the voluntary agreement from 2005 is from our judgement consistent with methodologies described in ETS 2008-2012 and the ETS from 2013.

3.4 The Forurensning database

The Inkosys database has been replaced by the "Forurensning" database which was presented to the ERT during the in-country review of the 2012 NIR. All the data from Inkosys has been transferred to Forurensning. The Forurensning database includes the data and information reported by the plants under their regular permit and data as reported under the EU ETS. The database eases the work of the inventory compilers at the agency as a lot of data is easily available. Specific queries can be tailored for withdrawal of data from the database.

3.5 The Norwegian Pollutant Release and Transfer Register (PRTR)

In addition to posting data and information from the EU ETS on the agency's web page, other data is also made publicly available. Data from the plants as reported under their regular permit can be accessed through the Norwegian Pollutant Release and Transfer Register (PRTR).[12] The Norwegian PRTR website provides information about discharges to air and water, waste transfers, production volumes and energy use for most of the emission sources in Norway. The website includes both point sources and diffuse emissions.

3.6 Inspections

The agency has a separate Inspection and Environmental Data Department, which includes two sections for product and industrial control. This department is working independently from the department evaluating emissions permits. They inspect and monitor industrial sites/plants, including underlying documentation for the emission estimates. The Department is part of the NEA and its tasks are described in the National System and it is hence considered a part of the inventory system.

The department has extensive competence and experience in performing audits and inspections. They also have technical expertise in industrial processes and offshore oil and gas production. There is exchange of knowledge and experience between the experts on the ETS and this department. The department has regular training courses for the

[12] See http://www.norskeutslipp.no/en/Frontpage/ for the English version.

inspectors, where the regulations they shall audit after is an important element. Particular controls are directed to the plants included in the emission trading system to check that monitoring plan is in line with how the operator monitors and reports the emissions. The plants are to be controlled based on the risk of erroneous reporting of emissions.

In their applications for permits, the plants describe their internal Quality Control Systems. It is a requirement in the permits that they apply and operate this system. This is one of the areas that the Inspection and Environmental Data Department carefully controls when they carry out inspections and audits at the facilities.

3.7 Guidance documents

There are guidance documents for measuring within the emissions trading system, the voluntary agreement between the industry and the authority and the guidelines for reporting that all plants with a permit must follow. The guidance documents are lengthy and in Norwegian, so instead of attaching these to the NIR URLs are provided below.

3.7.1 EU ETS:

https://www.miljodirektoratet.no/ansvarsomrader/klima/klimakvoter/kvotepliktig-industri/

3.7.2 Footprint (offshore activities)

https://offshorenorge.no/contentassets/cd872e74e25a4aadac1a6e820e7f5f95/044---anbefalte-retningslinjer-for-utslippsrapportering-rev.-21.pdf

3.7.3 Annual normal permit:

https://www.miljodirektoratet.no/globalassets/publikasjoner/m112/m112.pdf

Annex VIII: Agriculture

1 Livestock characterisation

1.1 Animal population data

Table AVIII-1 and AVIII-2 gives the animal population data used in the Norwegian emission estimations, presented at a detailed level.

Table AVIII.1 Animal population data used in the estimations. Animal places. 1990, 1995, 2000, 2005, 2010-2021.

	1990	1995	2000	2005	2010	2011	2012	2013
Mature dairy cattle	325 896	310 346	284 880	255 663	232 294	224 721	229 767	225 163
Beef cow (other mature cattle)	8 193	20 334	42 324	54 841	67 110	68 539	70 434	71 834
Replacement heifer	311 279	299 284	280 121	255 862	239 839	239 007	235 891	239 386
Heifers for slaughter<1 year	2224	1886	3159	2452	1999	2436	2257	2487
Bulls for slaughter<1 year	7 416	6 258	11 424	9 246	7 299	8201	9 472	10 514
Heifers for slaughter>1 year	44 796	45 216	60 353	55 167	51 411	46 324	40 606	44 808
Bulls for slaughter>1 year	282 528	277 979	273 925	253 923	223 573	215 335	207 571	209 926
Sheep <1 year (adj. for lifetime)	622 862	683 599	643 141	685 466	659 895	653 663	634 325	642 338
Sheep >1 år	714 384	783 922	766 098	717 098	691 450	687 440	685 326	689 345

Piglets	204 623	235 223	244 288	269 761	282 931	274 779	275 349	276 500
Young pigs for breeding	23 047	24 714	31 172	38 930	40 770	42 023	42 636	42 960
Sows	62 683	63 944	57 351	60 584	56 234	53 277	53 154	53 004
Boars	2 046	1 727	1 453	1 299	1 096	1 045	1 037	1 048
Fattening pigs (animal places)	423 836	428 654	444 604	457 395	480 007	478 882	465 301	466 925
Deer	NE	NE	2 280	4 173	7 249	7 808	8 367	7 829
Dairy goats	64 041	58 630	50 578	44 374	35 706	34 783	33 982	31 406
Other goats	19 759	20 082	19 131	18 163	20 793	21 186	20 061	21 013
Horses	31 430	38 013	51 156	61 784	76 752	78 101	79 086	79 965
Laying hens	2 895 663	3 556 841	3 228 812	3 343 410	3 945 607	3 877 138	4 050 447	4 216 858
Chickens reared for laying (animal places)	1 729 532	1 424 417	997 262	1 341 532	1 166 453	1 010 963	966 488	1 224 355
Broilers (animal places)	3 172 880	4 352 716	6 257 582	7 183 188	9 527 116	9 462 380	9 816 367	11 061 440
Turkeys for slaughter (animal places)	176 080	269 504	243 775	360 637	452 438	475 070	504 892	469 657
Ducks and geese for slaughter (animal places)	4 638	6 434	18 177	14 714	31 062	37 771	18 062	47 420
Turkeys, ducks and geese reared for laying (animal places)	15 506	29 930	20 292	45 378	36 901	14 889	13 557	13 257
Reindeer	242 443	212 333	172 407	234 608	254 384	251 071	258 360	248 225
Mink	56 411	44 199	68 526	98 247	107 980	119 741	141 368	182 334
Foxes	104 126	122 146	86 160	76 756	49 213	49 153	51 079	51 916
	2014	2015	2016	2017	2018	2019	2020	2021
Mature dairy cattle	222 553	222 276	220 461	215 849	211 730	199 417	195 076	196 934
Beef cow (other mature cattle)	73 894	77 408	84 372	88 332	92 304	94 001	99 748	106 082
Replacement heifer	246 165	240 419	243 924	247 715	245 636	240 049	245 069	247 748
Heifers for slaughter<1 year	2125	1495	1193	1595	2027	2071	1 721	1 767

Bulls for slaughter<1 year	9 729	7 514	6 667	6 231	7 965	7 414	6 169	5 809
Heifers for slaughter>1 year	65 498	63 318	63 169	41 906	50 329	45 159	51 046	55 006
Bulls for slaughter>1 year	199 249	198 814	211 218	244 399	252 164	231 431	222 899	223 390
Sheep <1 year (adj. for lifetime)	676 867	706 468	757 659	746 214	732 206	671 779	660 826	668 023
Sheep >1 year	683 479	716 252	729 014	730 666	676 937	634 028	644 880	621 374
Piglets	269 152	270 555	274 325	267 077	248 835	235 444	230 466	237 611
Young pigs for breeding	42 634	43 525	41 680	41 006	38 939	35 723	34 222	33 594
Sows	50 291	48 867	47 945	47 093	44 903	41 619	39 344	39 276
Boars	953	1 058	796	799	1 344	889	874	884
Fattening pigs (animal places)	481 210	465 971	482 215	481 541	497 604	475 338	458 665	456 193
Deer	7 714	7 469	7 838	7 086	7 970	8 072	8 347	8 302
Dairy goats	31 461	33 627	34 660	34 126	34 583	35 019	33 960	34 443
Other goats	21 750	21 891	22 198	21 112	23 413	24 017	25 236	26 305
Horses	78 635	78 303	77 350	76 511	80 470	80 919	81 877	83 566
Laying hens	4 320 632	4 359 188	4 336 730	4 365 344	4 308 640	4 627 642	4 585 350	4 666 613
Chickens reared for laying (animal places)	1 119 406	1 141 122	1 089 355	1 096 543	893 219	783 740	628 188	603 417
Broilers (animal places)	11 380 716	9 754 849	10 138 169	9 771 838	9 652 119	10 524 602	10 348 082	11 130 814
Turkeys for slaughter (animal places)	498 222	504 247	471 786	414 910	330 106	329 076	357 046	368 848
Ducks and geese for slaughter (animal places)	60 551	59 618	58 398	55 685	54 860	56 534	57 322	48768

Turkeys, ducks and geese reared for laying (animal places)	20 662	23 811	19 530	20 601	12 336	16 945	14 730	12180
Reindeer	232 905	211 974	211 666	213 913	213 012	215 144	213 753	212 866
Mink	174 613	161 394	143 156	107 039	136 993	82 540	44 198	7 500
Foxes	49 143	40 734	31 828	21 124	27 554	24 918	18 056	1 626

Table AVIII-2 Animal population data used in the estimations. Animal numbers. 1990, 1995, 2000, 2005, 2010-2021.

	1990	1995	2000	2005	2010	2011	2012	2013
Mature dairy cattle	325 896	310 346	284 880	255 663	232 294	224 721	229 767	225 163
Beef cow (other mature cattle)	8 193	20 334	42 324	54 841	67 110	68 539	70 434	71 834
Replacement heifer	143 904	138 359	129 500	118 090	111 122	110 311	108 455	109 643
Heifers for slaughter<1 year	4 134	3 232	6 267	3 745	2 966	3 587	3 419	3 660
Bulls for slaughter<1 year	13 847	10 825	23 295	14 868	11 685	13 128	15 042	16 552
Heifers for slaughter>1 year	24 878	24 477	32 443	29 098	27 000	24 694	21 480	23 600
Bulls for slaughter>1 year	171 871	169 104	175 101	160 711	148 883	145 825	141 045	143 867
Sheep <1 year (adj. for lifetime)	622 862	683 599	643 141	685 466	659 895	653 663	634 325	642 338
Sheep >1 year	714 384	783 922	766 098	717 098	691 450	687 440	685 326	689 345
Piglets	204 623	235 223	244 288	269 761	282 931	274 779	275 349	276 500
Young pigs for breeding	23 047	24 714	31 172	38 930	40 770	42 023	42 636	42 960
Sows	62 683	63 944	57 351	60 584	56 234	53 277	53 154	53 004
Boars	2 046	1 727	1 453	1 299	1 096	1 045	1 037	1 048
Fattening pigs	1 059 589	1 153 285	1 280 884	1 404 856	1 565 736	1 580 311	1 535 494	1 540 851

Deer	0	0	2 280	4 173	7 249	7 808	8 367	7 829
Dairy goats	64 041	58 630	50 578	44 374	35 706	34 783	33 982	31 406
Other goats	19 759	20 082	19 131	18 163	20 793	21 186	20 061	21 013
Horses	31 430	38 013	51 156	61 784	76 752	78 101	79 086	79 965
Laying hens	2 895 663	3 556 841	3 228 812	3 343 410	3 945 607	3 877 138	4 050 447	4 216 858
Chickens reared for laying	3 459 064	2 984 493	2 184 479	3 066 358	2 777 268	2 426 312	2 319 570	2 938 451
Broilers	15 864 401	23 318 120	35 757 612	43 612 212	61 245 745	61 505 467	63 806 388	71 899 359
Turkeys for slaughter	528 240	776 428	673 282	953 112	1 141 867	1 187 676	1 262 231	1 174 143
Ducks and geese for slaughter	18 551	27 267	81 365	69 368	153 831	188 855	90 309	237 100
Turkeys, ducks and geese reared for laying	15 506	29 930	20 292	45 378	36 901	14 889	13 557	13 257
Reindeer	242 443	212 333	172 407	234 608	254 384	251 071	258 360	248 225
Mink	56 411	44 199	68 526	98 247	107 980	119 741	141 368	182 334
Foxes	104 126	122 146	86 160	76 756	49 213	49 153	51 079	51 916
	2014	2015	2016	2017	2018	2019	2020	2021
Mature dairy cattle	222 553	222 276	220 461	215 849	211 730	199 417	195 076	196 934
Beef cow (other mature cattle)	73 894	77 408	84 372	88 332	92 304	94 001	99 748	106 082
Replacement heifer	109 813	111 391	113 462	114 771	114 249	111 134	111 819	112 613
Heifers for slaughter<1 year	3 117	2 176	1 820	2 326	3 037	2 981	2 475	2 531
Bulls for slaughter<1 year	15 518	11 984	10 633	9 800	13 481	11 480	9 467	8 952
Heifers for slaughter>1 year	34 421	32 757	32 662	21 845	27 156	24 169	27 178	29 415
Bulls for slaughter>1 year	138 048	136 877	139 121	159 825	168 203	155 043	148 833	148 347

Sheep <1 year (adj. for lifetime)	676 867	706 468	757 659	746 214	732 206	671 779	660 826	668 023
Sheep >1 year	683 479	716 252	729 014	730 666	676 937	634 028	644 880	621 374
Piglets	269 152	270 555	274 325	267 077	248 835	235 444	230 466	237 611
Young pigs for breeding	42 634	43 525	41 680	41 006	38 939	35 723	34 222	33 594
Sows	50 291	48 867	47 945	47 093	44 903	41 619	39 344	39 276
Boars	953	1 058	796	799	1 344	889	874	884
Fattening pigs	1 587 993	1 537 703	1 591 311	1 589 084	1 642 094	1 568 614	1 513 595	1 505 436
Deer	7 714	7 469	7 838	7 086	7 970	8 072	8 347	8 302
Dairy goats	31 461	33 627	34 660	34 126	34 583	35 019	33 960	34 443
Other goats	21 750	21 891	22 198	21 112	23 413	24 017	25 236	26 305
Horses	78 635	78 303	77 350	76 511	80 470	80 919	81 877	83 566
Laying hens	4 320 632	4 359 188	4 336 730	4 365 344	4 308 640	4 627 642	4 585 350	4 666 613
Chickens reared for laying	2 686 575	2 738 693	2 614 453	2 631 703	2 143 725	1 880 977	1 507 652	1 448 201
Broilers	73 974 651	63 406 519	65 898 097	63 516 948	62 738 774	68 409 911	67 262 533	72 350 290
Turkeys for slaughter	1 245 554	1 260 617	1 179 466	1 037 274	825 264	822 691	892 615	922 121
Ducks and geese for slaughter	302 757	298 089	291 989	278 423	274 298	282 672	286 611	243 838
Turkeys, ducks and geese reared for laying	20 662	23 811	19 530	20 601	12 336	16 945	14 730	12 180
Reindeer	232 905	211 974	211 666	213 913	213 012	215 144	213 753	212 866
Mink	174 613	161 394	143 156	107 039	136 993	82 540	44 198	7 500
Foxes	49 143	40 734	31 828	21 124	27 554	24 918	18 056	1 626

2 Methane emissions from enteric fermentation in Norway's cattle and sheep population

2.1 GE and Ym

Values for gross energy intake (GE) and CH_4 conversion rate (Y_m) used in the tier 2 CH_4 emissions from enteric fermentation from cattle and sheep are given in Table AVIII-3.

Table AVIII-3 Average gross energy intake (GE) and CH_4 conversion rate (Y_m). 1990, 1995, 2000, 2005, 2010-2021.

		1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Mature Dairy Cattle	Average GE (MJ/head/day)	306.1	305.6	301.2	315.7	332.8	331.5	335.9	341.1	341.8	348.0	350.6	346.8	345.7	359.5	361.1	361.7
	Ym (%)	6.5	6.5	6.6	6.5	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.3	6.3	6.3	6.3
Mature Non-Dairy Cattle	Average GE (MJ/head/day)	194.0	194.0	194.0	194.0	194.0	194.0	194.0	194.0	194.0	194.0	194.0	194.0	194	194	194	194
	Ym (%)	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
Heifer for replacement	Average GE (MJ/head/day)	122.3	125.2	125.0	131.2	137.3	136.3	136.5	137.6	135.2	138.6	139.0	138.8	139.7	140.6	142.1	143.4
	Ym (%)	6.6	6.7	6.7	6.8	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	7.0	7.0
Heifer slaughtered before 12 months	Average GE (MJ/head/day)	53.4	63.7	65.5	82.3	81.1	82.2	85.0	89.4	93.9	96.5	97.1	91.0	79.3	97.4	97.1	99.7
	Ym (%)	5.9	5.9	5.8	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.8	5.9	5.9	5.9	5.9	5.9

Heifer slaughtered after 12 months	Average GE (MJ/head/day)	76.2	78.9	78.7	81.7	82.8	80.7	78.2	79.1	91.1	93.4	94.7	92.5	89.9	90.2	85.7	87.8
	Ym (%)	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.1	7.0	7.0	7.0	7.0	7.0	7.1	7.1
Bulls slaughtered before 12 months	Average GE (MJ/head/day)	74.3	89.7	84.6	109.1	109.3	110.9	112.7	115.2	118.0	118.8	119.9	118.7	125.8	123.5	124.2	124.5
	Ym (%)	5.8	5.8	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.6	5.7	5.7	5.7
Bulls slaughtered after 12 months	Average GE (MJ/head/day)	109.5	116.9	118.8	127.5	133.8	133.4	132.7	134.8	137.1	139.5	138.1	136.2	135.6	138.1	139.6	140.8
	Ym (%)	6.5	6.4	6.3	6.2	6.0	6.0	6.0	6.0	5.9	5.9	6.0	6.0	6.0	6.0	6.0	6.0
Sheep	Average GE (MJ/head/day)	32.7	32.5	32.4	32.6	32.8	32.4	32.4	32.3	32.9	33.3	32.8	32.1	31.6	32.4	32.3	41.0
	Ym (%)	5.6	5.6	5.6	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5

3 Nitrogen excretion tables and background information for N and VS for cattle

3.1 Nitrogen excretion tables

Table AVIII-4 Nitrogen excretion. 1990, 1995, 2000, 2005, 2010-2021. Total N. N excretion per animal, kg.

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Dairy cattle	107.6	96.2	100.9	113.2	124.0	123.2	124.7	126.7	126.6	129.0	129.9	128.6	128.3	133.0	134.1	134.7
Suckling cows	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0	93.0
Replacement heifers	66.9	66.0	67.9	77.2	85.1	84.3	85.0	86.6	86.5	86.6	86.7	86.8	87.5	89.0	92.1	93.9

Heifers for slaughter	58.5	61.2	55.8	64.3	66.1	63.5	64.2	64.4	65.4	69.1	68.1	68.1	61.8	64.5	66.4	65.7
Bull for slaughter	53.8	54.7	52.6	65.5	68.1	66.0	64.7	65.7	66.8	69.9	72.7	72.2	69.0	71.4	73.3	75.0
Sows	15.4	17.5	19.7	21.8	24.0	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4
Boars	15.4	17.5	19.7	21.8	24.0	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4
Piglets	1.1	1.1	1.2	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Fattening pigs	4.0	3.8	3.6	3.4	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Young pigs for breeding	7.6	8.1	8.6	9.1	9.6	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
Laying hens	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Chickens reared for laying	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Broilers	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turkeys for slaughter	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Ducks and geese for slaughter	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Turkeys, ducks and geese reared for laying	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Horses	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Dairy goats	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9
Other goats	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Sheep over 1 year old	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6
Sheep under 1 year old	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Mink	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Foxes	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Deer	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Reindeer	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0

Table AVIII-5 Nitrogen excretion. 1990, 1995, 2000, 2005, 2010-2021. Ammonium N.

	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Dairy cattle	60.4	48.8	54.3	63.7	71.2	70.8	71.5	72.5	72.3	73.5	73.9	73.3	73.3	75.4	76.1	76.5
Suckling cows	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6
Replacement heifers	40.2	38.3	40.2	47.1	52.8	52.3	52.7	53.8	53.8	53.8	53.8	53.9	54.4	55.4	57.5	58.7
Heifers for slaughter	35.3	37.0	33.5	39.0	40.1	38.5	38.9	39.0	39.7	42.1	41.4	41.4	37.4	39.1	40.3	39.8
Bull for slaughter	31.6	30.1	29.6	39.0	41.2	39.9	39.0	39.6	40.3	42.3	44.1	43.9	41.8	43.3	44.6	45.7
Sows	10.6	11.7	12.8	13.9	15.0	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Boars	10.6	11.7	12.8	13.9	15.0	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Piglets	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Fattening pigs	2.8	2.6	2.5	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Young pigs for breeding	5.3	5.6	5.8	6.1	6.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Laying hens	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Chickens reared for laying	0.06	0.05	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Broilers	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Turkeys for slaughter	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Ducks and geese for slaughter	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Turkeys, ducks and geese reared for laying	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Horses	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Dairy goats	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Other goats	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
Sheep over 1 year old	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Sheep under 1 year old	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3

Mink	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Foxes	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Deer	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Reindeer	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7

3.2 Activity data tables for calculation of N and VS for mature dairy cows and young cattle

Table AVIII-6 Activity data used for calculation of N and VS for mature dairy cow and young cattle. 1990, 1995, 2000, 2005, 2010-2021.

Year	Mature dairy cows				Heifer for replacement				Bulls for slaughter			
	Milk yield (kg ECM per cow per year)	Weight (kg)	Protein content in the roughage g/kg dry matter	calculated protein content. g/kg dry matter	Weight by first calving (kg)	Feeding period. months	Protein content in the roughage g/kg dry matter	Protein content in concentrates. g/kg dry matter	Slaughter weight	Slaughter age. Months	Protein content in the roughage g/kg dry matter	Protein content in concentrates. g/kg dry matter
1990	6 320	508	150	184	435	26.0	140	184	255	18.8	140	184
1995	6 326	525	150	149	449	26.0	140	149	276	18.9	140	149
2000	6 156	524	150	167	448	26.0	140	167	269	16.7	140	167
2005	6 723	562	150	184	481	26.0	140	184	296	17.7	140	184
2010	7 373	597	150	195	511	25.9	140	195	302	16.9	140	195
2011	7 309	592	150	195	507	26.0	140	195	297	16.5	140	195
2012	7 475	594	150	195	509	26.1	140	195	294	16.3	140	195

2013	7 691	602	150	195	515	26.2	140	195	298	16.0	140	195
2014	7 711	596	150	195	510	26.9	140	195	302	15.9	140	195
2015	7 958	605	150	195	518	25.9	140	195	310	16.2	140	195
2016	8 062	606	150	195	519	25.8	140	195	317	16.8	140	195
2017	7 902	606	150	195	519	25.9	140	195	313	17.3	140	195
2018	7 840	610	150	195	523	25.8	140	195	306	16.4	140	195
2019	8 395	617	150	195	528	25.9	140	195	313	16.7	140	195
2020	8 463	630.	150	195	539.8	26.3	140	195	318	17.0	140	195
2021	8 489	639	150	195	547.2	26.4	140	195	322	17.1	140	195

4 FracGASF

Table AVIII-7 and Table AVIII-8 presents weighting of loss factors based on basis data for N-loss factor, N-share and amount for the different synthetic fertilizers. For the period 1990-1999 the same estimate for nitrogen loss and amount of nitrogen distributed on fertilizer type are used, which gives a constant $Frac_{gasf}$ (total N-losses are however adjusted for total nitrogen sale each year). The NH_3 emission factors (g NH_3/kg N applied) for the different types of fertilizers is given by EEA (2016).

Table AVIII-7 Weighting of loss factors based on basis data for N-loss factor, N-share and amount for the different synthetic fertilizers. 2021.

Fertilizer type	Amount of fertilizer (tonnes)	Amount of Nitrogen (tonnes)	Loss (g NH_3/kg N applied)
Ammonium nitrate	4 662	1 604	15
Ammonium nitrate m/S	87 739	23 566	8 [1]

Ammonium sulphate nitrate	720	216	15
Potassium sulphate	320	0	0
Potassium sulphate m/Mg	783	0	0
Potassium chloride	91	0	0
Kalkamonsalpeter	3 355	906	8
Calcium nitrate	8 959	1 389	10
Calcium nitrate m/B	3 551	547	10
NK-fertilizer 22-12	6 927	1 524	15
NP fertilizer 12-23	1 513	178	50
NPK-fertilizer 8-5-19	748	60	15 [1]
NPK-fertilizer 12-4-18	19 199	2 265	15 [1]
NPK-fertilizer 15-7-12	2 803	420	15 [1]
NPK-fertilizer 18-3-15	34 186	6 016	15 [1]
NPK-fertilizer 20-4-11	29 991	5 878	15 [1]
NPK-fertilizer 21-3-10	-	-	-
NPK-fertilizer 21-6-6	16	3	15 [1]
NPK-fertilizer 22-2-12	34 020	7 348	15 [1]
NPK-fertilizer 22-3-10	96 944	20 972	15 [1]

NPK-fertilizer 24-4-6	10 640	2 554	50
NPK-fertilizer 25-2-6	99 744	24 537	15 [1]
NPK-fertilizer 27-3-5	23 783	6 395	50
PK-fertilizer 0-11-21	829	0	0
P-fertilizer 0-20-0	260	0	0
Urea	131	60	155
Other fertilizer with N content	278	54	10 [1]
Other fertilizer	0	0	0 [1]

[1] *The loss of NH_3/ kg N applied factor has been changed for these products in the 2021 submission due to an evaluation of mineral fertilizing products.*

Table AVIII-8 Weighting of loss factors based on basis data for N-loss factor, N-share and amount for the different synthetic fertilizers. 1990-1999.

Fertilizer type	Amount of fertilizer (tonnes)	%-N	Loss (g NH_3/kg N applied)
Calcium nitrate	65869	15.5	15
Calcium ammonium nitrate	40642	27.5	15
Forest-calcium ammon	1483	15.0	15
Forest-AN	7	27.0	15
Urea	754	46.0	155
Ammonium sulphate	11	27.0	15
Ammonium nitrate	76	27.0	15
NK 17-17	257	16.9	15
NK 17-20	359	16.9	15
NK19-15	385	19.0	15

NK 22-10	2575	22.0	15
NK21-10	630	20.3	15
NK 22-10	2575	22.0	15
NPK 6-7-21	671	6.0	15
NPK 11-5-17	24826	11.0	15
NPK 11-5-17	111	11.0	15
NPK 14-4-15	82	14.0	15
NPK 14-6-16	1745	14.0	15
NPK15-4-12	5767	14.6	15
NPK15-4-12 m/Co	13	15.0	15
NPK 17-5-13	36892	17.2	15
NPK 18-3-15	102101	17.6	15
NPK 18-3-15	1347	17.8	15
NPK 20-2-12	863	21.0	15
NPK 20-3-6	83	20.0	15
NPK 21-4-10	158262	20.6	15
NPK 21-4-10	332	21.2	15
NPK 22-2-12	61932	21.6	15
NPK 23-3-6	221	23.0	15
NPK 23-3-6	28488	23.0	15
N- 24 m/micro	0	24.0	50
NPK 10-3-7	191	10.0	15
NPK 11-1-7	1	11.0	15
NPK 14-0-6	113	14.0	15
NPK 19-2-4	736	19.0	15

NPK 15-3-7	50	15.0	15
NPK 7-2-10	106	7.0	15
18-0-0 foliar spray	9	18.0	50
NPK 10-0-9	11	10.0	15
NPK 3-2-9	1	3.0	15

NPK (Nitrogen, phosphorus, potassium)

Source: Statistics Norway, Norwegian Food Safety Authority and EEA (2016)

Annex IX: Overview of notation key IE

Norway has had technical difficulties with the specification of methods, emission factors, notation keys and documentation boxes in the CRF. We have strived for completeness and consistency with the information in the NIR. In particular, our use of Excel import to the CRF makes it difficult to enter cell comments with IE and NE explanations. Thus, Table 9 in the CRF tables has only a few entries.

Explanations on the use of notation keys IE and NE are instead included in the documentation boxes in the CRF. As a supplement to Table 9, all information about use of notation key IE is gathered in this annex. The use of NE is summarized in chapter 1.7 Completeness.

1. Energy (source category 1)

Table AIX-1 Description of the use of notation IE in the energy sector.

Notation key	Source category	Gases	Allocation as per IPCC Guidelines	Allocation used by Norway	Explanation
IE	1A2a Iron and steel – other fuels	CO_2,, N2O	1A2a other fuels	1A2a liquid fuels	Emissions from waste oil and fuel oil are reported together in the ETS
IE	1A3ei Pipeline transport - gaseous fuels	CO_2, CH_4, N_2O	1A3ei	1A1cii	It is not possible to split emissions from emissions in 1A1c ii
IE	1B1ai Underground mines - Mining activities	CO_2,	1B1ai Mining activities	Summary table 2, 4 and 6	Indirect emissions of CO_2 are reported separately.
IE	1B1aii Underground mines - Post-mining activities	CO_2, CH_4	1B1aii Post-mining activities	1B1ai	Emissions from post-mining activities are included in the CH_4 emission factor for mining
IE	1B1aiii Underground mines – abandoned underground mines	CO_2,	1B1ai Post-mining activities	Summary table 2, 4 and 6	Indirect emissions of CO2 are reported separately.
IE	1B2ai Surface mines - Mining activities	CO_2,	1B2aii Surface mines	Summary table 2, 4 and 6	Indirect emissions of CO_2 are reported separately in *Table6*.
IE	1B2aii Surface mines - Post-mining activities	CO_2, CH_4	1B2aii Surface mines	1B2ai	Emissions from post-mining activities are included in the CH_4 emission factor for mining

IE	1B2a1 Oil - Exploration 1B2a2 Oil - Production	CO_2, CH_4	1B2a1 1B2a2	1.B.2.C iii Venting Combined	Fugitives (leakage) in oil and gas exploration and production are based on reports from the field operators and we have not yet implemented a method to split the emissions between fugitives and venting
IE	1B2a3 Oil - Transport	CO_2,	1B2a3	Summary table 2, 4 and 6	Indirect emissions of CO_2 are reported separately.
IE	1B2a5 Distribution of oil products	CO_2,	1B2a5	Summary table 2, 4 and 6	Indirect emissions of CO_2 are reported separately.
IE	1B2b1 Natural gas – Exploration 1B2b2 Natural gas – Production	CO_2, CH_4	1B2b1 1B2b2	1.B.2.C iii Venting Combined	Fugitives (leakage) in oil and gas exploration and production are based on reports from the field operators and we have not yet implemented a method to split the emissions between fugitives and venting
IE	1B2b3 Natural gas - Processing	CO_2, CH_4	1B2b3	1.B.2.B.6, 1.B.2.C. iii Venting combined	Emissions are included with emissions from gas terminals and gas processing units at offshore facilities.
IE	1B2b4 Natural gas - Transmission	CO_2, CH_4	1B2b4	1.B.2.B.6, 1.B.2.C. iii Venting combined	Emissions are included with emissions from gas terminals and gas processing units at offshore facilities.
IE	1B2b5 Natural gas - Distribution	CO_2	1B2b5	1.A	Gas consumption for combustion is measured as deliveries into the distribution system, and CO_2 is thus accounted for in 1A energy combustion.
IE	1B2b6 Natural gas - Distribution	CO_2	1B2b6	Summary table 2, 4 and 6	Indirect emissions of CO_2 are reported separately.
IE	1B2c1i Venting - Oil 1B2c1ii Venting - Gas	CO_2, CH_4	1B2c1i 1B2c1ii	1.B.2.C.1iii	Oil and gas are generally produced at combined facilities, and there is no information to split between emissions from oil and gas production.
IE	1B2c2iii Flaring - Combined	CO_2, CH_4, N_2O	1B2c2iii	1.B.2.C.2.i/ii	Flaring in oil and gas exploration and production is split by substance flared.

2. Industrial processes and product use (source category 2)

Table AIX-2 Description of the use of notation IE in the IPPU sector.

Notation key	Source category	Gases	Allocation as per IPCC Guidelines	Allocation used by Norway	Explanation
IE	2B8c	CO_2, CH_4	2B8c	2B8b	A single plant produced produced primarily ethylene, but also vinyl chloride and propylene from 1990 to 2000. These emissions are reported under 2B8b. In 2001, the part of the plant producing vinyl chloride was separated into a different plant. For transparent reporting, all emisisons from these two plants are reported under 2B8b.
IE	2D1	Recovery CO_2			Recovery has been taken into account in activity data.
IE	2D3	Emissions CO_2 Recovery CO_2			Abatement technology applied in use of NMVOC is included emission factor.
IE	2D3 Road paving	CO_2		Summary table 2, 4 and 6	Indirect emissions of CO_2 are reported separately.
IE	2D3 Solvent use	CO_2		Summary table 2, 4 and 6	Indirect emissions of CO_2 are reported separately.
IE	2F1f Stationary air conditioning	Recovery HFC-143a	2F1f		
IE	2F2 Foam blowing 2F3 Fire protection 2F4 Aerosols 2F5 Solvents	HFC	2F2 2F3 2F4 2F5	2F6	Emissions and activity data for are aggregated in 2F6 due to confidentiality
IE	2G1	SF_6	2G1 Emissions from manufacturing	2G1 Emissions from stocks	Emissions from manufacturing are included in emissions from stocks because of confidentiality

3. Agriculture (source category 3)

Table AIX-3 Description of the use of notation IE in the IPPU sector					
Notation key	Source category	Gases	Allocation as per IPCC Guidelines	Allocation used by Norway	Explanation
IE	3F1 Barley og Maize	CH_4, N_2O	3F1	3F1 Wheat	All emissions from field burning of agricultural residues are reported under 3F1-Wheat

4. LULUCF (source category 4)

Table AIX-4 Description of the use of notation IE in the LULUCF sector					
Notation key	Source category	Gases	Allocation as per IPCC Guidelines	Allocation used by Norway	Explanation
IE	4(I).A1 Direct N_2O from N inputs – Organic N	N_2O	4(I).A1- Forest land remaining forest land	3.Da3	Included in the agriculture sector
IE	4(I).A2 Direct N_2O from N inputs – Inorganic N	N_2O	4(I).A2 – Land converted to forest land	4(I).A1	Not possible to split between land converted to forest land and forest land remaining forest land, so all emissions are allocated to the latter.
IE	4(I).A2 Direct N_2O from N inputs – Organic N	N_2O	4(I).A2 – Land converted to forest land	3.Da3	Included in the agriculture sector
IE	4(I).E1 Direct N_2O from N inputs – Inorganic N	N_2O	4(I).E1 – Settlements remaining settlements	3.Da1	Included in the agriculture sector
IE	4(I).E2 Direct N_2O from N inputs – Inorganic N	N_2O	4(I).E2 – Land converted to settlements	3.Da1	Included in the agriculture sector
IE	4(I).E2 Direct N_2O from N inputs – Organic N	N_2O	4(I).E2 - Land converted to settlements	4(I).E1	Not possible to split between land converted to settlements and settlements remaining settlements, so all emissions are allocated to the latter.

IE	4(II).A.Emissions and removals from drainage, rewetting and other management of soils	CO_2	4(II).A - Forest land - Drained organic soils	4.A1/4.A2	Included in Table 4.A, divided on 4.A1 and 4.A2
IE	4(II).B Emissions and removals from drainage, rewetting and other management of soils	CO_2	4(II).B - Cropland - Drained organic soils	4.B1/4.B2	Included in Table 4.B, divided on 4.B1 and 4.B2
IE	4(II).C Emissions and removals from drainage, rewetting and other management of soils	CO_2	4(II).C - Grassland- Drained organic soils	4.C1/4.C2	Included in Table 4.C, divided on 4.C1 and 4C2
IE	4(II).D. Emissions and removals from drainage, rewetting and other management of soils	CO_2	4(II).D.1 Wetlands – Peat extraction lands - Drained organic soils	4.D1	Included in Table 4.D1 peat extraction remaining peat extraction
IE	4(II).D. Emissions and removals from drainage, rewetting and other management of soils	CO_2	4(II).D.3 Wetlands – Other wetlands lands - Drained organic soils	4.D1/4.D2	Included in Table 4.D, divided on 4.D1 and 4.D2
IE	4(II).H. Emissions and removals from drainage, rewetting and other management of soils	CO_2	4(II).H - Settlements - Drained organic soils	4.E1/4.E2	Included in Table 4.E, divided on 4.E1 and 4E2
IE	4(V).A1 Biomass burning	CO_2	4(V).A1- Forest land remaining forest land – controlled burning	4.A1	Included in Table 4.A1 – living biomass
IE	4(V).A1 Biomass burning	CO_2	4(V).A1- Forest land remaining forest land – wildfires	4.A1	Included in Table 4.A1 – living biomass
IE	4(V).A2 Biomass burning –	CO_2	4(V).A2 - Land converted to forest land - controlled burning	4.A2	Included in Table 4.A2 – living biomass
IE	4(V).A2 Biomass burning	CO_2	4(V).A2 - Land converted to forest land - wildfires	4.A2	Included in Table 4.A2 – living biomass

IE	4(V).A2 Biomass burning	CH_4	4(V).A2 Land converted to forest land - wildfires	4(V).A1	Included in forest land remaining forest land
IE	4(V).A2 Biomass burning	N_2O	4(V).A2 – Land converted to forest land – wildfires	4(V).A1	Included in forest land remaining forest land
IE	4(V).B1 Biomass burning	CO_2	4(V).B1- Cropland remaining cropland – controlled burning	3.F	Included in Table 3.F – Field burning of agricultural residues
IE	4(V).B1 Biomass burning	CH_4	4(V).B1- Cropland remaining cropland – controlled burning	3.F	Included in Table 3.F – Field burning of agricultural residues
IE	4(V).B1 Biomass burning	N_2O	4(V).B1- Cropland remaining cropland – controlled burning	3.F	Included in Table 3.F – Field burning of agricultural residues
IE	4(V).B1 Biomass burning	CO_2	4(V).B1- Cropland remaining cropland - wildfires	3.F	Included in Table 3.F – Field burning of agricultural residues
IE	4(V).B1 Biomass burning	CH_4	4(V).B1- Cropland remaining cropland - wildfires	3.F	Included in Table 3.F – Field burning of agricultural residues
IE	4(V).B1 Biomass burning	N_2O	4(V).B1- Cropland remaining cropland - wildfires	3.F	Included in Table 3.F – Field burning of agricultural residues
IE	4(V).B2 Biomass burning	CO_2	4(V).B2 - Land converted to cropland – controlled burning	3.F	Included in Table 3.F – Field burning of agricultural residues
IE	4(V).B2 Biomass burning	CH_4	4(V).B2- Land converted to cropland – controlled burning	3.F	Included in Table 3.F – Field burning of agricultural residues
IE	4(V).B2 Biomass burning	N_2O	4(V).B2- Land converted to cropland – controlled burning	3.F	Included in Table 3.F – Field burning of agricultural residues
IE	4(V).B2 Biomass burning - wild fires	CO_2	4(V).B2- Land converted to cropland – wildfires	3.F	Included in Table 3.F – Field burning of agricultural residues
IE	4(V).B2 Biomass burning	CH_4	4(V).B2- Land converted to cropland – wildfires	3.F	Included in Table 3.F – Field burning of agricultural residues
IE	4(V).B2 Biomass burning	N_2O	4(V).B2- Land converted to cropland – wildfires	3.F	Included in Table 3.F – Field burning of agricultural residues

IE	4(V).C1 Biomass burning	CO_2	4(V).C1- Grassland remaining grassland – wildfires	4.C1	Included in Table 4.C1 – living biomass
IE	4(V).C2 Biomass burning	CO_2	4(V).C2 – Land converted to grassland - wildfires	4.C2	Included in Table 4.C2 – living biomass
IE	4.Gs1 HWP - Approach 3 – GHG source and sink categories	CO_2	Net $C0_2$ emissions/removals from HWP in SWDS	5A1	Included in chapter 7.2 - Managed Waste Disposal on Land
IE	4.Gs1 HWP - Approach 3 – GHG source and sink categories	CO_2	Net $C0_2$ emissions/removals from domestic HWP (IU + SWDS)	5A1	Included in chapter 7.2 - Managed Waste Disposal on Land

5. Waste (source category 5)

Table AIX-5 Description of the use of notation IE in the waste sector

Notation key	Source category	Gases	Allocation as per IPCC Guidelines	Allocation used by Norway	Explanation
IE	5C1 Clinical waste	CO_2, CH_4, N_2O	5C1	1A1a-iii	Since 2006 all hospital waste is incinerated in incinerators for municipal waste
IE	5D2 Industrial wastewater	Recovery CH_4	5D2		

Annex X: Reference Approach – International comparison

This annex gives supporting data to NIR section 3.6.1.2 on the comparison of energy supply data in the Reference Approach with corresponding data reported to Eurostat. Eurostat data in ktoe were downloaded from https://ec.europa.eu/eurostat/web/energy/data/energy-balances, January 2022 edition.

Tables AX-1 and AX-2 expand NIR table 3.41 to the detailed list of fuels.

Table AX-3 combines the columns for *apparent consumption* from tables AX-1 and AX-2 within a single framework and includes explanations for the differences.

Tables AX-4 and AX-5 expand the data for *apparent consumption* from tables AX-1 and AX-2 to the complete time series.

Tables AX-1 and AX-2 expand NIR table 3.41 to the detailed list of fuels. Table AX-1has the actual energy data, and Table AX22 shows the differences.

Table AX-1 Energy data in the CRF Reference Approach and data published by Eurostat. 2021. PJ.

	CRF Reference Approach, PJ						Eurostat, PJ					
	Prod.	Imp.	Exp.	Bunkers	Stock change	App. cons.	Prod.	Imp.	Exp.	Bunkers	Stock change	App. cons.
Crude oil	3 734	106	3 371	-	-34	503	3 733	105	3 369	-	-34	503
Orimulsion	-	-	-	-	-	-	-	-	-	-	-	-
Natural Gas Liquids	355	-	37	-	0	317	337	-	-	-	-	337
Gasoline	-	20	174	0	-1	-153	-	20	173	-	-1	-152
Jet kerosene	-	9	10	7	-2	-6	-	9	10	7	-2	-6
Other kerosene	-	1	-	-	-0	1	-	1	-	-	-0	1
Shale oil	-	-	-	-	-	-	-	-	-	-	-	-
Gas/diesel oil	-	113	148	11	-5	-41	-	113	148	10	-5	-40
Residual fuel oil	-	36	33	1	-2	4	-	36	33	1	-2	4
LPG	-	10	245	-	2	-237	-	10	246	-	2	-238
Ethane	-	40	27	-	-0	13	-	40	28	-	-0	12
naphta	-	1	55	-	-0	-53	-	1	90	-	0	-89
Bitumen	-	16	0	-	0	15	-	16	0	-	-	16
Lubricants	-	2	0	-	-0	2	-	2	0	-	-	2
Petroleum coke	-	14	5	-	1	9	-	14	5	-	1	9
Refinery feedstocks	-	9	-	-	-	9	2	-	-	-	-	2
Other oil	-	-	-	-	-	-	-	0	0	-	-	0
Other liquid fossil	-	-	-	-	-	-	-	-	-	-	-	-
Liquid fossil totals	**4 089**	**375**	**4 104**	**19**	**-42**	**383**	**4 071**	**366**	**4 101**	**18**	**-41**	**360**
Anthracite	-	-	-	-	-	-	-	-	-	-	-	-
Coking coal	-	-	-	-	-	-	-	-	-	-	-	-
Other bituminous coal	4	25	2	-	-0	27	3	25	2	-	-0	26
Sub-bituminous coal	-	-	-	-	-	-	-	-	-	-	-	-
Lignite	-	-	-	-	-	-	-	-	-	-	-	-
Oil shale and tar sand	-	-	-	-	-	-	-	-	-	-	-	-
BKB and patent fuel	-	-	-	-	-	-	-	-	-	-	-	-
Coke oven/gas coke	-	9	-	-	0	9	-	9	-	-	0	9
Coal tar	-	-	-	-	-	-	-	-	-	-	-	-
Other solid fossil	-	-	-	-	-	-	-	-	-	-	-	-
Solid fossil totals	**4**	**34**	**2**	**-**	**-0**	**36**	**3**	**34**	**2**	**-**	**-0**	**35**
natural gas	4 221	6	4 009	-	5	213	4 221	6	4 009	2	5	210
Other gaseous fossil	-	-	-	-	-	-	-	-	-	-	-	-
Gaseous fossil totals	**4 221**	**6**	**4 009**	**-**	**5**	**213**	**4 221**	**6**	**4 009**	**2**	**5**	**210**
Waste	11	-	-	-	-	11	11	-	-	-	-	11
Other fossil fuels	-	-	-	-	-	-	-	-	-	-	-	-
Peat	-	-	-	-	-	-	-	-	-	-	-	-

Total	**8 325**	**415**	**8 115**	**19**	**-37**	**643**		**8 307**	**406**	**8 112**	**20**	**-36**	**616**

Table AX-2 Differences between energy data in the CRF Reference Approach and data published by Eurostat. 2021. PJ.

	Difference, PJ							Difference, per cent (base: Eurostat)					
	Prod.	Imp.	Exp.	Bunkers	Stock change	App. cons.		Prod.	Imp.	Exp.	Bunkers	Stock change	App. cons.
Crude oil	1,2	0,0	1,1	-	-0,0	0,2		0,0	0,0	0,0	.	0,0	0,0
Orimulsion	-	-	-	-	-	-		.	.	.	.	.	.
Natural Gas Liquids	17,7	-	37,2	-	0,4	-19,8		5,3	.	.	.	.	-5,9
Gasoline	-	0,0	1,7	0,0	-0,0	-1,7		.	0,0	1,0	.	0,1	1,1
Jet kerosene	-	-0,0	-0,0	-0,0	-0,0	0,0		.	-0,0	-0,0	-0,5	0,0	-0,6
Other kerosene	-	0,0	-	-	0,0	-0,0		.	0,0	.	.	-2,5	-0,0
Shale oil	-	-	-	-	-	-		.	.	.	.	.	.
Gas/diesel oil	-	0,0	-0,1	0,7	-0,0	-0,6		.	0,0	-0,1	6,8	0,0	1,5
Residual fuel oil	-	-0,0	-0,0	0,0	-0,0	-0,0		.	-0,0	-0,0	0,0	0,0	-0,0
LPG	-	0,0	-0,9	-	0,0	0,9		.	0,0	-0,4	.	0,0	-0,4
Ethane	-	0,0	-0,7	-	0,0	0,7		.	0,0	-2,7	.	-0,0	6,1
naphta	-	-0,0	-35,4	-	-0,8	36,2		.	-0,0	-39,3	.	-235,6	-40,5
Bitumen	-	-0,0	0,0	-	0,0	-0,0		.	-0,0	0,1	.	.	-0,3
Lubricants	-	0,0	0,0	-	-0,0	0,0		.	0,0	0,1	.	.	0,0
Petroleum coke	-	-0,0	-0,0	-	-0,0	-0,0		.	-0,0	-0,0	.	-0,0	-0,0
Refinery feedstocks	-1,6	9,2	-	-	-	7,6		-100,0	.	.	.	.	482,7
Other oil	-	-0,3	-0,1	-	-	-0,2		.	-100,0	-100,0	.	.	-100,0
Other liquid fossil	-	-	-	-	-	-		.	.	.	.	.	.
Liquid fossil totals	17,4	8,9	2,8	0,7	-0,4	23,3		0,4	2,4	0,1	3,6	1,0	6,5
Anthracite	-	-	-	-	-	-		.	.	.	.	.	.
Coking coal	-	-	-	-	-	-		.	.	.	.	.	.
Other bituminous coal	0,5	-0,0	-0,0	-	-0,0	0,5		15,8	-0,0	-0,0	.	0,0	2,1
Sub-bituminous coal	-	-	-	-	-	-		.	.	.	.	.	.
Lignite	-	-	-	-	-	-		.	.	.	.	.	.
Oil shale and tar sand	-	-	-	-	-	-		.	.	.	.	.	.
BKB and patent fuel	-	-	-	-	-	-		.	.	.	.	.	.
Coke oven/gas coke	-	-0,0	-	-	0,0	-0,0		.	-0,0	.	.	0,0	-0,0
Coal tar	-	-	-	-	-	-		.	.	.	.	.	.
Other solid fossil	-	-	-	-	-	-		.	.	.	.	.	.
Solid fossil totals	0,5	-0,0	-0,0	-	0,0	0,5		15,8	-0,0	-0,0	.	-0,0	1,5
natural gas	0,0	-0,0	-0,0	-2,4	-0,0	2,6		0,0	-0,0	-0,0	-100,0	-0,0	1,2
Other gaseous fossil	-	-	-	-	-	-		.	.	.	.	.	.
Gaseous fossil totals	0,0	-0,0	-0,0	-2,4	-0,0	2,6		0,0	-0,0	-0,0	-100,0	-0,0	1,2
Waste	0,2	-	-	-	-	0,2		1,9	.	.	.	.	1,9
Other fossil fuels	-	-	-	-	-	-		.	.	.	.	.	.
Peat	-	-	-	-	-	-		.	.	.	.	.	.
Total	18,2	8,9	2,8	-1,8	-0,4	26,7		0,2	2,2	0,0	-8,7	1,2	4,3

Table AX-3 combines the columns for *apparent consumption* from tables AX-1 and AX-2 within a single framework and includes explanations for the differences. The table excludes

fuels that are either not produced/used in Norway or which are reported as "included elsewhere" (e.g., anthracite).

Table AX-3 Comparison of apparent consumption in the CRF Reference Approach to data published by Eurostat. 2021. PJ.

Fuel	Apparent consumption reported in GHG inventory (TJ)	Apparent consumption in Eurostat reporting (TJ)	Absolute difference (TJ)	Relative difference %	Explanations for differences
Crude oil	502 915	502 748	168	0,0 %	
Natural Gas Liquids	317 399	337 179	-19 780	-6,2 %	Difference in NCV values for production. Different allocation of exports and naphtha, with differences also in NCV. Total difference for export of these fuels in ktonne terms close to 0.
Gasoline	-153 451	-151 764	-1 687	1,1 %	Different allocation of export of gasoline, LPG and ethane. Total difference for these fuels close to 0
Jet kerosene	-6 247	-6 282	35	-0,6 %	
Gas/diesel oil	-40 684	-40 080	-604	1,5 %	Difference for bunkers
LPG	-236 886	-237 791	904	-0,4 %	Different allocation of export, see note for gasoline
Ethane	12 877	12 141	736	5,7 %	Different allocation of export, see note for gasoline
Naphtha	-53 210	-89 418	36 208	-68,0 %	Different allocation of export, see note for NGL
Bitumen	15 461	15 511	-50	-0,3 %	
Lubricants	1 964	1 963	1	0,0 %	
Refinery feedstocks	9 218	1 582	7 636	82,8 %	The CRF includes amounts of biofuels which are reported elsewhere in the reporting to Eurostat
Other oil	-	235	-235	..	Not reported in the CRF
Liquid fossil totals	383 182	359 849	23 332	6,1 %	Net difference mainly due to - NCV differences for NGL production - NCV differences for NGL/naphtha export - CRF net supply of refinery feedstocks includes biofuels
Other bituminous coal	26 616	26 079	537	2,0 %	Russian production of coal in Svalbard is included in CRF

Solid fossil totals	35 711	35 174	537	1,5 %	
Natural gas	212 560	209 956	2 604	1,2 %	CRF lacks option for natural gas bunkers
Gaseous fossil totals	212 560	209 956	2 604	1,2 %	
Waste	11 339	11 122	216	1,9 %	Different definitions
Total	642 792	616 101	26 691	4,2 %	Over 2%

Tables AX-4 and AX-5 expand the data for *apparent consumption* from Tables AX-1 and AX-2 to the complete time series.

Note that the CRF and Eurostat data do not reflect the same levels of revisions and updates throughout the time series.

- The time series for 1990-2009 was revised in the national energy balance as reported in the reference approach but has not been resubmitted to IEA/Eurostat.
- Due to different updating and reporting cycles, changes may have been made to the CRF data that are not reflected in Eurostat data.

See NIR section 3.6.1.2 for more information.

Table AX-4 Energy data in the CRF Reference Approach and data published by Eurostat. Apparent consumption by fuel group and year. PJ.

	CRF Reference Approach, PJ						Eurostat, PJ				
	Liquid	Solid	Gaseous	Other fossil	Total		Liquid	Solid	Gaseous	Other fossil	Total
1990	334,8	37,8	68,2	3,1	443,9		315,2	36,1	82,7	2,3	436,4
1991	389,8	34,5	87,0	3,0	514,3		337,0	32,8	80,9	2,9	453,6
1992	329,8	33,8	104,6	3,6	471,8		295,0	32,2	135,5	2,5	465,2
1993	341,5	37,3	111,3	3,8	493,8		313,1	35,6	154,7	2,8	506,3
1994	353,0	43,0	102,4	4,1	502,5		276,1	41,3	164,4	2,7	484,6
1995	362,1	44,5	125,3	4,3	536,4		294,2	42,9	144,9	2,4	484,4
1996	374,0	43,8	109,3	4,1	531,2		301,6	42,1	125,0	2,5	471,1
1997	363,0	44,8	154,2	4,8	566,7		308,5	43,1	164,2	2,4	518,1
1998	402,8	46,5	179,5	5,4	634,3		313,0	44,8	180,3	3,2	541,2
1999	489,0	45,3	174,7	4,8	713,8		331,1	44,5	199,1	3,3	578,0
2000	557,9	44,9	188,4	5,2	796,3		337,1	44,0	173,5	3,2	557,8
2001	419,9	40,4	274,1	5,3	739,7		328,8	39,5	258,0	3,5	629,7
2002	426,0	34,9	195,8	5,2	662,0		339,0	34,0	179,6	3,4	556,0
2003	415,1	33,9	238,6	6,5	694,1		414,0	33,0	217,3	4,7	669,0

2004	563,1	39,5	188,3	6,0	796,9		497,2	38,8	169,3	4,3	709,6
2005	548,4	33,1	184,4	6,7	772,6		511,4	32,5	170,5	4,6	719,0
2006	568,5	30,4	201,3	7,2	807,5		538,4	29,9	168,4	4,8	741,6
2007	398,5	34,3	226,9	7,1	666,7		408,4	33,7	203,8	4,9	650,7
2008	466,5	36,5	232,6	7,7	743,2		491,2	36,0	232,6	5,3	765,0
2009	429,8	23,9	226,6	7,4	687,7		516,3	23,5	226,6	5,4	771,9
2010	458,9	32,7	267,3	6,6	765,5		504,5	32,0	267,3	6,8	810,5
2011	381,3	36,1	214,0	7,6	638,9		404,9	35,4	211,8	7,8	660,0
2012	401,1	35,0	233,2	8,6	677,8		439,2	34,2	229,7	8,9	712,1
2013	442,5	33,1	235,4	10,1	721,1		496,3	32,5	235,3	10,1	774,2
2014	434,0	36,2	239,8	10,5	720,5		399,8	35,6	239,8	10,5	685,6
2015	423,9	34,9	259,1	10,9	728,9		242,0	34,4	259,5	10,9	546,7
2016	360,3	32,3	241,3	10,6	644,5		367,0	31,7	233,2	10,7	642,6
2017	461,5	36,0	211,7	10,6	719,9		435,5	35,5	208,6	10,6	690,2
2018	431,4	35,0	233,1	11,3	710,8		406,4	34,5	230,7	11,4	683,0
2019	390,6	34,1	210,9	11,4	647,0		368,6	33,5	208,6	11,1	621,8
2020	396,0	35,0	192,8	11,4	635,3		373,1	34,5	190,2	11,1	608,9
2021	383,2	35,7	212,6	11,3	642,8		359,8	35,2	210,0	11,1	616,1

Table AX-5 Energy data in the CRF Reference Approach and data published by Eurostat. Apparent consumption by fuel group and year. PJ.

	Difference, PJ						Difference, per cent (base: Eurostat)				
	Liquid	Solid	Gaseous	Other fossil	Total		Liquid	Solid	Gaseous	Other fossil	Total
1990	19,5	1,7	-14,5	0,8	7,5		6,2	4,7	-17,6	35,9	1,7
1991	52,8	1,6	6,2	0,1	60,7		15,7	5,0	7,6	4,6	13,4
1992	34,8	1,7	-30,9	1,1	6,6		11,8	5,2	-22,8	44,4	1,4
1993	28,3	1,7	-43,5	1,0	-12,5		9,0	4,7	-28,1	33,5	-2,5
1994	76,8	1,7	-62,0	1,5	17,9		27,8	4,1	-37,7	54,0	3,7
1995	67,9	1,7	-19,6	1,9	51,9		23,1	3,9	-13,5	77,1	10,7
1996	72,5	1,7	-15,6	1,6	60,1		24,0	4,0	-12,5	66,2	12,8
1997	54,5	1,7	-10,0	2,4	48,6		17,7	4,0	-6,1	98,1	9,4
1998	89,9	1,7	-0,7	2,2	93,0		28,7	3,7	-0,4	68,8	17,2
1999	157,9	0,8	-24,4	1,5	135,8		47,7	1,9	-12,3	45,4	23,5
2000	220,8	0,9	14,9	2,0	238,5		65,5	2,0	8,6	62,0	42,8
2001	91,1	0,8	16,2	1,8	110,0		27,7	2,1	6,3	51,9	17,5

2002	87,0	0,8	16,2	1,9	106,0		25,7	2,5	9,0	56,2	19,1
2003	1,1	0,9	21,3	1,9	25,1		0,3	2,7	9,8	39,8	3,8
2004	66,0	0,6	19,0	1,7	87,3		13,3	1,6	11,2	39,0	12,3
2005	37,0	0,6	13,9	2,1	53,6		7,2	1,9	8,2	45,6	7,5
2006	30,0	0,6	32,9	2,4	65,9		5,6	1,9	19,5	49,7	8,9
2007	-9,9	0,6	23,1	2,2	16,0		-2,4	1,8	11,3	45,0	2,5
2008	-24,7	0,5	0,0	2,4	-21,7		-5,0	1,4	0,0	45,3	-2,8
2009	-86,6	0,4	-0,0	2,0	-84,2		-16,8	1,6	-0,0	37,1	-10,9
2010	-45,6	0,7	0,0	-0,2	-45,0		-9,0	2,3	0,0	-3,6	-5,6
2011	-23,6	0,7	2,1	-0,3	-21,1		-5,8	1,9	1,0	-3,3	-3,2
2012	-38,1	0,8	3,4	-0,3	-34,2		-8,7	2,3	1,5	-3,6	-4,8
2013	-53,8	0,6	0,1	-0,0	-53,1		-10,8	1,9	0,0	-0,3	-6,9
2014	34,2	0,6	0,0	0,1	34,9		8,6	1,6	0,0	0,6	5,1
2015	182,0	0,6	-0,4	0,0	182,2		75,2	1,6	-0,1	0,1	33,3
2016	-6,7	0,6	8,0	-0,0	1,9		-1,8	1,8	3,4	-0,3	0,3
2017	26,0	0,6	3,2	0,0	29,7		6,0	1,6	1,5	0,2	4,3
2018	25,0	0,6	2,3	-0,1	27,8		6,2	1,6	1,0	-1,0	4,1
2019	22,1	0,5	2,4	0,2	25,2		6,0	1,6	1,1	2,1	4,1
2020	22,9	0,5	2,6	0,3	26,4		6,1	1,6	1,4	2,6	4,3
2021	23,3	0,5	2,6	0,2	26,7		6,5	1,5	1,2	1,9	4,3

Annex XI Response to the Saturday paper in the UNFCCC 2018 in-country review of the Norwegian GHG inventory

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Summary

This improvement work has led to improvements of both the energy balance and the emission inventory. More specifically, the quality controls and checks undergone since the Saturday paper has

- provided a more robust calculation system
- resulted in adjustments in the figures
- been important quality controls of data streams and sources even where it has not led to changes

1. Introduction and reader's guide

The Norwegian GHG Inventory was subjected to an in-country review in 2018. The team of experts expressed concerns about the size of the differences in energy use and emissions as estimated by the reference and the sectoral approach (RA/SA differences), in addition to uncertainties in the Norwegian national system due to the reorganization of staff at Statistics Norway. This annex summarizes how the Statistics Norway (SN) and the Norwegian Environment Agency (NEA) have been working to resolve these issues, including improvements made and lessons learned.

The overall goals for the work have been:

- To reduce the difference in energy use and emissions between the Reference Approach (RA) and the Sectoral Approach (SA) to an acceptable level
- To document and provide reasons for this level of acceptance in the NIR
- To ensure a robust Norwegian national system

The statistical difference in the Norwegian Energy Balance and difference between the Reference and Sectoral approach has been a topic for a long time. A large statistical difference in the energy balance is not unexpected when the production of energy products far exceeds the domestic use, but it nevertheless leads to questions regarding the quality of the sectoral approach, i.e., the emission inventory.

In chapter 2 we describe relevant work performed prior to the Saturday Paper in 2018. As a response to the Saturday Paper in 2018, Statistics Norway and the Norwegian Environment Agency developed a work plan to resolve the issues related to reducing the difference between the reference and the sectoral approach. Chapter 3 summarizes this work plan and the organization of the improvement work. Chapter 4 describes overall process of transferring and enhancing the competence and the strengthening of institutional arrangements that has taken place since the reorganization at Statistics Norway. Chapter 5 summarizes the work on finalizing the new production system for the energy balance. Chapter 6 describes the improvement work performed for specific data sources or elements in the energy balance:

- evaluating inconsistencies between production and export data on refined petroleum products, including gathering updated data, or performing corrections
- evaluating the coverage of the sales statistics and the import data in the foreign trade statistics, including gathering updated data, or performing correction
- evaluating the need for quality control of other energy products, like gas and coal

Even though the statistical difference constitutes the lion's share of the RA-SA difference in the Norwegian emission inventory, some additional issues have been identified. Chapter 7 describes these issues. Chapter 8 describes the enhanced collaboration with data providers that has resulted from the project. In chapters 9 and 10 you will find a summary of the resulting RA-SA analysis, an assessment of the results from the project and plans for future works.

2. Improvement work and quality controls of the RA/SA prior to 2018

The statistical difference between the supply and use of petroleum products in the Norwegian Energy Balance has been an issue for a long time. This should not be unexpected from a country exporting almost 90 per cent of its petroleum products. Just minor discrepancies between production and export on the supply side of the balance may result in significant imbalances with the consumption side figures. There has, however, been a tendency for a positive bias in the statistical difference for a long time, which has led to questions on whether the domestic use of petroleum products might have been underestimated. The statistical difference in the Norwegian Energy Balance has thus been under scrutiny from the Energy team at Statistic Norway from long before the Saturday Paper in 2018. This chapter describes improvement projects prior to 2018.

2.1. Work prior to 2012

The RA-SA differences have been a perennial subject in the ARR review reports, but with a strengthening of the feedback over time. In the in-country review in 2006, the ARR has only an encouragement to reconcile the approaches (§28). In the ARR 2009, the subject was raised to a recommendation "to make efforts to reduce the differences between the reference and sectoral approaches". In 2011, Norway received the first Saturday paper regarding the RA-SA difference.

Work in 2011 and 2012 entailed among other measures a change of data source for the RA supply side from data reported to the IEA to the national energy balance as published by Statistics Norway. The emission inventory was (and is) based on the national energy balance, whereas the IEA reporting at the time used different methods for retrieving data from the different energy statistics. The change made the RA-SA comparison more transparent, but initially did little to reduce the differences. Also, export data were improved with respect to new oil and gas fields and the proper handling of export of rich gas in pipelines.

2.2. RA-SA project of 2012 – 2015

In the in-country review of 2012, Norway received a new Saturday paper due to large RA-SA difference in the emission inventory. In response to the Saturday paper, a project was launched to address the bias and make corrections if possible.

In Norway, most of the produced petroleum products are primary, while most of the domestic use relates to secondary petroleum products. Primary products are unrefined products like natural gas and crude oil (including pretreatment, such as fractionation and stabilization). Secondary products are products refined into finished products like gasoline and diesel or semi-manufactured products for use as raw material in manufacturing. Hence, separate energy balances for *primary and secondary* petroleum products were elaborated in the project. To further increase the transparency, more detailed product categories and one transfer item were included in the balance system as well. This transfer item covers fractionation at a crude petroleum pretreatment plant and the production of LNG at LNG plants.

New data on primary petroleum products were identified and collected, to establish alternative export figures and new revision controls. No alternative data on secondary petroleum products were identified, and hence these products were not prioritized in this project. The export data, e.g., exports of crude oil and condensate from the Norwegian Petroleum Directorate, collected in this project was consistent with the production data and was therefore easier to control and compare. Furthermore, it was found that some of the natural gas export (rich gas) should be moved to NGL to make it more consistent with production figures. These corrections increased the total export measured in energy units and decreased statistical differences.

All the collected data was readily available from the Norwegian Petroleum Directorate, one terminal and one pretreatment facility, respectively, and suitable for routine revision control. In the project, two revision controls were developed for figures from the Norwegian Petroleum Directorate on production and shipments of crude oil, i.e., the estimated stock changes, compared to the reported stock changes.

Based on new and original data, two alternative detailed energy balances for primary petroleum products were established, for revision purposes. Several causes of statistical difference for primary petroleum products were identified in this process and the statistical differences for these products were significantly reduced.

2.3. Project of 2015 – 2018 – Building a new system for the energy statistics

A second project was launched, with the aim to build a better system for the energy statistics. One of the main goals was to reduce the statistical difference in the energy balance.

During 2015 -2018, a new model for the energy statistics was built, and a comprehensive review of all the methods and data sources was carried out. The new model has a very complicated technical system with many difficult tasks and contains more than 30 data sources, several types of factors, estimates, a link list[13], calculations, table definitions[14] etc. The system is using derivatives and data processing in an Oracle application developed in SN for editing and estimating (ISEE). In addition, many new methods and data sources was incorporated in the system.

It was planned to include all the new export data sources from the 2012 -2015 project for all primary petroleum products, instead of the export from the External Trade Statistics, in the new system for the energy statistics. The main reason was that the possibilities for revising the data are far better in the new data sources. In addition, it was planned to implement all other corrections developed in the project of 2012-2015 as well. Unfortunately, the implementation of the new data and the corrections was not fully controlled prior to the publication of the first revised energy balance and some of the corrections were lacking in the first revised energy balance.

The new model replaced the old energy balance system from 2016- 2017 and was first released for the years 2010 to 2015. Due to the revised energy balance, the new statistical difference at the total level for the years 2010 to 2015 was smaller in all years except 2014, where there was a marginal increase compared to the difference in previous figures. Revised energy figures for 1990 – 2016 was released in 2018.

The improvement in the statistical difference was mainly due to reduced statistical difference for natural gas. The energy use in the energy-producing industries in GWh was 15-18 per cent higher in the revised figures. Several company-specific factors were included for energy content in oil and gas extraction, which is higher than the standard factor used before. When comparing the figures in physical units, the difference between old and new figures was 1-3 per cent. The remaining difference could be explained by the fact that some

[13] The link list contains the links between the variable name for each data source and the classification variables used in the system

[14] An overview of which variables are to be retrieved from the system and a description of where in the delivery it is to be placed. Each delivery out of the system (for publication of the energy balance, for emission statistics, and for international reporting) has its own table definition

quantities of natural gas that were previously placed on transformation are now placed in the energy industries own use.

3. Organization of the work in response to the 2018 Saturday Paper

Norway has put significant effort into reducing the RA-SA difference in the Norwegian emission inventory, both by reducing the statistical difference in the energy balance and by reducing differences due to other issues. In response to the Saturday Paper in 2018 a work plan was developed. A summary of how the work has progressed and status for the activities in the work plan, updated plans and resource allocation have been documented for the respective year in Chapter 10.4 in NIR 2019, NIR 2020 and NIR2021. This chapter gives a summary of how the work has been organized, what work has been carried out and the results from this work.

The project also included activities to strengthen the institutional arrangements. These are described in chapter 4 below.

The following overall roles and responsibilities was established for this work:

1. **The steering group.** A steering group consisting of the Directors of the departments in both NEA and SN has been established for the follow up of the plan to resolve the issues related to the differences between the Reference and Sectoral Approach and to the institutional arrangements. The group has had the overall responsibility for meeting the requirements of the plan, and for sufficient resource allocation and financing. The head of sections in both NEA and SN have been responsible for planning of meetings and the reporting to the steering group.
2. **Statistics Norway (SN)** holds the responsibility for calculating emissions for both the reference and sectoral approach in the Norwegian emission inventory. SN has been responsible for the practical implementation of the work plan.
3. **Norwegian Environment Agency (NEA)** is the appointed national entity responsible for reporting the greenhouse gas emissions for Norway, and for coordination of the inventory work in the three institutions in the Norwegian National System. Inventory experts at NEA have been contributing as discussion partners, especially on the issue of defining the accepted level of difference between the reference and sectoral approach. NEA also holds the responsibility of arranging the biannual National System Meetings, where progress towards reducing the difference between RA and SA has been discussed and reported, as described below.

The work was organized in three main task groups with the responsibility of work programs as described in Table XI-1.

Table XI.1 Organisation of the project in three groups with related tasks

Task group name	Who	Short description of tasks/milestones
The RASA-framework and reporting	The Emission Inventory team at SN	• The appointed RASA-responsible(s) in the emission inventory team has a clear understanding of the reporting requirements as described in 2006 IPCC Guidelines • A new system/routine for reporting RASA in CRF and NIR is established • Updated tables and analysis in the CRF and NIR reported • All differences in RASA that are not due to statistical differences are removed or explained

The Energy Balance and statistical differences	The Energy Balance team at SN	• A clear documentation (illustrations) of the data and workflows of the Energy Balance is provided in NIR
		• Statistical differences are reduced to an accepted level, as defined by project group working on this issue ("Level of accepted differences")
		  ○ Evaluate inconsistencies between production and export data on refined petroleum products. Gather updated data, or perform correction
		  ○ Evaluate the coverage of the sales statistics and the import data in the foreign trade statistics. Gather updated data, or perform correction
		  ○ Evaluate the need for quality control of other energy products, like gas and coal
		  ○ Perform a new consolidation of the energy balance if the

		problems with statistical differences are still not solved (due November 2021). Focus on 2010 to 2020 • The Energy Balance data sources and System have undergone a thorough quality check • Regular contact with important data providers is established to ensure good quality of data
Level of accepted differences	Both teams at SN and the inventory team at NEA	• The level of accepted differences in energy use and emissions is evaluated and documented in NIR

Reporting of work progress, updating of plans and evaluation of resources were addressed four times a year according to Table XI.2.

Table XI.2 Annual cycle for reporting of plans and progress from SN to NEA and Steering group

Reporting "format"	When	Participants	Suggested agenda	Documents
National system meeting	April	Head of sections in NEA and SN, relevant members of inventory teams/leaders of the three project groups	Status of work and presentation of plans for this year	
Written report by e-mail	June	From leaders of the three project groups to Head of sections in NEA and SN	Status of work, evaluation of progress and resources, updated plans	
National system meeting	September	Head of sections in NEA and SN, relevant members of inventory teams/leaders of the three project groups	Status of work, evaluation of progress and resources, updated plans	
Steering group meeting	December	Directors of the departments in NEA and SN, Head of sections in NEA and SN, relevant members of inventory teams/leaders of the three project groups	Summary of work, evaluation of progress and resources, presentation of plans for next year	Draft text to chapter 10.4 for NIR (summary of progress and plans)

4. Strengthening the Institutional Arrangements

A major reorganization of staff was carried out in Statistics Norway (SN) in 2018, as work areas were moved between its two offices located in Oslo and Kongsvinger. Up to 2018, the group of experts compiling the emission inventory for Norway worked at SNs office in Oslo. This group was through 2018 replaced by new staff located in SNs office in Kongsvinger.

The long-term goal of this relocation was to improve data quality by increasing the contact and collaboration between the departments producing the input (activity) data and the inventory compilers.

During the in-country review of the Norwegian Emission Inventory in 2018, the team of review experts expressed concerns about the change of staff and potential consequences on the quality of the emission inventory.

The text and tables in the sections below describe how SN and NEA have worked since 2018 to

1) ensure that the quality of the emission inventory was not compromised in the first and most critical phase of staff replacement
2) establish new and improved routines to ensure the quality of the national system, based on recommendations from the review reports. This includes the annual evaluation of resources and plans for continuous improvement and capacity building across the whole inventory team

4.1. Handling of the first critical phase – 2017-2019

Detailed transition plans were elaborated in SN in 2017, prior to the reorganization of staff. The transition plans listed activities and timelines and identified people and responsibilities for the staff involved.

The transition happened in 2018, and the old inventory team worked closely with the new inventory team, providing guidance. One expert from the old inventory team remained in the new team also in 2019 to help the process and ensure the quality of the inventory. The transition between the old and new energy teams presided likewise as for the inventory team in 2018. One of the experts from the old energy team joined the new energy team and has been of invaluable help since the transition period.

In addition, a plan for capacity building and increased contact between the more experienced staff in NEA and the new staff in SN was set up to counteract the risks of loss of institutional memory. This plan is summarized in Table XI.3 Plan for capacity building in

2018-2021 and is now a part of the annual work cycle with improved routines as described below.

The critical transition period was considered closed by end of 2019.

4.2. Establishing of new and improved routines – 2019 and onwards

After the most critical phase of the transition, the focus has been on establishing new and improved routines that answers to the recommendations given by the review team in 201815 and reiterated in the review report in 202016. The routines were aimed at ensuring regular evaluation of the National System, securing resources, and to encourage continuous updating of the knowledge across both teams in SN and NEA. These processes have been formalized through the inclusion of new tasks in the annual inventory activity.

Two important results of the changes should be highlighted:

- A new cross-cutting role in the energy and emission inventory teams at SN has been established: There are currently two teams working on the statistics related to the energy balance (equivalent to 6 –person-years) and the emissions inventory (equivalent to 6-person years). In addition, one person is working across both teams to ensure knowledge transfer and an in-depth understanding of the statistics for both approaches. This has proven to be very useful.
- There has been a substantial increase of financial resources allocated to RA-SA-related projects after the UN review report in 2018: 500 000 NOK (almost 50 000 EUR) per year has been directed from NEA to SNs work on mapping out the differences between the sectoral and reference approach. This has been central in moving the project forward as it has been a common priority across the involved institutions.

In the sections below, other important aspects of the work related to the Norwegian national system is described.

Activities related to the recommendations provided by the review team in ARR2020 ID G.2, G.3, G.4 and G.7(d)) on securing sufficient resources, planning, evaluation, and documentation of the processes:

- The roles and responsibilities of each of the three core institutions in the Norwegian National System are specified in signed agreements. As NEA is appointed as the single entity with overall responsibility for inventory delivery and quality, the agreements are between NEA and SN, and NEA and NIBIO. The agreements help to ensure that SN and NIBIO allocate enough of their own resources to deliver on their responsibilities to the National System. The current

[15] https://unfccc.int/sites/default/files/resource/arr2018_NOR.pdf
[16] https://unfccc.int/sites/default/files/resource/arr2020_NOR.pdf

agreements are valid for the years 2015-2022. An updated version will be signed in 2022 and will include additional responsibilities related to the reporting on GHG emissions to the EU and considering any new tasks foreseen under the Paris agreement.

- Additional financial resources are secured for reporting obligations and improvement projects though annual contracts between NEA and SN, and NEA and NIBIO. These contracts contain descriptions of improvement projects planned for the coming year. The process of identifying and prioritizing improvement projects for the coming year is normally initiated in fall and considers:
    - Findings in the latest UNFCCC review report
    - Issues identifies by the EU review team
    - Findings from the latest review under the LRTAP convention
    - Key category analysis and uncertainty analysis as reported in the most recent NIR
    - Findings and needs identified by the inventory teams in the three institutions
    - Input from stakeholders outside the national system, like experts from research institutes, NGOs, governmental bodies, and the general public
    - Budgets and available human resources in NEA, SN and NIBIO

  The process concludes with the signing of contracts in January each year.
  These annual contracts that identify and prioritize improvement projects have been important in securing resources for the work in SN on the reference and sectoral approach.
- The status of resources and improvement projects are reported and evaluated in regular meetings and is documented and archived in the minutes from the meetings. The progress that SN has shown in the work with the RASA-project, indicates that sufficient resources have been allocated to this project.
  It is, however, important to note that although NEA can express views and possible concerns about resource allocation within SN, it does not have a mandate to instruct SN on how to allocate its resources.
- Capacity building activities have been given extra attention these past years. These activities were planned and formalized through the plan in Table XI.3.
  The most important form of capacity building has however been through work with the annual improvement projects and the contact between the institutions in relation to these projects.

Activities related to the recommendations provided by the review team in ARR2020 ID G.6 and G.7(e) on enhancements to the national system in relation to upstream data providers.

- An overview of the key data providers is given in annex V to this NIR. The table shows both providers within Statistics Norway, NIBIO and the Norwegian Environment Agency and data providers in other institutions.
- The steering group established in 2019, consisting of Directors of the departments in NEA and SN, have discussed and evaluated the need for improved contact between SN and key upstream data providers. The steering group concluded that there was no need to establish new routines, but that current and already established channels of communication and feedback between SN and data providers should be used and improved. This includes:
    - Annual quality reports: Quality reports are sent once a year from SN to data providers. The reports contain information on how the data is used in SN, an evaluation of the quality of the data, and suggestions for improvement.
    - Annual directors' meetings: High level meetings between the director of SN and directors of data providing institutions are held annually.
    - Contact between emission inventory experts and data providers: Communication about data and potential errors through meetings, by e-mail and telephone.
    - Annual meetings in the reference/contact group for energy and emission statistics: The mandate of the group is to give counsel and to present user needs related to energy and emission statistics. Members of the group are four government ministries and eight other organizations with energy and environmental interests, including NEA.

  Key elements in the dialogue with data providers is described in chapter 8 of this RA-SA annex.

Table XI.3 Plan for capacity building in 2018-2021

	Activity	Status by March 2022
November 2018	• Participation of relevant SN-staff in a seminar about emission inventory for the Oil and Gas Industry, arranged by NEA for developing countries.	Completed
January 2019	• Workshop on RASA. Arranged by SN to make further plans for the project that will run in 2019 and 2020 • Workshop on Key Source Analysis and Uncertainty Analysis arranged by NEA. Capacity building	Completed

March 2019	• Workshop on SF_6 arranged by NEA. Participants from both SN and the most important data provider. Ensuring correct understanding of the data needs and emission model	Completed
April 2019	• Nordic Inventory Meeting in Helsinki: Four persons from the new inventory team will attend the meeting in Helsinki to learn, discuss and get to know other inventory experts	Completed
May 2019	• HBEFA meeting in Zurich: The inventory compiler responsible for road traffic will attend the meeting, travelling with representative from NEA • CEIP LRTAP meeting in Thessaloniki 13-15. May: Three persons from the inventory team will attend the meeting, traveling with representative from NEA	Completed

September 2019	• Two-days seminar for all members of the National System:
	  ○ Roles and responsibilities of the member institutions. The agreements and obligations
	  ○ Other relevant issues: To be decided
	  ○ Teambuilding.
		Completed

November 2019	• Data flow of reported emissions from NEA in SN	Completed
March 2020	• Short seminar on bioenergy	Completed
May 2020	• Nordic Inventory Meeting: Forum for inventory team to discuss and learn from Nordic colleagues • CEIP LRTAP meeting in Slovakia: Participants from the new inventory team will attend the meeting, traveling with representative from NEA	Completed LRTAP meeting was held virtually

September 2020	• Meeting on data flow of reported emissions from NEA in SN, aiming at improving workflow	Completed
November 2020	• Workshop on indirect emissions arranged by NEA	Completed
April 2021	• Workshop on QAQC-management arranged by NEA for the QAQC-coordinators in the three core institutions	Completed
May 2021	• CEIP LRTAP virtual meeting	Completed
June 2021	• Nordic Inventory Meeting: Forum for inventory team to discuss and learn from Nordic colleagues	Completed
September 2021	• Meeting on data flow of reported emissions from NEA in SN, aiming at improving workflow (continued from 2020)	Delayed to 2022
2019-2021	• GHG management institute courses: Two of the new inventory compilers have attended courses under the direction of GHG management institute and several compilers are planning to do so in the next years. • EU capacity building webinars	Continuously

5. Work on the production system for the energy balance – competence building, quality control and documentation

First, it was necessary for the new energy team to raise the competence on the energy statistics and how the new model was intended to work. It has been a high priority to secure that the system works in the right way and with the right result. Through a thorough internal review of the energy statistics system the competence of the new energy team was raised, and the team learned how to control the technical system and fix errors that was detected in the review.

5.1. The Energy Balance data sources and system have undergone a thorough quality check

When the new energy team at SN started their work, the new system of the energy statistics (described in chapter 2.2) was not fully developed. The system had not been fully tested by the previous team before the transfer, so they were not aware of all the challenges that the model contained. Unfortunately, the new system had several "childhood diseases" (bugs) that needed to be corrected, and there were some data sources from the first project (2012-2015) that was yet to be incorporated in the new energy statistics production system.

A comprehensive work to correct and improve the new energy statistics system from its "childhood diseases" has been undertaken, and almost all errors that have been detected have now been corrected. This implies a much better quality of the energy balance since first time it was released. It should be mentioned that one of the members from the old energy balance staff continued to work on the energy balance after the change in organization in 2018 and could be due to that more easily detect and contribute to correction of several of these errors.

The energy team has been working with the definitions in the energy balance and make clear and correct boundaries between energy products, between energy balance and energy account, and between posts in respectively the energy balance and energy account. During the quality control of the table definitions, link list and factors in the energy statistics system it was found that the system mostly works as planned, but some errors was discovered and corrected. It was found that:

- wastage has been recorded twice for blast furnace gas
- calculated statistical deviations were calculated incorrectly for biogas 2010-2019
- blast furnace gas used for conversion was misplaced on own consumption instead of transformation in district heating plants.

Several changes have been performed to improve the system. The choices that were made in the project from 2012 for primary products is now part of the present energy statistics system. The two revision controls that were developed are also included as part of the annual quality control. Due to the review, many manual operations have been replaced by automatic ones. Changes are now logged, which makes it easier to track the history of the statistics.

The significance the review has had for the development / changes in the figures has not been quantified, but it has been of importance.

5.2. A clear documentation of the data and workflows of the Energy Balance is provided in NIR

The ERT in the 2018 review wanted a clear documentation of the data and workflows of the Energy Balance to be provided in NIR. In Chapter 3.6.1 there is an illustration of the energy flow in the Norwegian energy balance and in Chapter 3.2.1.2 shows an illustration of the new technical system of the energy balance. A detailed description of the methods and data sources in the energy balance/ energy account system is to be found in the document (in Norwegian) "Energiregnskap og -balanse – Dokumentasjon av statistikkproduksjonen fra statistikkåret 1990 og framover".

6. Improvements and important quality controls of the energy balance

The energy team is constantly working to improve the energy statistics, not just as a response to the Saturday paper, but as one of the activities in the normal production cycle. The quality controls and checks undergone since the Saturday paper in 2018 has led to many improvements in the energy balance. As described in the previous chapter, the Saturday Paper initiated thorough scrutiny of the calculation system, making it more robust. In addition, the work has resulted in adjustments in several of the figures. More importantly, however, it has resulted in important quality controls of data streams and data sources that have made us more confident that the energy balance does not underestimate the use of energy products in Norway.

From 2018, the focus has been on quality assurance of the secondary energy products. All historical data that were meant to be included in the new energy statistics system is now controlled and checked for correctness. The sections below mostly concentrate on the work that has led to improvements and new quality controls.

6.1. Evaluating inconsistencies between production and export data on refined petroleum products

6.1.1. The refineries

Norway has a large production and export of oil products, and the production of secondary petroleum products takes place mainly in the oil refineries. The transformation figures for Norway have previously shown that more energy comes out of the refineries than what enters. To solve this problem Statistics Norway has had extensive dialogue, including several meetings and subsequent dialogue with the refineries in Norway to ensure the quality of the data we receive from them. We have exchanged information and clarified various aspects of the data collection.

The collaboration with the refineries has, among other things, led to a better understanding of what is being reported and an adjustment of the questionnaire used for reporting. This has also contributed to corrections of figures back in time. These following corrections has been made in the figures for the years 2010-2018 (and applies to 2019 and beyond):

- Correction of the conversion factor for energy content on crude oil from 42.3 to 42.7
- Correction of the conversion factor for energy content on refinery gas from 48.6 to 47.685
- Correction of the conversion factor for energy content on non-commercial petroleum coke from 37.1 to 29.5.
- Previously included bio share is extracted from certain products, e.g., car gasoline, car diesel, light fuel oil.
- Ethane used as feedstock in refineries (around 10-30 kt per year) has been added in the energy balance from 2010 and forwards. These figures are based on more detailed information from the refineries. This had not been included earlier.
- The production of MTBE has been removed. These figures only have an accounting meaning for the refineries. The refineries do not produce MTBE.

These corrections have meant that it is no longer the case that more energy comes out of the refineries than what enters. Earlier, refinery output had exceeded input in refineries for several years but adding missing feedstock and correcting the conversion factors have contributed to a more correct relationship between input and output in the refineries. According to the refineries, it still happens that output exceeds input, because losses usually are close to zero, and inaccuracies in some of the figures might give a higher output than input, but now this is more seldom.

Another correction is that some of the refinery gas has been moved from fuel consumption in refineries, to transformation in a gas power/CHP-plant which is integrated with the refinery. This has been done back to 2010.

The energy team has also started to use a new data source to check the figures for the refinery. This is data provided by one of the refineries and it contains information that will be useful in controlling the figures. SN has used this new information to correct the input of crude oil for 2011 and 2017. In Norway there have been two refineries, but in 2021 one of the refineries closed the refinery activity and continues just as an oil and gas and oil terminal.

6.1.2. Import and export

A check of the detailed information behind the figures on import and export for the external trade statistics has shown that some of the figures for fossil energy products really

are bioproducts and should be placed on biodiesel instead. The volume is not very large, but it will be corrected for 2020 and some years back.

A quality control of the figures from the Oil Directorate and the external trade statistics has been carried out and this has led to corrected figures on imports of LNG (for several years from 2008 and onwards) and exports of crude oil (2018).

Errors were found in how naphtha and LPG has been kept in the energy balance, revealing an overestimation in the export of naphtha in the years 2016, 2017 and 2018 and LPG in 2018. Corrections were implemented in the energy balance of 2020.

Import and export of fuels used in navigation has also been discussed with the foreign trade statistics, revealing that fuels used by the ship itself is not customs declared. If the ships fill fuel abroad, this energy consumption will not be included in the energy balance. In discussions with experts from several Nordic countries and Great Britain, it was argued that bunkered fuel was not part of the sales statistics. If bunkered fuel was included, the global emissions would be overestimated because bunkered fuel are reported in the country which it was bought. In the EU review in 2019, Norway was told that the inventory would be rejected if emissions from navigation was calculated from any other source than the sales statistics of petroleum products. It was therefore decided to concentrate the work on other issues.

6.2. Evaluating the coverage of the petroleum sales statistics

Through contact with the refineries, respondents and from figures from the Coastal administration we suspected that the sale of marine gas oil (MGO) was too low in the petroleum sales statistics. To control the figures in the petroleum sales statistics SN has performed multiple checks:

- control of the population of the statistics to secure the coverage
- increased dialogue with the respondents
- a check if the survey was understood properly so that the respondents had a clear understanding of what was to be reported.
- several energy products were compared to figures in the tax data

SN has performed a control of the population in the sales statistics to ensure that all the respondents who is to report is included in the survey. There are 13 companies that report their sales of petroleum products in Norway, and they cover the whole marked. The population was controlled against the respondents in the tax data and Drivkraft Norge`s customer register. Drivkraft Norge is an association that represents the interests of fuel and energy companies in Norway. There are a larger number of companies selling petroleum products in Norway, but they are customers of the 13 companies included in

the survey. In the reporting's the companies attach receipts, which allows SN to split the sales on different industries, including the split in national/international navigation.

SN performed a control if the respondents understood properly what was to be reported. Because of this control, the information about what is to be reported in the survey has been clarified and the respondents have a clear understanding of what is to be reported.

As a result of the dialogue with the respondents some of the respondents reported new data.

- New data led to an increase in the figures for MGO for the period 2012 to 2019. The figures were adjusted with very small amounts in 2012, with an increase every year to 2019. About 600 million liters were added to the statistics in 2019, about 33 per cent of the total sale in 2019. This review also resulted in some small changes (increase) in road diesel in the same period.
- The quality assurance also resulted in better coverage of LPG reported in the sales statistics. For 2020 and onwards we collect all the sale of LPG and SN don't have to estimate part of the sale.
-

Several energy products are reported annually to the tax authorities due to registration and environmental taxes. A comparison of the volume of gasoline and road diesel in the two data sources showed that the volume of gasoline and road diesel are about the same, with only a small discrepancy of 1-2 percent. The volumes of gasoline and road diesel are also controlled using the international road traffic model HBEFA, although this model only includes vehicles registered in Norway and therefore gives slightly less consumption than the sales statistics.

Statistics Norway has worked to ensure that the correct respondents are included in both the sales statistics and the natural gas survey. This has helped to improve the total figures for marine gas oils and lng sold in Norway.

By comparing the figures in the sales statistics with tax data, SN has gained better control over the total figures. The sales statistics give us figures broken down by industry, including national and international navigation. In addition, tax data are used to allocate the wholesale part of marine gas oils into national navigation, fishing, international navigation and oil and gas extraction.

These things have helped to reduce the uncertainty of fuel allocation between national navigation and international navigation (bunkers).

6.3. Evaluating the need for quality control of other energy products, like gas and coal

SN has performed a quality control of coal, blast furnace gas and natural gas. The population is controlled for completeness and there has been an evaluation of the need to include new quality controls.

Coal

The Norwegian energy balance includes only one coal production from one company in Norway. This is situated on the part of Svalbard with Norwegian settlement, and the coal is either exported or used for transformation in the central heating plant on Svalbard. There are around 40 end consumers of coal /coke inn Norway. Their consumption is from imports, which means that imports, corrected for stock changes, should correspond to consumption. The main part of the coal and coke consumption in Norway is for use as a reductant in industrial activities.

When the population of the coal/coke statistics was controlled, it was found that two small companies where missing from the statistics. These two companies have been added to the statistics and will be controlled if they have figures for years back in time during the production cycle of spring 2022. These figures will be added if they are missing from the statistics.

During the review of the coal and coke statistics, SN made a new quality control for improving the coal/coal statistics. From the spring 2022 data collection, the consumption data is compared with import data. The companies are contacted when there are large differences that could not be explained by stock changes. The purpose is to find out if the differences are due to either reporting in “wet weight” (coal and coke should be reported in dry weight) or if some of the data are reported in an incorrect product category or if the data are reported inaccurately. This is done in addition to the current editing routines where the reported data are compared with data for previous years.

Blast furnace gas

Blast furnace gas is a part of coal/coke, but SN receive data for both production and consumption from the same companies, and these figures are balanced before it is included in the energy balance, so there should not be any statistical difference. Errors in the statistical difference from blast furnace gas was corrected in the 2022 production cycle and are almost eliminated. Parts of this statistical difference was linked to that some petroleum coke gas from one refinery was wrongly categorized as blast furnace gas. This is now corrected.

Natural gas

SN has performed a control of the population of the natural gas data source. It was found that one company both transport and uses LNG for own consumption on its ships. This company have been added to the natural gas statistics to improve the figures on use of LNG in navigation. The population in this survey has also been checked against tax data and found to be complete.

We found that some figures for 2019 and 2020 was included in the energy balance incorrectly from this source, in addition to other sources. This was corrected in June 2022. From June 2022, the energy balance also includes figures for LNG used in the military for the period from 2010 and onwards. This is a new data source.

6.4. Quality control of other data sources

Stocks

SN performed a quality control of the stock figures and discovered errors in the figures. As a result, the entire time series was reviewed. This led to several corrections, especially for the period 1990-2000. Stock figures were corrected for fuel oil, distillates, kerosene oils and petroleum coke.

Landfill gas and biogas

After a check of the figures for biogas, it was found that the production of landfill gas in the energy balance was lacking for the years 2015 to 2019. This also led to a discovery that figures for flaring were too high and has been corrected in the energy balance

Gas power data source

One of the data sources in the energy balance system provide information about consumption for transformation in the production of electricity from natural gas. This is a complex composite data source with many figures and calculations, where we have found some shortcomings and other challenges. The ETS-data contain some of the same information as the surveys for the energy statistics, especially consumption figures. This makes the ETS-data a good source for quality control and will therefore be used as a reference to check some of these figures.

Comparison with EU-ETS data

CO_2 emissions from plants that are included in the European Emission Trading system (EU-ETS) represents 44 per cent of the CO_2 emissions under 1A, distributed as 93 per cent of the emissions in 1A1 and 21 per cent in 1A2. These emissions undergo quality control as a part of the third-party verification, and the emission data is further controlled by the Norwegian Environment Agency and Statistics Norway in close cooperation. These reported data serve as an important verification of the energy data in the energy balance,

and the results of these verification routines have not indicated any significant deficiencies in the energy balance.

7. Quality controls of the Emission inventory and the RA-SA calculations

The new emission team took over an emission model that at the time of the reorganization was not fully compatible with the new energy balance system. The emission team had to raise the competence of the emission model and how it was intended to match with the new energy balance system. The new energy balance system is massively more detailed than the former version, and a great deal of work has been done to secure that these systems work together in a proper manner.

7.1. Improvements in the use of energy data in Sectoral approach

In the transition from the old to the new energy balance, an error was introduced in the emission model due to the new detailed level in the energy dataset. This error particularly affected the figures of marine gas oils and resulted in an overestimation of the emissions in 1A3D. This error is now corrected and the consumption of marine gas oils into the emission model correspond to the consumption in the energy balance. Due to this error, new QA-controls where implemented.

The link between the energy balance ant the emission model is a table definition which has been updated, resulting in figures being placed in the right place in the emission inventory.

Due to the new and much more detailed energy dataset, a new comparison and harmonization was needed to avoid over- or under reporting where directly reported emissions from point sources are uses in the inventory.

Through this work, the new emission team has raised the competence of the emission model, how the model is matched to the energy balance system, how to ensure that directly reported emissions are not underestimated or double counted and how to correct errors that have been detected. In addition to the existing QA/QC system, several new quality controls have been introduced. The figures under 1A1 and 1A2 are controlled in a closer cooperation with NEA, and the figures for 1A3 and 1A4 mobile are checked closely with the figures from the energy balance.

7.2. A new system/routine for reporting RASA production in CRF and NIR is established

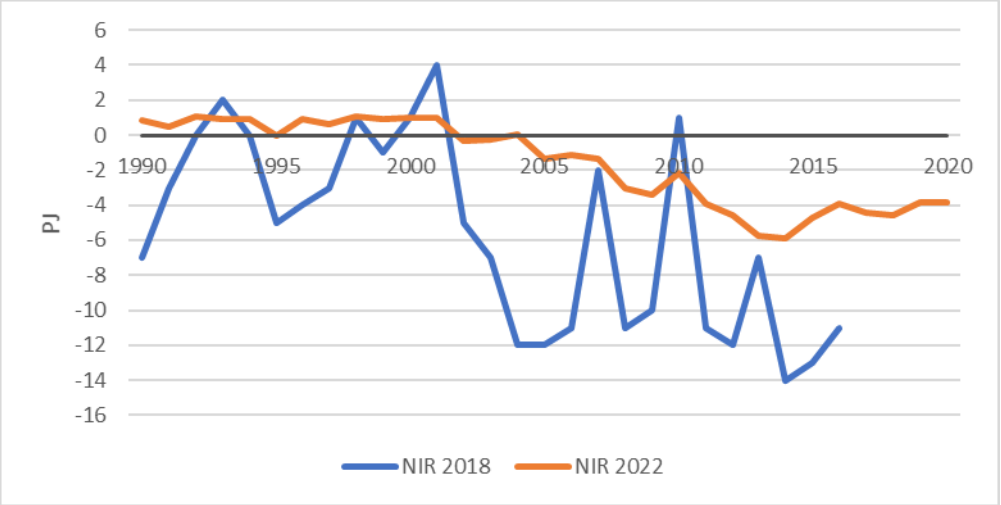
SN has built a new system for the RA-SA calculations, in the SAS programming language. The new system replaced an Excel system with more than 90 spread sheets. The new

system is easier to maintain and have a lower risk of errors. Previously, the RA calculations were aggregated into product groups early in the calculation process. In the new system, detailed data from the energy balance are included further in the calculations. The detailed data makes it easier to compare the product groupings between the RA and SA side.

SN has also changed the way that the energy is obtained for use in the SA reporting. Energy figures are now obtained in GJ from the Energy statistics. Previously energy was obtained in tonnes from the energy statistics and converted to GJ based on average NCV values. Because of this change, the previous deviation that existed due to wrongly converted energy content is removed and now ensures consistency in the CRF with the energy balance.

Based on the new RA-SA system, there has been performed a thorough review of the RA calculations to reduce differences in RA-SA that are not due to statistical differences. This review has led to improvements in the RA-SA comparison for all the energy product groups. The results from this review were most visible for solid and other fossil fuels/waste, resulting in major improvements in the comparison between RA and SA for these product groups. Consequently, the differences between RA and SA that is not caused by statistical differences is heavily reduced.
The improvements have been partly on the supply side (CRF 1AB) with improved fuel split, improved NCV values and more fuels included, and partly on the carbon excluded side (CRF 1AD) with more precise data for carbon excluded that matches the delimitations in the SA. The effect of the new methods is shown in figure XI.1. The figure shows the fraction of the RA-SA difference in energy terms that were not due to statistical differences or differences between transformation output and input (and thus not affected by changes in the energy statistics proper).

Figure XI.1 RA-SA difference after adjusting for statistical differences and transformation differences. NIR 2018 and NIR 2022



The new calculation system is used for the reporting of the RA-SA comparison in CRF and the RA-SA figures are described both in Chapter 3.6 and in NIR annex XII.

The remaining differences include both known and quantified inconsistencies and an unexplained remainder. Known inconsistencies include the handling of waste energy data, and that it is technically infeasible to include natural gas bunkers in RA in the CRF system. The unexplained remainder may include effects of the NCV for crude oil, which may be different from what would seem appropriate from consumption of secondary fuels in the SA.

Also, the NCVs for crude oil has a large impact on RA, while the general NCVs does not necessarily reflect actual use. The possible effect of NCVs for crude oil has not been quantified.

7.3. The appointed RA-SA responsible in the emission inventory team has a clear understanding of the reporting requirements

One of the areas where SN has had to gain competence has been on the RA-SA reporting requirements. Through the years from 2018 to the reporting in 2022, there has been a steep learning curve for the appointed RA-SA responsible at Statistics Norway. Through the implementation of the new calculation system the appointed RA-SA responsible has gained a clear understanding of the reporting requirements and has accomplished to reduce the RA-SA difference that is not due to statistical difference to only minor differences that mostly are explained.

8. Regular contact with data providers is established to ensure good quality of data

8.1. Within Statistics Norway

Some of the data sources in the energy statistics are collected from statistics within Statistics Norway. Cooperation agreements of data delivery have been prepared and signed with four departments in Statistics Norway. These agreements are renewed annually, in addition to follow-up meetings once or twice a year. There is also a close cooperation between the energy team and the team working with emissions.

8.2. Outside Statistics Norway

The energy team collaborates at various levels with several agencies and institutions outside Statistics Norway: The Norwegian Environment Agency, The Norwegian Water Resources and Energy Directorate, Enova SF (owned by the Ministry of Climate and Environment), The Norwegian Petroleum Directorate, The Ministry of Trade, Industry and Fisheries, The Ministry of Petroleum and Energy, The Norwegian Tax Administration and Drivkraft Norge (an association that represents the interests of fuel and energy companies in Norway). The collaboration consists of cooperation agreements of data delivery, annual meetings, professional discussions and sharing of data. As part of the agreement, SN prepares annual quality reports for all received data deliveries to ensure quality.

8.3. Collaboration with respondents

The energy team work well with their respondents in several statistics, and this has been important in improving the figures in the energy balance. It ensures a common understanding of what is to be reported and it gives us a greater understanding for the challenges that the respondents are dealing with. For example, itis in close collaboration with the refineries and the oil companies that the refinery numbers and the sales statistics have improved.

8.4. International collaboration

Statistics Norway report energy figures to Eurostat and The International Energy Agency (IEA) and receive a lot of questions about the data and suggestions for improvements. This dialogue gives valuable input to quality improvements of the energy statistics. In addition, most of the members of the energy group have participated in one or more courses arranged by Eurostat and IEA.

In December 2021 and January 2022, the energy team participated in a review that the IEA had, where the Ministry of Petroleum and Energy was responsible. During the first half of 2022, ta quality report will be submitted to Eurostat in which the energy team will describe

the data sources, the methods, and the quality in the energy balance/energy account system.

9. Current status: Remaining difference between Reference and Sectoral approach, but increased confidence in the emission inventory

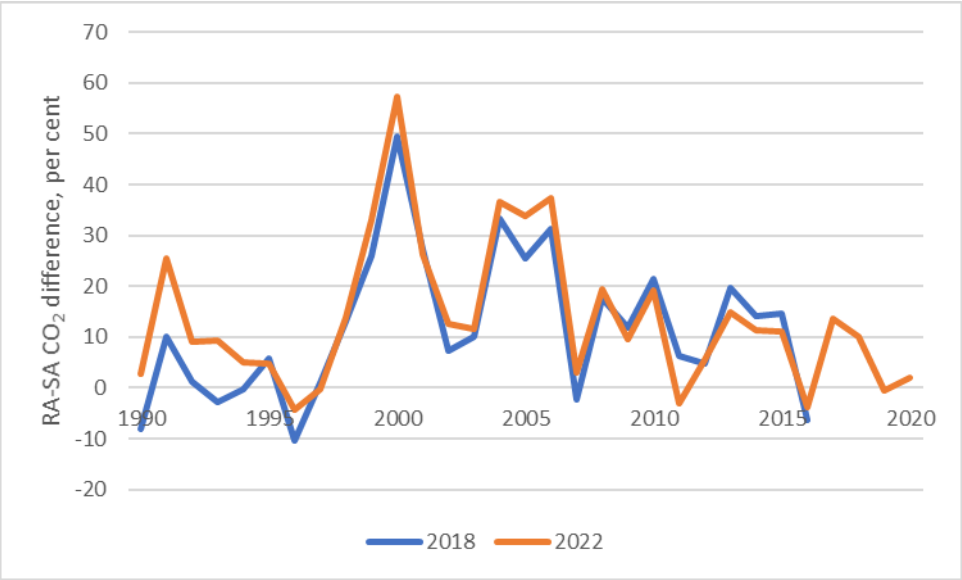
This chapter summarizes the comparison of the Reference and the Sectoral approach, after the project to reduce the difference. It also describes how the difference has changed over time, as a result of the improvement work that has been done. In addition, the chapter describes how the project has increased the confidence in the sectoral approach (the emission inventory) as well as how it has led to targeted competence building.

9.1. *Summary of the comparisons of the Reference and Sectoral approach*

As a result of the improvement work, the RA-SA difference has been reduced for most years in the time series after 2010, although not as much as hoped. Fig XI.2 shows the RA-SA difference reported in the present inventory report and in the NIR 2018.

Earlier NIR results are not shown in the figure. The RA-SA differences in the NIR 2013, when a new data set for the RA supply data was introduced, are very similar to the NIR 2018 data. Results from the 2015-2018 project were mainly used for quality controls of new years and were partly implemented in the energy balance after the transition to the new energy statistics system described in chapter 5.

Figure XI.2 RA-SA CO_2 difference in per cent from NIR 2018 and NIR 2022



The differences for CO_2 emissions now range between -4 and +57 per cent. For the years from 2010, for which the new detailed energy statistics system is used, the differences range from slightly negative to 15-20 per cent. The highest discrepancy for CO_2 is found in some of the years for which a less comprehensive energy statistics system is used, in particular 2000 and in 2004-2006.

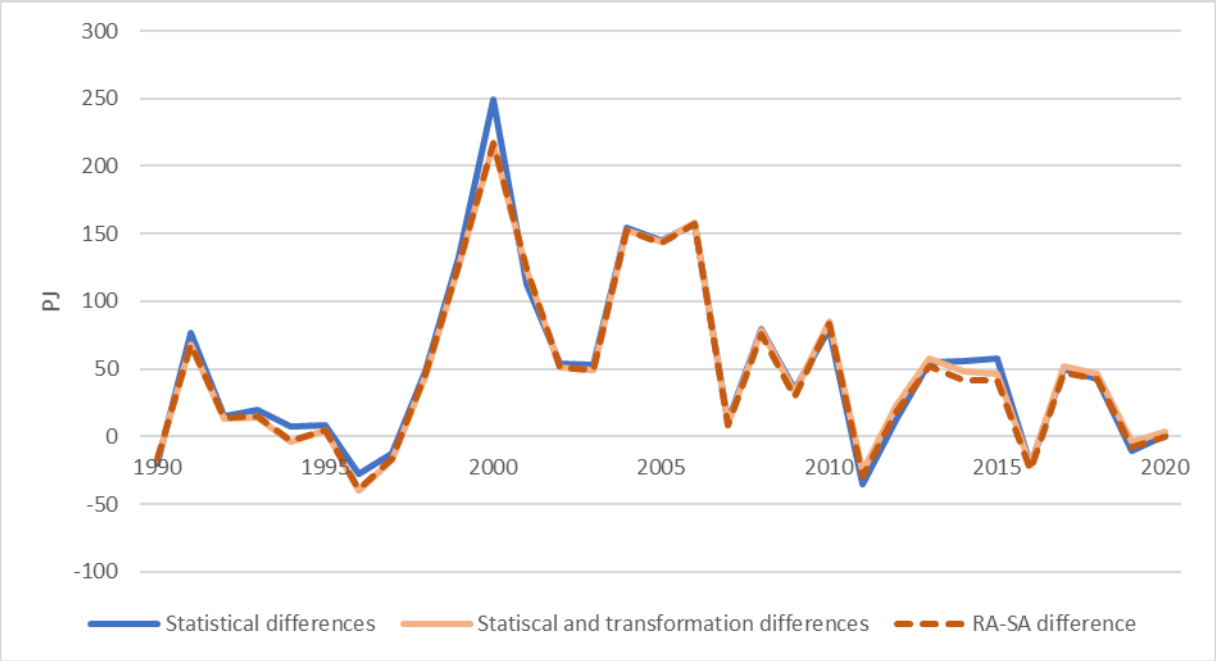
For 2020, the difference for fuel consumption is –0.1 per cent and for CO_2 1.9 per cent. The RA-SA difference is primarily due to differences for liquid and gaseous fuels. The difference in per cent may be larger for solid fuels and other fossil fuels for some years, but the absolute values are much smaller.

The differences in *energy terms* are generally shifted in a negative direction relative to the differences in CO_2. (NIR section 3.6.1.). Large positive CO_2 differences are smaller in PJ terms, whereas negative CO_2 differences are smaller in PJ, with smaller positive differences and larger negative ones. At least for the later years, this is likely due to the use of a standard carbon content value for crude oil which is higher than what would seem appropriate from consumption of secondary fuels in the SA. A very large proportion of the RA apparent consumption is crude oil, so the carbon content has a large impact. See annex XII for more information.

The following sections present data in energy (PJ) terms. This is partly in order to show the correspondence to energy balance, and partly due to the confounding effects of the carbon content data mentioned above.

The main contribution to the RA-SA difference is by far the statistical differences in the energy balance. The remaining discrepancies are mainly due to differences between outflows and inflows in the transformation sector (losses in conversion, etc.). This is described in detail in annex XII and is summarized in fig XI.3. The figure is in PJ terms in order to combine the RA-SA and energy balance data.

Figure XI.3 RA-SA difference in PJ compared to statistical difference in the Norwegian energy balance. 2020 data in the current NIR.



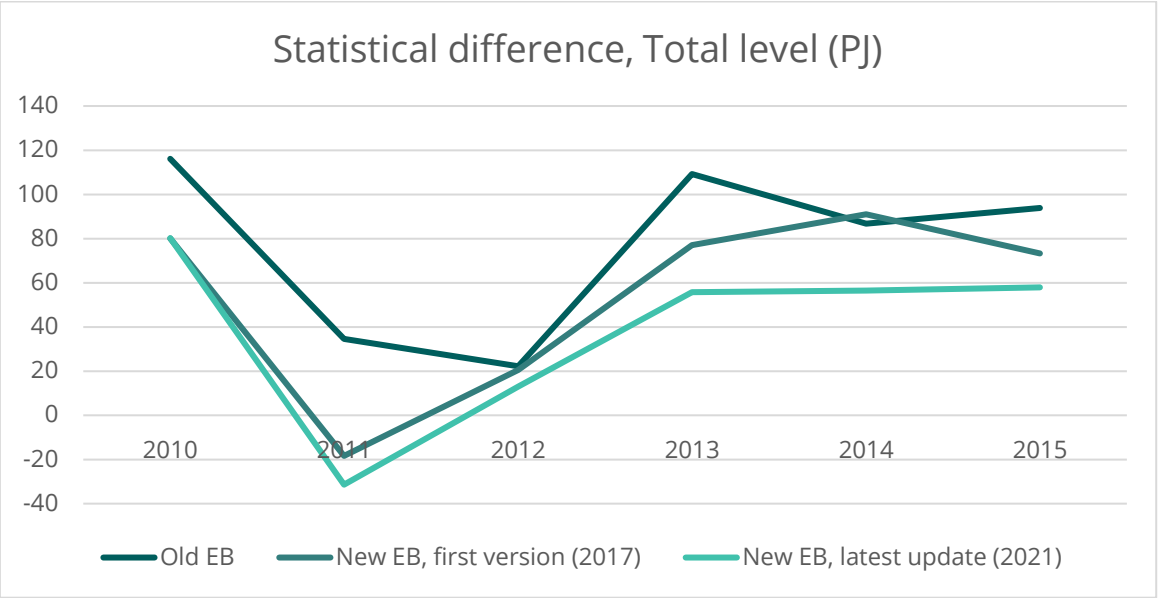
The small remaining differences that are not due to statistical- or transformation differences are discussed in annex XII and in section 7.2.

Tracing the changes in the RA-SA difference one further step, we finally show the changes in the statistical difference in the energy balance. In Figure XI.4 the statistical difference for all energy products is compared for the years 2010 to 2015, for the following versions of the energy balance

- the old energy balance - used in NIR 2018
- new energy balance (first version) - 2017, used in NIR 2019
- new energy balance (latest update) - 2021, used in the current NIR

As shown, the statistical difference in the energy balance has been significantly reduced.

Figure XI.4 Statistical difference, Total level (PJ)



Note: The figure shows the total statistical difference, including biofuels and electricity. However, the difference is dominated by fossil fuels, as biofuels and electricity have very small differences in the period shown.

The reduction in statistical difference at the total level is mainly due to a reduction of the statistical difference for liquid and natural gas. The changes in the energy statistics leading to these improvements are discussed in section 6.

A separate improvement in the RA/SA comparison has been a more reliable transfer of energy balance data to the Reference Approach. This is described in section 7.2.

9.2. Sensitivity analysis and implications for quality control

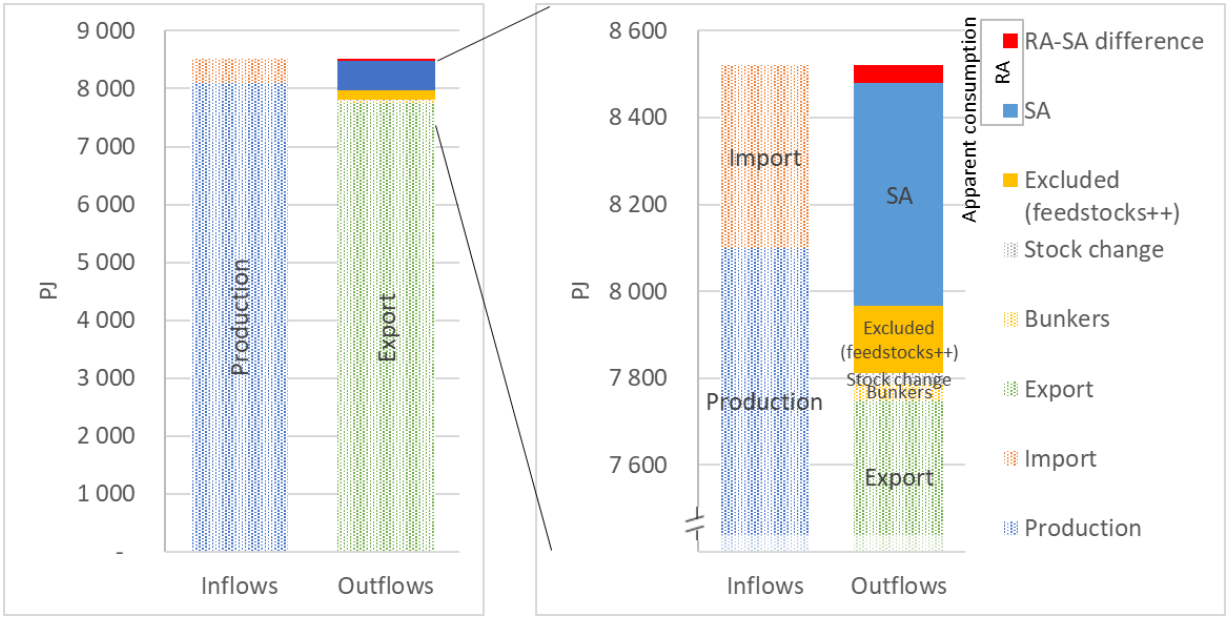
As chapter 9.2 shows, there is still a notable difference between Reference and Sectoral approach emission estimates for Norway, in spite of a significant effort to reduce the difference. This is not unexpected, given the large production of oil and gas in Norway, compared to national consumption.

In Norway, the total production of primary products is about 15 - 20 times the consumption in SA. A change or error of 0,10 per cent in the production figures would give a RA-SA difference of ± 2 per cent. A change of 0,25 per cent would give a RA-SA difference of ± 5 per cent, and a change of 0,5 per cent would give a RA-SA difference of about ± 10 per cent. This shows that it is very difficult to get the RA-SA comparison to be very low in a country that has such a large production and exports of primary products as Norway. As described above, the main explanation for the RA-SA difference in Norway lies within the

statistical difference in the energy balance. It is, in our judgement, not unreasonable with a statistical difference of 0,5 - 1 per cent in the production of fossil fuels in the energy balance.

Figure X6 illustrates the situation with actual data for Norway. The figure uses data for 2018 from the current report, as they are more illustrative than the 2020 data (due to larger RA-SA difference).

Figure XI.6. Elements of the RA-SA analysis. Supply data in hatched colours, and the RA and SA in solid. Data for 2018



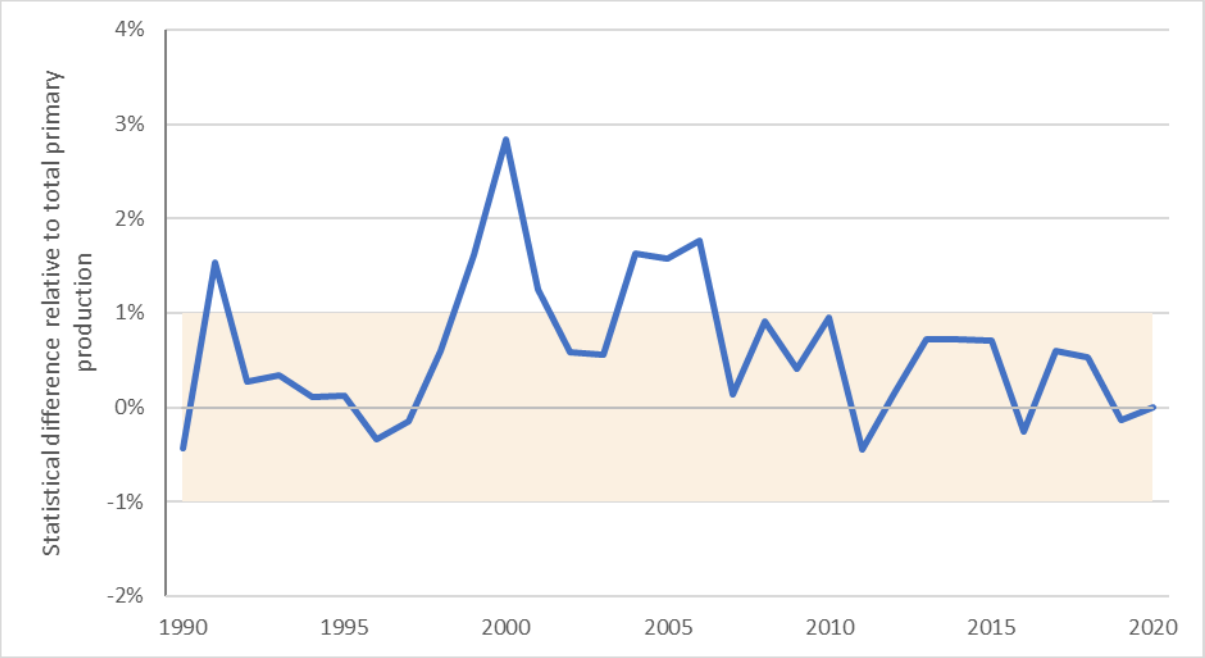
The right-hand side is an enlarged view of the upper part of the left-hand side. The figure is basically a depiction of the supply part of the energy balance. Inflows and outflows are items that contribute with a positive and negative sign, respectively, to the net supply[17]. The net supply corresponds to the solid colours and is partitioned into the SA energy consumption, energy excluded as feedstocks etc., and the RA-SA difference. The latter is not a part of the outflow as such but is a "balancing item" that is calculated as the remaining difference between the two columns.

For the year shown, the total primary production of fuels was 16 times the sectoral approach. The figure shows clearly how the RA-SA difference (red) is significant relative to the SA, but small relative to the total inflows.

[17] The apparent consumption in the RA is almost, but not exactly equal to the net supply in the published energy balance. They differ in some technical details, *e.g.* with respect to natural gas bunkers.

The statistical difference as share of production for all fossil fuels is within ± 1 per cent for most years and within 2 per cent for all years except in 2000 (figure XI.7).

Figure XI.7 Statistical difference as share of production and import of fossil fuels



With Norwegian conditions a statistical difference of 0,5 per cent would, as mentioned above, result in a RA-SA difference within a level of ± 10 per cent. The RA-SA difference in the Norwegian inventory in energy terms has been on or within this level for the last ten years. A continued discrepancy was foreseen even in the upstart of the project in response to the Saturday paper. Norway thus planned to find what could be an acceptable or reasonable level of difference between RA and SA, given Norwegian conditions. The sensitivity analysis has given some input as to where such a threshold could be, but in the course of the project we have evaluated that it is more appropriate to work on improving the energy statistics and emission inventory, rather than to set a fixed threshold.

The results from many years of investigation of the differences between the Reference and Sectoral approaches, and more specifically the statistical difference in the energy balance, has led us to the following assessment:

- The Reference approach serves as a good starting point to identify areas in the energy balance or emission inventory that need further investigation through quality control
- The RA-SA difference is very sensitive to errors in production or export figures, and the Sectoral approach thus needs to be verified independently from the RA-SA differences.

- The fact that there is a remaining RA-SA difference in spite of a long history of improvement projects at Statistics Norway further illustrates the need to focus on quality controls and other verification of the Sectoral approach/emission inventory in Norway.

9.3. Increased confidence in the Sectoral approach

As described in the previous chapters, significant effort has been put into reducing the difference between the Reference and Sectoral approach, both in the current project and in preceding work. The energy balance has undergone major improvements, and both the production system and the data are of better quality than prior to the improvements. Chapter 9.1 summarizes how the work has led to changes in the RA-SA comparison.

The most valuable result of the work is however, from our judgment, not the reduction in the RA-SA difference or in the changes in the emission inventory. Through the systematic review of data sources and calculation methods in response to the Saturday paper described in chapters 5 through 7, both Statistics Norway and the Norwegian Environment Agency has gained increased confidence in the Sectoral approach in several ways:

- Statistics with improved methods
- Statistics with improved QC
- Statistics that have been thoroughly assessed without finding significant problems
- Corrections of errors

This does not mean that we can guarantee that there are no unidentified errors or data gaps in the Sectoral approach/emission inventory, but it has affirmed our assessment that there is no reason to believe that there are major errors in the energy data, and that we have no reason to believe that the Norwegian emission inventory underestimates emissions.

9.4. Increased competence and closer collaboration lead to targeted improvement work

The Saturday paper on the difference between the Reference and the Sectoral approach, including the questions raised about the National Inventory System came at a very appropriate point in time. Due to the reorganization of Statistics Norway, there was a need for a transfer of competence to the new staff, both for the energy and inventory teams in the statistical agency. This was a planned activity regardless of the Saturday Paper, but the questions raised by the review team gave a targeted objective of this work. The project to reduce the difference between the Reference and the Sectoral approach has increased the competence on both issues specific to RA-SA differences and more general competence on

energy and emission issues. The latter includes, among other things, competence in accounting rules for the energy balance and emission inventory.

Through the work to reduce the RA-SA difference, the level of knowledge has been raised considerably in both the energy team and the emission team at Statistics Norway, and the cooperation between the teams are strengthened. The national inventory system has also proved to work well, and the collaboration between Statistics Norway and the Norwegian Environment Agency has been further strengthened in the process. The project has led to more collaboration and closer dialogue with data providers, as described in chapter 8. This further strengthens the quality controls of the energy balance and emission inventory.

10. Plans for future work

During the last decade, Norway has put significant effort into reducing the RA-SA difference in the Norwegian emission inventory. As described in the previous chapters, this has included both work to reduce the statistical difference in the energy balance and to reduce differences due to other issues. From the quality controls and improvements that has resulted from the work, we assess that the sectoral approach is of good quality, and that the Norwegian emission inventory is not underestimated. There still however is a significant difference between the Reference and Sectoral approach for some energy products, largely due to statistical differences in the energy balance. The work to identify and correct the statistical difference will continue as part of the regular and strengthened QA/QC routines for the energy balance and emission inventory.

The RA-SA comparison is currently done after the annual publication of the energy balance. The historical reason for this is that the RA-SA comparison has been part of the emission inventory production and reporting cycle, and not a part of the energy balance production cycle. As a result of this project in response to the Saturday Paper in 2018 and the improved collaboration in the production of the energy balance and the emission inventory, it is planned that the result from the RA-SA calculation will be used in the annual quality control in the production of the energy balance and emission statistics in the future.

The primary focus will be on the most recent years in the time series. If large errors are detected that also applies to years far back in the time series, there will be an evaluation and possibly correction back in time. Norway acknowledges that the RA-SA difference in many years early in the time series is above the level of ± 10 per cent difference. It is worth noting that the RA-SA difference is relatively small for 1990. It is however almost impossible to gather updated and improved data from early in the time series, e.g., prior to 2010. Thus, the RA-SA differences will most likely remain as reported in 2022.

Going forward, Norway wishes to focus on new requirements in the energy balance and to improve the methods within the emission inventory. In addition to the prioritized task to reduce the statistical differences in the coming years, there is a lot happening in the energy field that requires the energy statistics to be further developed. There are new reporting requirements in progress from Eurostat and IEA, and the energy mix in the Norwegian marked is under rapid development. In response to this, Statistics Norway is looking into the possibility of collecting figures for hydrogen, solar energy, electric ferries and battery storage, among other things. Use of electricity for passenger cars in road transport is already separated in the energy balance. In addition, the energy team at Statistics Norway wants to improve the figures for energy consumption on railways, and in 2022, the collection of the sales figures on biofuels will be improved.

There are still some remaining RA-SA differences left that is not due to statistical differences. The emission team at Statistics Norway will continue the work to reduce these differences. As part of this work, it is planned for cooperation with other Nordic countries with high RA-SA differences.

Annex XII: Reference Approach – Methods and detailed results

This annex contains technical information on the Reference approach for quality assurance of the energy combustion sector (1A) in the inventory.

The annex has two parts: First an overview of the methods used in preparing data for the reference approach, and second a more detailed presentation of the results of the analysis and the various causes of the RA/SA difference.

For a history of the work on the reference approach and a discussion of the significance of the results, see annex XII.

1. Methods in the reference approach

This section gives information on how the reference approach data are obtained from the energy balance. Most data are taken directly from the balance. However, modifications were required for some fuel types and balance posts:

Supply data (Table1.A(b)):
The energy supply data is collected from Statistics Norway's "Production and consumption of energy, energy balance and energy account". In some cases, the energy balance data were modified in order to fit into the reference approach framework:

- *NGL*: In the energy balance, NGL is only production that is recorded as an unfractionated mix. Production which is recorded as fractionated products is included with LPG or ethane. In the RA there is no item for LPG/ethane production, and this production is included with NGL. (See NIR section 3.6.2 on differences in NCVs and TJ/ktoe data between the published energy balance, as used here, and data reported to the IEA/Eurostat.)
- *Coal* (other bituminous coal): It was necessary to adjust manually for geographical differences, as the energy supply data does not include production of coal in the

Russian settlement on Svalbard. This data is added to the RA figures for Other Bituminous coal in 1AB.

- It is necessary to manually adjust for some consumption of fossil fuel feedstock accounted for in the Industrial Process and Product Use chapter. This is added to feedstock, reductants and other non-energy use of fuels in 1AD, and applies for Petroleum coke, Gas diesel oil, residual fuel oil, natural gas, LPG, Other bituminous coal and waste.

CRF table 1Ab presents fuel quantities in 1000 tonnes or million cubic meters. The fuel quantities are converted to TJ by appropriate Conversion factors (Table AXII.1). For most fuel types, the same conversion factors can be used throughout the time series, and for all supply side items (left hand column in the table). For other fuel types, the input data are on a lower aggregate level than in the CRF tables. In these cases, the conversion factor is calculated as a weighted average of the factors used in the energy balance. This applies to crude oil, natural gas dry, waste, solid biomass, and liquid biomass. For some fuel types, the conversion factors are different for the energy from production, imports, exports, stock change and bunkers. The Conversion factor given in table 1Ab is then an average weighted by the calculation of the Apparent Consumption.

Table AXII.1 Conversion Factors to Energy Units (Heat Equivalents) 2021.

Fuel Category	Fuel Type	All supply side items	Production	Imports	Exports	Stock Change	Bunkers	Apparent Consumption
Solid Fuels (TJ/kt)	Other Bituminous Coal	28.10						
	Coke Oven Gas			28.50		28.50		28.50
Gas Fuels (TJ/10^6 m^3)	Natural Gas Dry		35.41	35.28	35.28	35.65	35.28	38.03
Liquid Fuels (TJ/kt)	Crude Oil		42.71	42.74	42.72	42.63		42.71
	Natural Gas Liquids	46.10	46.10		46.10	46.10		46.10
	Gasoline	43.90						

	Jet Kerosene	43.10						
	Other Kerosene	43.10						
	Gas Diesel Oil	43.10						
	Residual Fuel Oil	40.60						
	LPG	46.10						
	Ethane	46.10						
	Naphtha	43.90						
	Bitumen	40.20						
	Lubricants	40.20						
	Petroleum Coke	35.00						
	Refinery Feedstocks	43.90						
Waste (TJ/kt)	Waste		16.62					16.62
Biomass	Solid biomass (TJ/kt)		16.79	21.22	18.07			16.95
	Liquid biomass (TJ/kt)		36.80	35.47	36.80			34.60
	Gas biomass (TJ/10^6 m^3)		50.40	50.40				50.40

Once the apparent consumption is estimated, the remaining calculations are similar to the Sectoral Approach. Potential emissions were estimated using fuel-specific C coefficients. Emission factors used in the reference approach are the same as those used in the sectoral approach, multiplied by 12/44 to convert the emission factor for CO_2 to an emission factor for carbon. In those cases where the fuels are shown on a less aggregated level in the input data, the emission factors in the RA are as the NCVs implied emission factors per fuel type (weighted averages).

Feedstock and non-energy use data (Table1.A(d)):
The carbon in products from non-energy uses of fossil fuels that are excluded from the RA was then estimated and subtracted (see NIR section 3.2.2). To obtain actual CO2 emissions,

net emissions were adjusted for any carbon that remained unoxidized as a result of incomplete combustion.

In general, these data are obtained from item 12 in the energy balance: "Consumption for non-energy purposes".

2. Quantification of differences between RA and SA

This section is a detailed comparison of the fuel consumption in reference and sectoral approaches to the energy balance, which is the basis for both data sets. The comparison illustrates how the RA and SA are obtained from the energy balance, and how the different elements of the balance contribute to the differences between RA and SA. The comparison was made for the aggregate fuel groups and for all fossil fuels together. The comparison is summarized in Table AXII-3 in this annex.

The main result is that the difference between the energy consumption in RA and SA is primarily due to statistical differences in the energy balance. Another important, though smaller, contribution is differences between input and output in transformation. In addition, a number of other smaller differences were identified. The remaining difference between RA and SA after adjusting for these items is less than 1.1 per cent of the SA energy consumption for all years, and generally below 0,5 per cent from 2010 onwards.

The analysis is shown in energy terms. The RA/SA CO_2 differences are generally shifted in positive direction relative to the energy difference (NIR section 3.6.1).

2.1 Correspondence of RA and SA with the energy balance

The comparison of the Reference and Sectoral approaches is reported both in energy terms and in CO_2 terms in the CRF table 1AC. This section discusses the correspondence of the RA, the SA and the RA/SA difference to the energy balance. A basic premise is that the Sectoral approach is based on the consumption data in the energy balance (or the basic statistics that underlie the balance).

The reference approach is estimated as the total net supply *minus* energy corresponding to carbon excluded because it does not give CO_2 emissions that is recorded in the sectoral

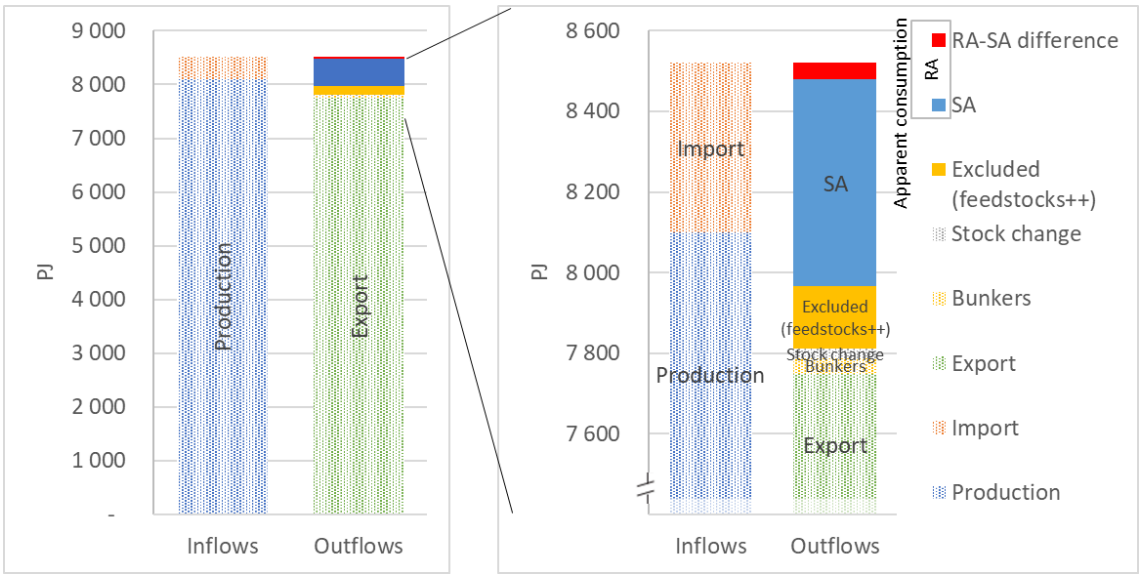
approach (CRF 1A). This means that the net supply may be broadly viewed as partitioned into three elements:

- Consumption for feedstocks and other non-energy use which is included in neither the reference nor the sectoral approaches
- The Reference approach, which includes
    - The Sectoral Approach
    - Items which are included in the net supply, but neither in the sectoral approach nor in the "energy excluded" part, and thus appear as the RA/SA difference. This applies in particular to the statistical difference, but also other energy balance items fall in this category. The part may have a negative sign.

The RA/SA difference also include other inconsistencies, in particular from different methods for delimiting feedstocks/non-energy use and from different (weighting of) conversion factors. See the the description of possible discrepancies in the IPCC guidelines (IPCC 2006), vol 2, ch. 6.8 for more details on possible discrepancies.

Figure X6 illustrates the situation with data for Norway. The figure uses data for 2018 from the 2022 submission. Figures from 2018 are more illustrative than data from later years, due to larger RA-SA difference.

Figure XII-6. Elements of the RA-SA analysis. Supply data in hatched colours, and the RA and SA in solid. Data for 2018



The right-hand side is an enlarged view of the upper part of the left-hand side. The figure is basically a depiction of the supply part of the energy balance. Inflows and outflows are items that contribute with a positive and negative sign, respectively, to the net supply. The net supply corresponds to the solid colours and is partitioned into the SA energy consumption, energy excluded as feedstocks etc., and the RA-SA difference. The latter is not a part of the outflow as such but is a "balancing item" that is calculated as the remaining difference between the two columns.

The "apparent consumption" in the RA calculation will be approximately equal to the net supply in the energy balance. Small discrepancies due to different methods will appear as RA/SA difference, as detailed in sections 2.2-2.3.

The partitioning of the net supply and the correspondence to items in the energy balance is shown in table AXII.2 below. The codes refer to the energy balance as published by Statistics Norway[18].

[18] Link to the energy balance: https://www.ssb.no/en/energi-og-industri/energi/statistikk/produksjon-og-forbruk-av-energi-energibalanse-og-energiregnskap.

Table AXII-2 Energy Balance and its allocation in the Reference and Sectoral Approaches.				
Energy balance item	How the energy balance net supply is partitioned			Corresponding info on other parts of the inventory (cf CRF Table1.A(d), right hand part)
	Inventory: Sectoral approach (1A)	Reference approach: Excluded	RA/SA difference	Inventory: Sectors 1B, 2, etc.
Transformation items (7, 1.2)				
7. Transformation processes				
7.1-7.2 (blast furnaces and petroleum refineries): Transformation to other fossil fuels.			Part of "statistical differences in transformation", appears as RA/SA difference	
7-3-7.6 (power and heating plants):	Sectoral Approach: 1A1a			
1.2. Secondary energy production			Part of "statistical differences in transformation", appears as RA/SA difference	
8. Energy industries own use				
8.3. Petroleum refineries, petrol coke gas (cracker burn-off)		RA: excluded as part of "Fuel quantity for NEU" in Table1AD, reported as "other oil"		In the inventory, petrol coke gas (cracker burn-off) is in 1B2a4
8.3. Petroleum refineries, regular energy consumption	Regular energy consumption at refineries in 1A1b			
Other energy industries	Sectoral Approach: 1A1a-c			
9. Distribution losses For fossil fuels: Only flares in manufacturing and refineries		(Not excluded)	Appears as RA/SA difference	In the inventory, included in 2 Industrial processes, and in 1B2bc-flaring (refineries)
10 Final consumption (11+12)				
11. Non- energy consumption	Generally excluded from the SA.	RA: excluded as part of "Fuel quantity for NEU" in Table1AD,		In the inventory, included in 2 Industrial processes.

	Exeptions: The sectoral approach includes emissions from non-energy use of gasoline, gas diesel oil, and residual oil (1A5a) and lubricants for two-stroke engines (1A5b)	adjusted for the amounts that correspond to the emissions reported in 1A5a and 1A5b.		
12. Final energy consumption	Sectoral Approach: 1A2-1A5.			
Exceptions: Coal and coke used as reducing agents with utilization of heat is accounted here in the energy balance, and not in item 12	Excluded from the SA.	RA: excluded as part of "Fuel quantity for NEU" in Table1AD		In the inventory, included in 2 Industrial processes.
13. Statistical differences (6+7-8-9-10)			Appears as RA/SA difference	

The table shows that the following items from the energy balance will remain as differences between the Reference and Sectoral approaches:

- Statistical differences in a wide sense. This includes
    - Main statistical difference (item 13). Range: -25 to 219 PJ (table AXII.2; excluding biofuels, electricity, and district heating).
    - Statistical differences within the transformation sector. This appears when the production of derived energy bearers (item 1.2) is different from the consumption in the transformation sectors (item 7). It includes transformation losses as well as statistical inconsistencies. Transformation to heat or power by combustion (items 7.3-7.5) is handled in the sectoral approach and is excluded from this comparison. Range: -33 to 10 PJ (table AXII.2).
- Distribution losses. For fossil fuels, this includes flaring in industry and refineries of natural gas and derived gases such as blast furnace gas, refinery gas, and fuel gas from ethylene cracking. Range: 2-5 PJ, not show in table AXII.2.

In addition, the RA/SA difference will comprise inconsistencies that are known and quantifiable (see section 2.3 below), as well as remaining differences that may be due to minor differences in definitions and scope and to errors in the energy or emission inventories.

2.2 Analysis of the RA-SA difference

The analysis is summarized in Table AXII-3 below. The analysis in the CRF tables is shown in the left-hand part. The RA/SA difference is split into components in the right-hand part, showing the remaining difference when statistical and transformation differences and other quantified discrepancies are separated. The "other discrepancies" are detailed in the following tables.

Table AXII-3 Overview over the Reference and Sectoral approaches for energy. All fossil fuels. PJ

	Consumption data from CRF: Table 1AC			Statistical difference and other discrepancies					
Year	RA: Apparent consumption (excluding non-energy use and feedstocks)	SA: Consumption	Difference RA-SA	Statistical difference (13)	Difference within transfor-mation (7.1 +f7.2+ 7.6 – 1.2)	Bunkers, natural gas, not included In RA	Renewable fraction of waste	Remaining difference RA-SA	Remaining difference RA-SA in per cent of SA
1990	342.9	357.9	-15.0	-19.5	2.6	0.0	1.2	3.1	0.9 %
1995	413.3	407.4	5.9	8.4	-3.7	0.0	2.0	3.1	0.8 %
2000	650.0	431.1	218.9	225.2	-8.7	0.0	2.4	4.7	1.1 %
2005	621.9	478.5	143.4	144.7	-0.4	0.0	3.4	2.6	0.5 %
2010	624.1	537.1	87.0	83.6	5.7	0.0	5.8	3.5	0.7 %

2011	492.9	517.6	-24.7	-31.1	9.6	0.0	6.3	3.1	0.6 %
2012	534.1	512.3	21.7	15.8	10.3	0.0	7.2	2.8	0.5 %
2013	576.4	522.1	54.3	57.4	2.4	0.0	7.4	1.9	0.4 %
2014	573.2	529.8	43.4	57.2	-8.0	0.0	7.5	1.8	0.3 %
2015	575.7	531.5	44.3	59.7	-11.0	1.6	8.0	2.0	0.4 %
2016	499.7	522.7	-22.9	-15.2	0.4	2.2	8.0	-2.3	-0.4 %
2017	565.7	516.6	49.1	51.8	1.7	2.0	7.9	1.5	0.3 %
2018	555.5	512.1	43.5	44.1	3.8	2.2	8.5	1.8	0.4 %
2019	492.5	498.7	-6.2	-8.3	6.5	2.4	8.4	1.6	0.3 %
2020	483.7	476.4	7.3	10.4	0.4	2.6	8.2	2.1	0.4 %
2021	490.8	469.3	21.5	26.8	-0.8	2.6	8.5	1.4	0.3 %

The main contribution to the RA-SA difference is by far the statistical differences in the energy balance. The remaining discrepancies are mainly due to differences between outflows and inflows in the transformation sector (losses in conversion, etc.). See figure XII.2.

Figure XII-2 RA-SA difference in PJ compared to statistical difference in the Norwegian energy balance.

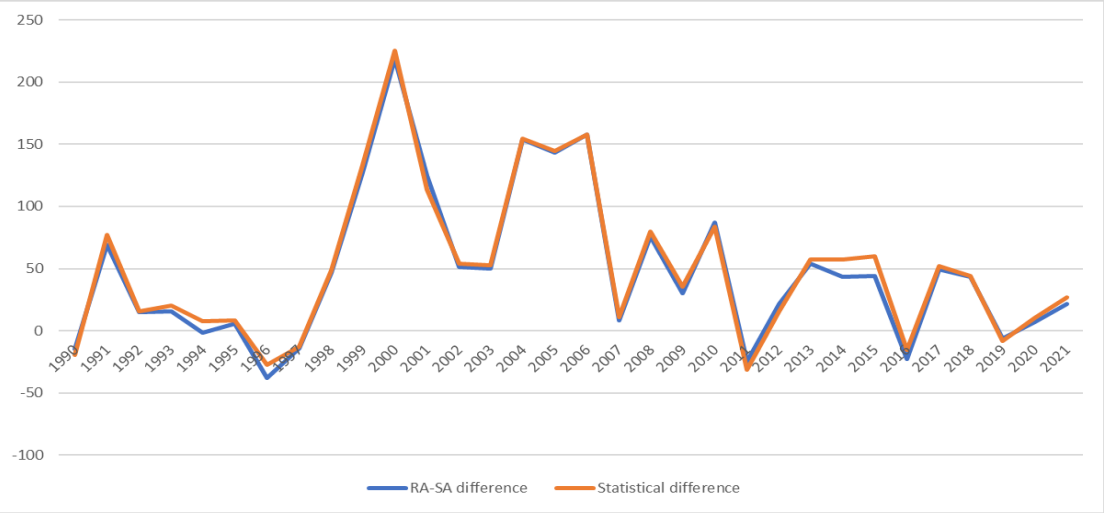


Table AXII-4 Overview over the Reference and Sectoral approaches for energy. Natural gas. PJ.		
	Consumption data from CRF: Table 1AC	Statistical difference and other discrepancies

Year	RA: Apparent consumption[1]	SA: Consumption	Difference RA-SA	Statistical difference	Bunkers, natural gas, not included In RA	Remaining difference RA-SA	Remaining difference RA-SA in per cent of SA
1990	68.2	89.9	-21.7	-21.7	0.0	0.0	0.0 %
1995	125.3	118.8	6.6	6.6	0.0	0.0	0.0 %
2000	166.0	141.3	24.6	23.1	0.0	1.5	1.1 %
2005	158.8	179.8	-21.0	-21.5	0.0	0.5	0.3 %
2010	243.7	219.3	24.4	23.7	0.0	0.7	0.3 %
2011	188.7	207.2	-18.4	-19	0.0	0.6	0.3 %
2012	210.6	203.9	6.7	5.9	0.0	0.8	0.4 %
2013	211.2	204.2	7.0	6.5	0.0	0.5	0.3 %
2014	214.0	214.7	-0.7	-1.1	0.0	0.4	0.2 %
2015	232.1	221.0	11.1	9.3	1.6	0.2	0.1 %
2016	218.8	218.2	0.6	-2	2.2	0.4	0.2 %
2017	186.3	223.3	-37.0	-39.3	2.0	0.3	0.1 %
2018	210.4	210.4	0.0	-2.6	2.2	0.4	0.2 %
2019	185.6	211.6	-26.0	-29.1	2.4	0.7	0.3 %
2020	169.2	201.1	-31.9	-35.3	2.6	0.8	0.4 %
2021	191.9	186.2	5.7	2.7	2.6	0.4	0.2 %

1) Excluding non-energy use and feedstocks

Table AXII-5 Overview over the Reference and Sectoral approaches for energy. Solid fuels. PJ.

	Consumption data from CRF: Table 1AC			Statistical difference and other discrepancies			
Year	RA: Apparent consumption[1]	SA: Consumption	Difference RA-SA	Statistical difference	Difference within transfor-mation	Remaining difference RA-SA	Remaining difference RA-SA in per cent of SA
1990	7.9	7.5	0.4	0.1	0.1	0.2	2.5 %
1995	9.9	9.6	0.4	-0.2	0.2	0.4	3.8 %
2000	7.4	7.1	0.3	-0.4	0.1	0.6	7.9 %
2005	5.8	5.3	0.5	-0.1	0.1	0.5	8.6 %

2010	8.7	5.7	3.0	1.8	0.7	0.5	9.1 %
2011	11.3	5.5	5.8	4.3	1.0	0.6	10.3 %
2012	8.9	5.4	3.5	2.3	0.9	0.2	4.2 %
2013	6.4	5.0	1.4	0.4	0.9	0.0	0.8 %
2014	9.1	5.0	4.1	2.9	1.0	0.2	4.5 %
2015	8.3	4.7	3.6	2.5	0.9	0.1	2.4 %
2016	4.5	4.7	-0.2	-1.1	0.8	0.1	1.8 %
2017	7.7	5.3	2.4	1.2	1.0	0.2	3.9 %
2018	7.2	5.0	2.2	1	1.0	0.2	3.4 %
2019	6.5	4.7	1.9	0.9	0.9	0.1	1.6 %
2020	6.7	3.8	3.0	2.2	0.8	0.0	-0.2 %
2021	4.8	3.9	0.9	-0.1	0.9	0.1	3.5 %

1) Excluding non-energy use and feedstocks

Table AXII-6 Overview over the Reference and Sectoral approaches for energy. Waste. PJ.

	Consumption data from CRF: Table 1AC			Statistical difference and other discrepancies			
Year	RA: Apparent consumption[1]	SA: Consumption	Difference RA-SA	Statistical difference	Renewable fraction of waste	Remaining difference RA-SA	Remaining difference RA-SA in per cent of SA
1990	3.1	3.9	-0.8	0.4	1.2	0.0	-0.6 %
1995	4.3	5.9	-1.6	0.4	2.0	0.0	-0.6 %
2000	5.2	7.2	-2.0	0.3	2.4	0.0	0.5 %
2005	6.7	9.9	-3.1	0.3	3.4	0.0	-0.3 %
2010	6.6	12.9	-6.3	0	5.8	-0.5	-3.8 %
2011	7.6	13.9	-6.3	0	6.3	0.0	0.1 %
2012	8.6	15.9	-7.3	0	7.2	-0.1	-0.7 %
2013	10.1	17.5	-7.4	0	7.4	0.0	0.0 %
2014	10.5	18.0	-7.5	0	7.5	0.0	-0.1 %
2015	10.9	18.9	-8.0	0	8.0	0.0	0.0 %
2016	10.6	18.6	-7.9	0	8.0	0.0	0.1 %

2017	10.6	18.6	-8.0	0	7.9	0.0	-0.2 %
2018	11.3	19.8	-8.6	0	8.5	-0.1	-0.3 %
2019	11.4	19.8	-8.5	0	8.4	0.0	-0.2 %
2020	11.4	19.6	-8.2	0	8.2	0.0	0.1 %
2021	11.3	19.9	-8.6	0	8.5	-0.1	-0.6 %

1) Excluding non-energy use and feedstocks

Table AXII-7 Overview over the Reference and Sectoral approaches for energy. Liquid fuels. PJ.

	Consumption data from CRF: Table 1AC			Statistical difference and other discrepancies			
Year	RA: Apparent consumption[1]	SA: Consumption	Difference RA-SA	Statistical difference	Difference within transfor-mation	Remaining difference RA-SA	Remaining difference RA-SA in per cent of SA
1990	263.6	256.6	7.1	1.7	2.5	2.9	1.1 %
1995	273.7	273.1	0.5	1.6	-3.9	2.8	1.0 %
2000	471.4	275.5	196.0	202.2	-8.8	2.6	0.9 %
2005	450.6	283.6	167.1	166.1	-0.5	1.5	0.5 %
2010	365.2	299.2	66.0	58.1	5.1	2.8	0.9 %
2011	285.2	291.1	-5.9	-16.4	8.6	2.0	0.7 %
2012	306.0	287.1	18.9	7.6	9.4	1.9	0.6 %
2013	348.7	295.4	53.3	50.5	1.5	1.3	0.4 %
2014	339.6	292.1	47.5	55.4	-9.1	1.1	0.4 %
2015	324.5	286.8	37.6	47.9	-11.9	1.6	0.6 %
2016	265.8	281.2	-15.4	-12.1	-0.5	-2.9	-1.0 %
2017	361.0	269.4	91.7	89.9	0.7	1.1	0.4 %
2018	326.6	276.8	49.8	45.7	2.7	1.3	0.5 %
2019	289.0	262.6	26.4	19.9	5.6	0.9	0.3 %
2020	296.4	251.9	44.4	43.5	-0.4	1.3	0.5 %
2021	282.7	259.3	23.4	24.3	-1.7	0.9	0.3 %

1) Excluding non-energy use and feedstocks

2.3 Other discrepancies

This section summarizes the RA/SA discrepancies beyond statistical and transformation differences, as quantified in the main fuel tables above, as well as other possible causes. Statistical and transformation differences and the work to reduce these are discussed in annex XII.

The quantified differences all relate to the supply part of the reference approach (Table 1A.(b)).

- Natural gas: The CRF reporting tables do not allow entering bunkers for international transport. Use of LNG for shipping is increasing in Norway, also for international sailing. Thus, the RA consumption is slightly higher than in the energy balance, giving a positive contribution to the RA/SA difference.
- Waste: The handling of waste energy data is currently different in the RA and the SA. The RA follows the energy balance and gives only the non-renewable waste. In the SA, on the other hand, the fuel consumption data include renewable waste as well. Thus, the SA values for waste are higher, giving a negative contribution to the RA/SA difference.

The remaining differences when adjusting for these cases are in the order of 2-4 PJ, or below 1.1 per cent of the sectoral approach.

There are many possible causes for the remaining differences. The reference approach is a rough approximation and is not expected to match the sectoral approach precisely. A number of sources for discrepancies are discussed in the IPCC guidelines (IPCC 2006), vol 2, ch. 6.8. Some case that merits mention here are:

- The NCV value for crude oil has a strong impact on the final difference, as the contribution from crude oil to the RA CO_2 emissions are actually larger than the total RA emissions. (Net export of secondary fuels balances the crude oil.) A reduction in the NCV value of 0.2 per cent, from 42,7 to 42,6 TJ/kt, would give a reduction in the RA/SA difference in the order of 1 PJ.
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The Norwegian Environment Agency is a government agency under the Ministry of Climate and Environment.

We work for a clean and diverse environment. Our primary tasks are to reduce greenhouse gas emissions, manage Norwegian nature and prevent pollution.

M-2508 | 2023