

Yliasteollisuus  
Yliasteollisuus



ENERGY IN FINLAND 2004

# Finland in Brief

## Area

Situated in northern Europe with an area of 338,145 km<sup>2</sup> of which 68% forest, 10% water, 8% cultivated land.

## Population

5.2 million, with average density of 17 persons per square kilometre. More than two-thirds of the population reside in the southern third of the country.

## Average Temperatures

Town	Latitude	January	July
Helsinki	60°	-4.2°C	+17.2°C
Rovaniemi	66°	-11.7°C	+14.9°C

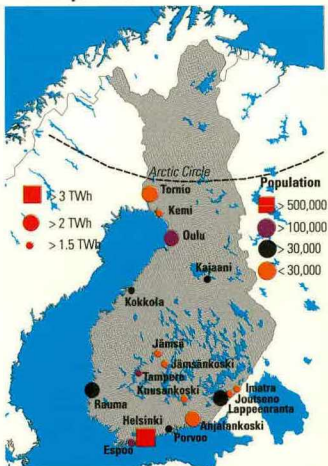
## Economy in 2004

GDP totalled € 150 bil., i.e. € 28,643/capita, of which services 66.7%, secondary production 30.2% and primary production 3.1%.

## Structure of Industry in 2004, Value Added Gross in Production

	bil. €	%
<b>Total industry</b>	<b>32.2</b>	<b>100</b>
Mining and quarrying	0.4	1
Wood and paper industry	4.9	15
Chemical industry	3.5	11
Metal industry	14.3	44
Machinery and equipment	4.1	13
Electrical equipment	6.7	21
Other metal industry	3.5	11
Other manufacturing ind.	6.0	19
Electricity, gas and water ind.	3.1	10

## Municipalities with High Electricity Consumption 2004



## Natural Resources

Productive forestland is the most valuable natural resource of Finland. The indigenous energy resources in the country are hydro power, wood and peat. Finland also has some rich deposits of metallic ores from which copper, zinc, iron, and nickel are extracted.

## Total Energy Consumption in 2004

1,487 PJ (35.5 Mtoe)  
284.4 GJ/capita (6.8 toe/capita)

## Electricity Consumption in 2004

87.0 TWh  
16,645 kWh/capita

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## Inquiries:

Kirsi-Marja Aalto

+358 9 1734 3442

[energia.tilastokeskus@stat.fi](mailto:energia.tilastokeskus@stat.fi)

<http://www.stat.fi/energia>

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= Energy

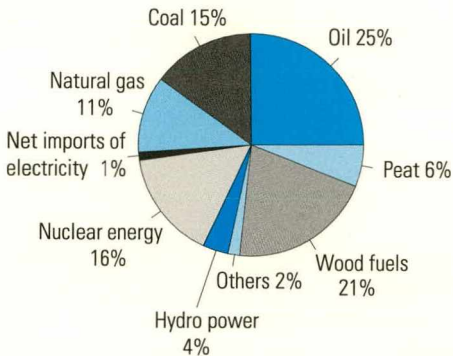
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Painojussit Oy, Helsinki 2005

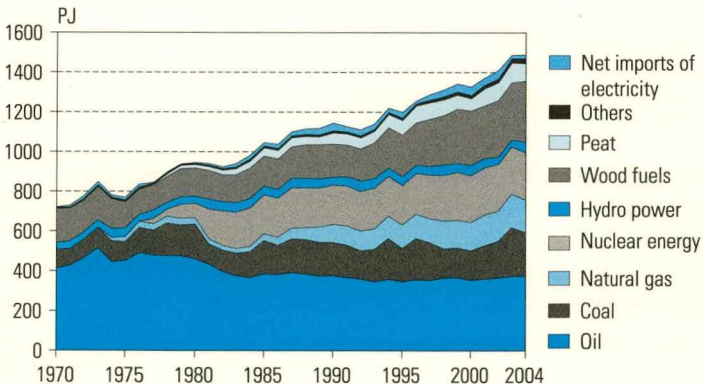
# Total Energy Consumption

## Total Energy Consumption by Energy Source 2004



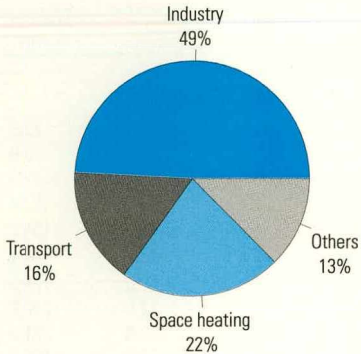
Total energy consumption in 2004 was 1 487 PJ.

## Total Energy Consumption by Energy Source 1970–2004



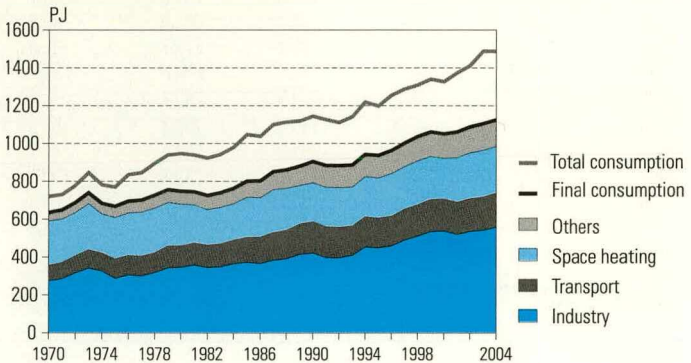
# Total Energy Consumption

## Final Energy Consumption by Sector 2004



Final energy consumption in 2004 was 1 125 PJ.

## Total Energy Consumption and Final Energy Consumption by Sector 1970–2004





# Total Energy Consumption

## Total Energy Consumption by Energy Source, PJ

	Oil	Coal	Natural gas	Nuclear energy	Hydro power
1970	412.9	94.8	—	—	33.9
1975	451.0	94.8	26.5	—	43.5
1980	460.3	176.2	32.2	72.3	36.4
1981	433.9	100.0	25.6	150.9	48.7
1982	396.6	108.5	24.2	172.6	46.6
1983	377.2	112.7	23.5	182.4	48.4
1984	365.9	130.1	26.9	194.2	47.2
1985	385.3	167.8	34.1	196.1	44.0
1986	382.1	147.7	41.3	196.3	44.2
1987	391.6	168.5	54.6	202.2	49.2
1988	385.9	172.7	58.8	201.2	47.6
1989	375.0	170.1	77.0	196.5	46.4
1990	377.8	166.8	90.8	197.8	38.7
1991	367.4	164.0	95.7	200.8	47.0
1992	361.1	141.6	99.3	198.2	53.9
1993	345.8	163.8	102.6	205.1	48.0
1994	359.2	204.7	113.3	199.9	42.0
1995	347.1	166.6	117.6	197.8	46.1
1996	356.3	207.6	123.1	203.8	42.2
1997	353.2	190.8	121.1	218.7	42.5
1998	364.6	148.1	138.7	228.8	53.3
1999	366.7	149.6	138.9	240.7	45.3
2000	353.6	149.0	141.9	235.4	52.3
2001	360.1	168.1	153.9	238.4	47.1
2002	365.5	184.7	152.9	233.4	38.5
2003	373.9	244.6	169.2	238.1	34.4
2004	374.7	220.4	163.0	238.0	53.9
<b>Share</b>					
2004	25%	15%	11%	16%	4%
<b>Annual change</b>					
04/03	0%	-10%	-4%	0%	57%

Wind power is included in hydro power. Total amount of wind power in 2004 was 0.433 PJ.

## Total Energy Consumption

Wood fuels	Peat	Others	Net imports of electricity	Total	
170.1	0.9	6.0	1.9	<b>720.5</b>	1970
130.7	1.7	7.2	14.4	<b>769.8</b>	1975
142.1	17.1	6.3	4.4	<b>947.2</b>	1980
145.1	18.8	8.0	8.1	<b>939.1</b>	1981
133.7	23.3	8.8	8.3	<b>922.7</b>	1982
141.3	30.4	9.1	17.2	<b>942.2</b>	1983
153.2	34.7	9.5	18.8	<b>980.4</b>	1984
151.3	41.1	10.3	17.0	<b>1 047.0</b>	1985
152.5	43.3	10.1	20.9	<b>1 038.5</b>	1986
158.4	45.4	10.2	20.1	<b>1 100.3</b>	1987
167.7	41.5	10.6	26.6	<b>1 112.5</b>	1988
172.0	39.5	10.5	31.9	<b>1 119.0</b>	1989
167.2	55.9	10.8	38.7	<b>1 144.3</b>	1990
158.6	56.4	10.1	25.9	<b>1 125.8</b>	1991
161.2	55.3	10.7	29.6	<b>1 110.9</b>	1992
180.5	58.4	9.9	27.1	<b>1 141.3</b>	1993
201.8	66.7	10.0	21.9	<b>1 219.4</b>	1994
207.5	74.3	10.7	30.3	<b>1 198.0</b>	1995
212.8	84.8	10.9	13.2	<b>1 254.6</b>	1996
237.2	83.3	13.2	27.6	<b>1 287.6</b>	1997
247.6	79.6	15.2	33.5	<b>1 309.4</b>	1998
273.2	70.5	15.6	40.0	<b>1 340.5</b>	1999
273.8	61.9	16.1	42.8	<b>1 326.7</b>	2000
265.4	85.9	18.2	35.9	<b>1 373.1</b>	2001
283.9	89.7	19.3	42.9	<b>1 410.8</b>	2002
289.4	99.2	21.7	17.5	<b>1 487.9</b>	2003
306.0	88.8	24.6	17.5	<b>1 486.9</b>	2004
					<b>Share</b>
21%	6%	2%	1%	<b>100%</b>	2004
					<b>Annual change</b>
6%	-10%	14%	0%	0%	04/03

# Renewable Energy Sources

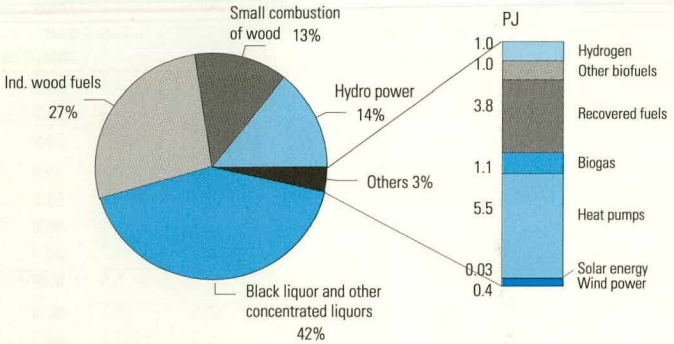
## Renewable Energy, PJ

	Hydro power	Industrial wood fuels	Black liquor and others	Small combustion of wood	Others	<b>Total</b>	Share of total energy consumption
1970	33.9	20.2	57.7	92.2	..	<b>204.0</b>	28%
1975	43.5	14.8	48.3	67.6	..	<b>174.3</b>	23%
1980	36.4	31.1	67.4	43.6	0.7	<b>179.2</b>	19%
1981	48.7	33.1	68.2	43.7	1.1	<b>194.8</b>	21%
1982	46.6	29.4	60.5	43.8	1.4	<b>181.8</b>	20%
1983	48.4	30.7	66.6	44.0	1.7	<b>191.5</b>	20%
1984	47.2	34.4	74.7	44.0	2.0	<b>202.4</b>	21%
1985	44.0	31.6	75.5	44.1	2.6	<b>197.8</b>	19%
1986	44.2	31.1	77.2	44.2	2.3	<b>199.0</b>	19%
1987	49.2	32.4	81.6	44.4	2.6	<b>210.1</b>	19%
1988	47.6	35.0	88.1	44.5	2.3	<b>217.6</b>	20%
1989	46.4	36.3	91.1	44.6	2.0	<b>220.5</b>	20%
1990	38.7	36.5	86.1	44.7	2.4	<b>208.3</b>	18%
1991	47.0	32.9	80.9	44.8	2.6	<b>208.3</b>	19%
1992	53.8	32.8	83.5	44.9	2.7	<b>217.7</b>	20%
1993	48.0	40.4	95.1	45.0	2.8	<b>231.3</b>	20%
1994	42.0	52.4	104.4	45.0	2.8	<b>246.6</b>	20%
1995	46.0	53.9	109.0	44.7	3.5	<b>257.0</b>	21%
1996	42.1	56.2	109.6	46.9	3.7	<b>258.6</b>	21%
1997	42.5	61.6	128.5	47.0	4.0	<b>283.6</b>	22%
1998	53.2	64.7	135.4	47.6	5.7	<b>306.6</b>	23%
1999	45.2	84.0	142.6	46.6	6.2	<b>324.5</b>	24%
2000	52.0	84.9	143.5	45.3	6.9	<b>332.7</b>	25%
2001	46.9	83.9	133.7	47.8	8.2	<b>320.5</b>	23%
2002	38.2	89.6	145.6	48.7	8.7	<b>330.8</b>	23%
2003	34.0	93.7	147.0	48.7	10.5	<b>333.9</b>	22%
2004	53.5	100.5	157.1	48.5	12.9	<b>372.4</b>	25%



# Renewable Energy Sources

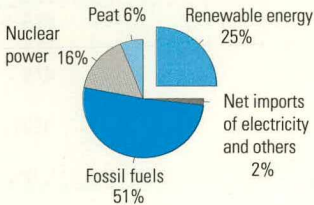
## Renewable energy 2004



The total consumption of renewable energy in 2004 was 372 PJ which is 25% of total energy consumption.

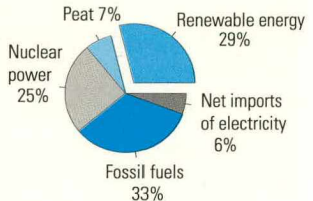
## Renewable energy 2004

### In Total Energy Consumption



Total 1 487 PJ

### In Electricity Supply



Total 87 TWh

# Electricity

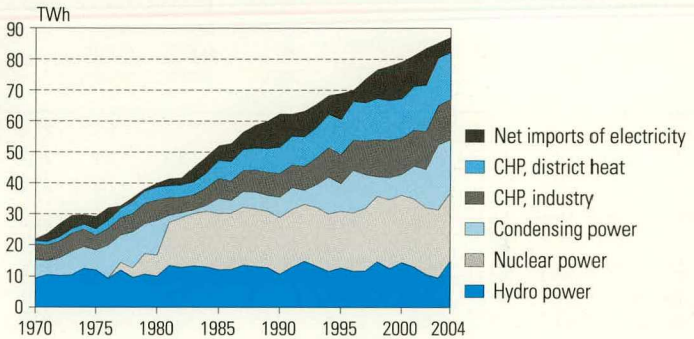
## Supply and Total Consumption of Electricity, TWh

	Hydro power	Wind power	Nuclear power	Condensing power <sup>1)</sup>	CHP industry	CHP district heat	Net imports	Total consumption
1970	9.4	–	–	5.9	4.9	1.0	0.5	<b>21.8</b>
1975	12.1	–	–	6.3	4.8	2.1	4.0	<b>29.2</b>
1980	10.1	–	6.6	11.1	6.6	4.2	1.2	<b>39.9</b>
1985	12.2	–	18.0	4.9	6.4	5.9	4.7	<b>52.0</b>
1986	12.3	0.00	18.0	4.1	6.3	6.2	5.8	<b>52.7</b>
1987	13.7	0.00	18.5	5.1	6.8	6.8	5.6	<b>56.4</b>
1988	13.2	0.00	18.4	5.4	7.1	7.1	7.4	<b>58.7</b>
1989	12.9	0.00	18.0	5.1	7.5	7.7	8.9	<b>60.0</b>
1990	10.8	0.00	18.1	6.6	7.7	8.5	10.7	<b>62.3</b>
1991	13.1	0.00	18.4	7.0	7.3	9.3	7.2	<b>62.3</b>
1992	15.0	0.00	18.2	4.6	7.7	9.5	8.2	<b>63.2</b>
1993	13.3	0.00	18.8	7.4	8.7	9.8	7.5	<b>65.5</b>
1994	11.7	0.01	18.3	12.0	9.5	10.7	6.1	<b>68.3</b>
1995	12.8	0.01	18.1	8.9	9.5	11.3	8.4	<b>68.9</b>
1996	11.7	0.01	18.7	13.8	9.7	12.5	3.7	<b>70.0</b>
1997	11.8	0.02	20.1	10.9	10.9	12.3	7.7	<b>73.6</b>
1998	14.8	0.02	21.0	6.3	12.0	13.2	9.3	<b>76.6</b>
1999	12.5	0.05	22.1	7.2	12.0	12.8	11.1	<b>77.8</b>
2000	14.5	0.08	21.6	6.7	11.7	12.7	11.9	<b>79.2</b>
2001	13.0	0.07	21.9	10.6	11.6	14.1	10.0	<b>81.2</b>
2002	10.6	0.06	21.4	12.4	12.3	14.9	11.9	<b>83.5</b>
2003	9.5	0.09	21.8	21.0	12.7	15.3	4.9	<b>85.2</b>
2004	14.9	0.12	21.8	17.2	13.0	15.1	4.9	<b>87.0</b>
<b>Share</b>								
2004	17%	0%	25%	20%	15%	17%	6%	<b>100%</b>
<b>Annual change</b>								
04/03	57%	31%	0%	-18%	2%	-1%	0%	<b>2%</b>

<sup>1)</sup> Condensing power includes conventional condensing power, peak gas turbine power and gas engines.

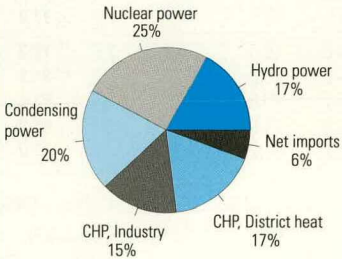
Source: Adato Energia Oy.

## Electricity Supply 1970–2004

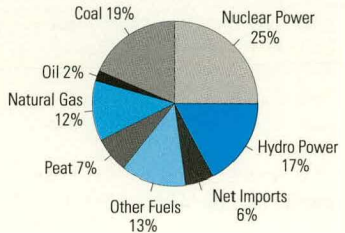


## Electricity Supply 2004

### By Mode of Production



### By Source



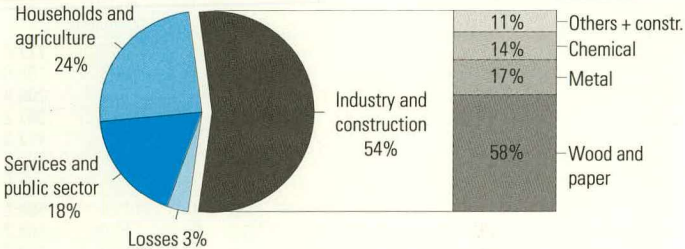
Total electricity supply in 2004 was 87.0 TWh.

## Electricity Consumption by Sector, TWh

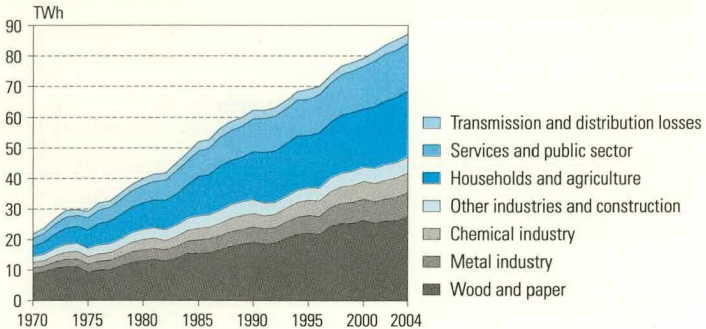
	Industry and construction					Households and agriculture	Services and public sector	Transm. and distrib. losses	Total
	Total	Wood and paper	Metal	Chemical	Others + construction				
1970	14.5	9.0	1.8	1.8	1.9	3.3	2.5	1.5	<b>21.8</b>
1975	17.1	9.2	2.7	2.4	2.7	6.0	3.9	2.2	<b>29.2</b>
1980	23.3	13.0	3.6	3.4	3.3	8.6	5.7	2.3	<b>39.9</b>
1985	27.8	15.4	4.4	3.8	4.1	12.8	8.4	3.1	<b>52.0</b>
1986	28.1	15.7	4.5	3.8	4.0	13.2	8.6	2.8	<b>52.7</b>
1987	29.6	16.6	4.6	4.1	4.3	14.5	9.4	3.0	<b>56.4</b>
1988	31.5	17.8	4.8	4.5	4.4	14.4	9.8	3.0	<b>58.7</b>
1989	32.4	18.5	4.9	4.6	4.5	14.5	10.2	2.9	<b>60.0</b>
1990	33.1	19.1	5.0	4.5	4.5	15.6	10.8	2.8	<b>62.3</b>
1991	32.0	18.6	5.0	4.2	4.1	16.5	11.2	2.6	<b>62.3</b>
1992	32.3	18.9	5.1	4.4	4.0	16.7	11.4	2.8	<b>63.2</b>
1993	34.2	20.5	5.3	4.6	3.8	17.2	11.5	2.7	<b>65.5</b>
1994	36.2	21.8	5.5	4.9	3.9	17.8	11.7	2.6	<b>68.3</b>
1995	37.0	22.2	5.7	5.0	4.1	17.1	11.9	3.0	<b>68.9</b>
1996	36.9	21.7	6.0	5.1	4.2	18.0	12.4	2.7	<b>70.0</b>
1997	40.2	24.4	6.2	5.2	4.4	18.2	12.6	2.5	<b>73.6</b>
1998	41.8	25.3	6.7	5.4	4.4	19.0	13.1	2.8	<b>76.6</b>
1999	42.3	25.4	6.8	5.6	4.5	19.3	13.4	2.8	<b>77.8</b>
2000	43.8	26.3	7.0	5.9	4.6	19.0	13.8	2.6	<b>79.2</b>
2001	43.3	25.4	7.0	5.9	4.9	20.2	14.7	2.9	<b>81.2</b>
2002	44.6	26.1	7.2	6.2	5.1	20.8	15.2	2.9	<b>83.5</b>
2003	45.2	26.3	7.7	6.4	4.9	21.3	15.3	3.4	<b>85.2</b>
2004	47.1	27.4	8.0	6.5	5.1	21.2	15.8	3.0	<b>87.0</b>
<b>Share</b>									
2004	54%	31%	9%	8%	6%	24%	18%	3%	<b>100%</b>
<b>Annual Change</b>									
04/03	4%	4%	4%	3%	4%	0%	3%	-14%	<b>2%</b>

Sources: Adato Energia Oy; Fortum Power and Heat Oy, (formerly Neste Group) Statistics Finland/Environment and energy

## Electricity Consumption by Sector 2004



## Electricity Consumption by Sector 1970–2004



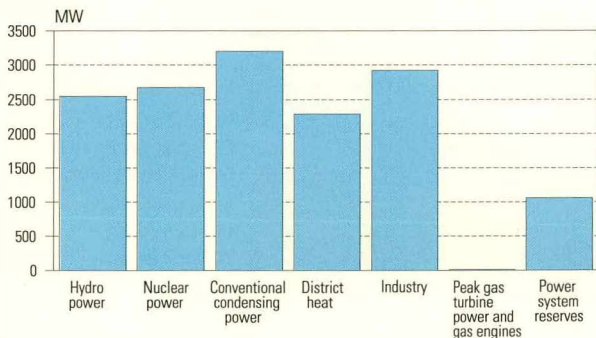


## Energy Sources in Electricity Generation, PJ

	Hydro power	Nuclear energy	Hard coal	Oil	Natural gas	Peat	Other fuels	Net imports of electr.	Total
1970	33.9	—	41.8	32.1	—	..	17.9	1.9	<b>127.6</b>
1975	43.5	—	40.2	38.2	8.9	..	14.6	14.4	<b>159.8</b>
1980	36.4	72.3	102.7	26.8	12.6	..	29.2	4.4	<b>284.4</b>
1985	44.0	196.1	60.9	7.7	9.7	8.9	22.7	17.0	<b>367.2</b>
1990	38.7	197.8	61.3	9.7	24.8	17.2	29.1	38.7	<b>417.3</b>
1995	46.1	197.8	65.0	7.5	37.1	36.3	36.6	30.3	<b>456.6</b>
1996	42.2	203.8	106.1	8.7	40.4	40.8	38.1	13.2	<b>493.2</b>
1997	42.5	218.7	90.3	6.8	33.2	36.6	44.6	27.6	<b>500.2</b>
1999	45.3	240.7	57.0	8.1	38.3	28.4	50.7	40.0	<b>508.7</b>
2000	52.3	235.4	60.2	7.5	41.3	21.7	53.7	42.8	<b>514.9</b>
2001	47.1	238.4	77.4	6.6	48.2	41.1	56.6	35.9	<b>551.4</b>
2002	38.5	233.4	93.6	7.0	48.1	41.6	62.1	42.9	<b>567.2</b>
2003	34.4	238.1	152.2	8.7	62.4	47.7	67.3	17.5	<b>628.4</b>
2004	53.9	238.0	136.3	10.8	51.2	46.3	62.4	17.5	<b>616.3</b>

Source: Adato Energia Oy

## Electricity generation capacities in peak load period Simultaneously available capacity of power plants at beginning of year 2006



Total capacity of power plants 13 650 MW

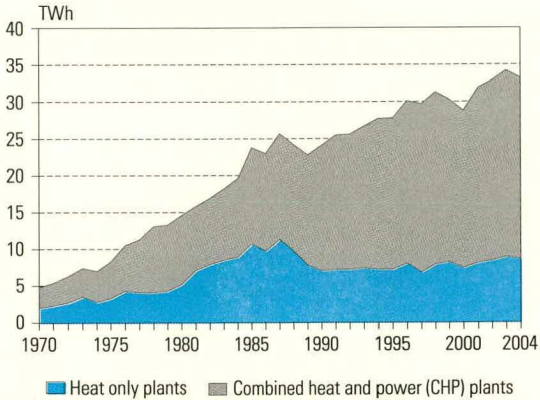
# Heating

## Production and Consumption of District Heat, TWh

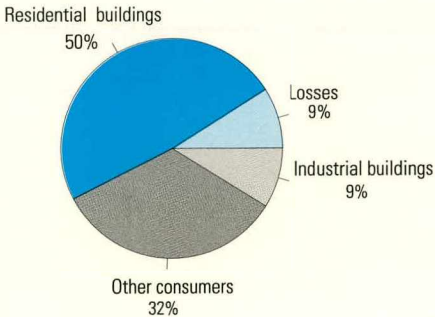
	Net production of district heat			Network and measuring losses	Consumption of district heat			
	Heat only plants	CHP plants	Total		Residential buildings	Industrial buildings	Other consumers	Total
1970	2.0	2.8	<b>4.8</b>	0.3	..	0.6	..	<b>4.5</b>
1975	3.3	5.0	<b>8.2</b>	0.6	4.7	0.9	2.0	<b>7.7</b>
1980	5.2	9.4	<b>14.6</b>	1.3	7.8	1.4	4.1	<b>13.3</b>
1981	7.1	8.7	<b>15.7</b>	1.5	8.5	1.4	4.4	<b>14.3</b>
1982	7.9	9.0	<b>16.9</b>	1.8	9.2	1.4	4.5	<b>15.1</b>
1983	8.5	9.7	<b>18.2</b>	2.0	9.6	1.5	5.1	<b>16.2</b>
1984	8.9	10.7	<b>19.6</b>	2.1	10.3	1.6	5.5	<b>17.5</b>
1985	10.7	13.1	<b>23.8</b>	2.2	12.6	2.1	7.0	<b>21.7</b>
1986	9.7	13.3	<b>23.0</b>	2.0	12.1	1.9	6.9	<b>21.0</b>
1987	11.3	14.4	<b>25.7</b>	2.1	13.5	2.2	7.8	<b>23.6</b>
1988	9.7	14.5	<b>24.2</b>	2.0	12.8	2.1	7.4	<b>22.2</b>
1989	7.8	15.0	<b>22.8</b>	2.0	11.9	1.9	7.0	<b>20.9</b>
1990	7.0	17.1	<b>24.1</b>	1.9	12.5	2.0	7.7	<b>22.3</b>
1991	7.2	18.3	<b>25.5</b>	2.0	13.0	2.1	8.4	<b>23.5</b>
1992	7.2	18.4	<b>25.6</b>	2.0	13.1	2.1	8.4	<b>23.6</b>
1993	7.4	19.3	<b>26.7</b>	2.0	13.9	2.3	8.5	<b>24.6</b>
1994	7.2	20.5	<b>27.6</b>	2.3	14.0	2.4	8.9	<b>25.3</b>
1995	7.2	20.6	<b>27.8</b>	2.4	14.3	2.7	8.4	<b>25.4</b>
1996	8.0	22.1	<b>30.0</b>	2.5	15.3	2.9	9.4	<b>27.6</b>
1997	6.8	22.9	<b>29.7</b>	2.6	15.1	2.9	9.1	<b>27.1</b>
1998	7.9	23.4	<b>31.3</b>	2.7	15.6	3.0	9.9	<b>28.5</b>
1999	8.2	22.1	<b>30.4</b>	2.6	15.4	3.0	9.5	<b>27.8</b>
2000	7.4	21.4	<b>28.8</b>	2.5	14.9	2.6	8.8	<b>26.3</b>
2001	8.1	23.8	<b>31.9</b>	2.7	16.2	2.9	10.1	<b>29.1</b>
2002	8.4	24.5	<b>32.9</b>	2.9	16.6	3.0	10.4	<b>30.0</b>
2003	8.9	25.3	<b>34.1</b>	3.0	17.4	3.0	10.9	<b>31.2</b>
2004	8.6	24.6	<b>33.2</b>	3.0	16.1	2.9	11.2	<b>30.3</b>

Sources: Finnish Energy Industries/District heating (formerly Finnish DH Ass.) and since 1995 also Association of Finnish Local and Regional Authorities.

## Production of District Heat 1970–2004



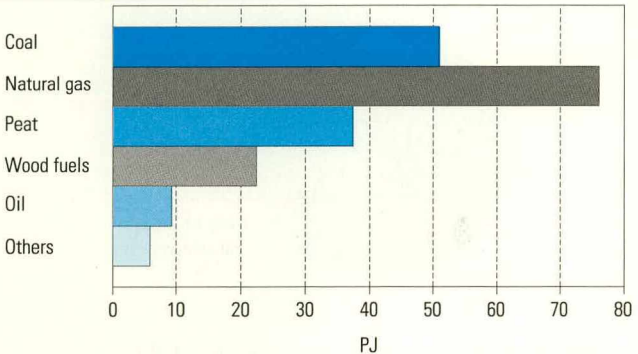
## District Heat Use 2004



District heat use in 2004 was 33.2 TWh.

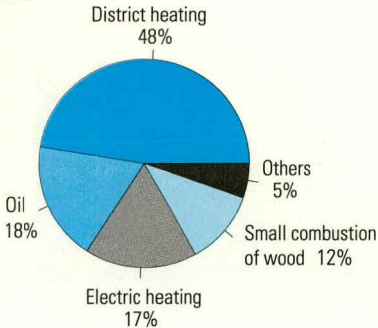
# Heating

## Fuel Consumption in Production of District Heat and Combined Production of District Heat and Electricity 2004



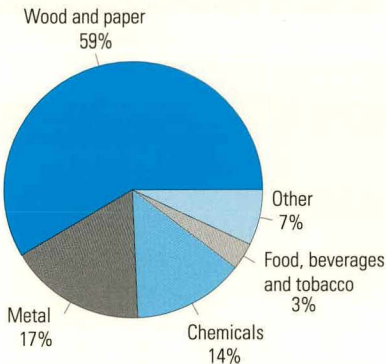
Total fuel consumption in production of district heat and combined production of district heat and electricity in 2004 was 202 PJ (56,0 TWh).

## Heating of Residential, Commercial and Public Buildings 2004



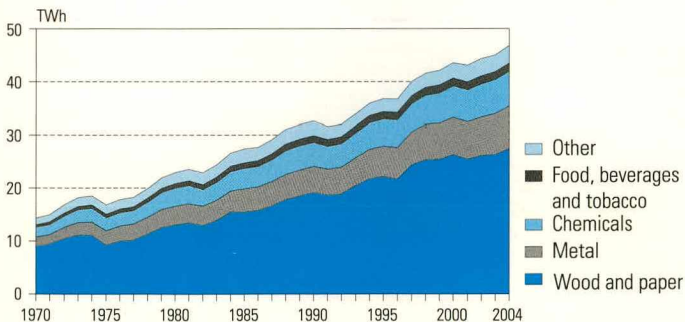
Total heating energy in 2004 was 57.3 TWh. Heating energy for buildings is calculated by subtracting boiler losses from fuels according to their default efficiencies (see page 34).

## Electricity Consumption by Branch of Industry 2004



Total electricity consumption by industry in 2004 was 46.8 TWh.

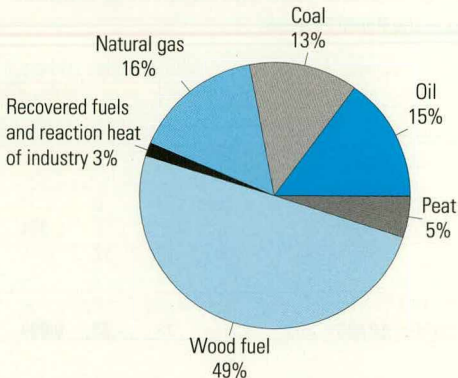
## Electricity Consumption by Branch of Industry 1970–2004





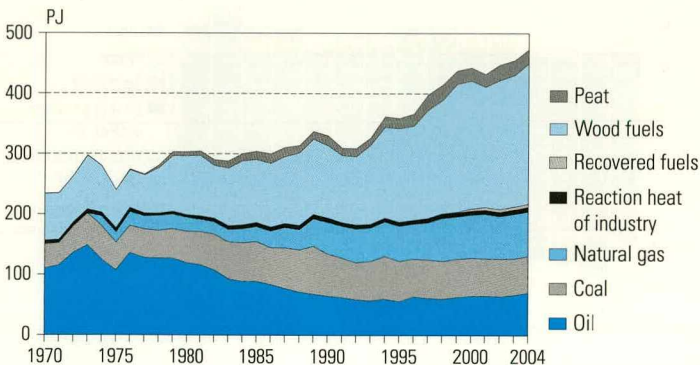
# Industry

## Fuel Consumption in Industry 2004



Total fuel consumption in industry in 2004 was 473 PJ.

## Fuel Consumption in Industry 1970–2004



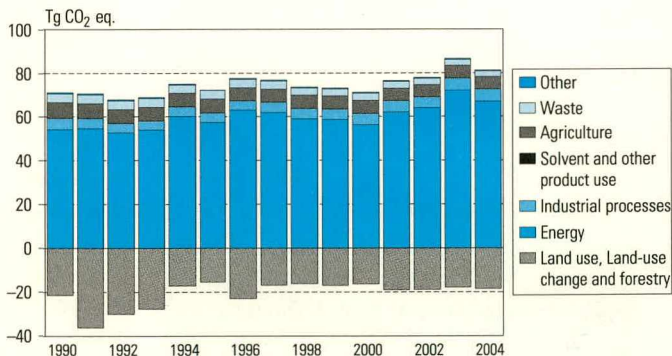
# Air Emissions

## Greenhouse Gas Emissions 1990 and 2004 (1 000 tonnes)

### The Gases Included in the Kyoto Protocol

	Carbon dioxide (CO <sub>2</sub> )		Methane (CH <sub>4</sub> )		Nitrous oxide (N <sub>2</sub> O)		Others (HFC, PFC, SF <sub>6</sub> )	
	1990	2004	1990	2004	1990	2004	1990	2004
Fuel combustion	52 930	65 040	19	21	2	4	–	–
Fugitive emissions from fuels	230	120	1	3	0	0	–	–
Industrial processes	3 320	3 580	0	1	5	5	0.004	0.37
Agriculture	–	–	102	88	16	12	–	–
Waste	–	–	182	118	1	1	–	–
Others	120	60	1	0	2	1	–	–
<b>Total</b>	<b>56 600</b>	<b>68 800</b>	<b>305</b>	<b>231</b>	<b>26</b>	<b>23</b>	<b>0.004</b>	<b>0.37</b>
Emissions, million tonnes of CO <sub>2</sub> equivalent	56.6	68.8	6.4	4.9	8.1	7.1	0.09	0.7

## Greenhouse Gas Emissions 1990–2004

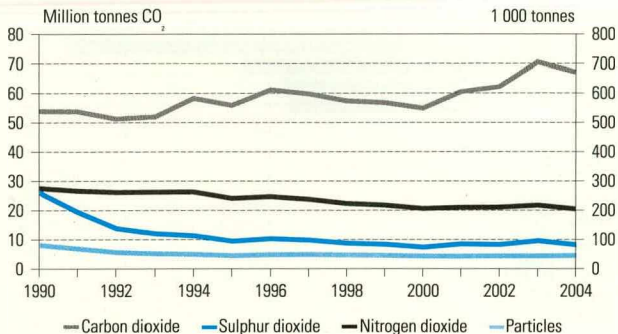


Note, that emissions from energy sector for the years 1991-2003 are not yet updated in this figure.

Source: Statistics Finland, Greenhouse Gas Inventory

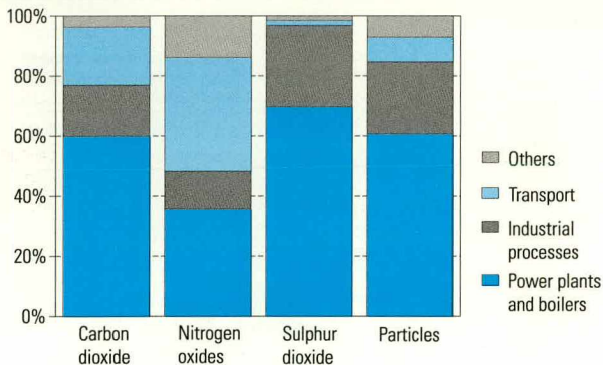
# Air Emissions

## Emissions from Energy Production and Consumption 1990–2004



Sulphur dioxide and particles include also emissions from processes. The left-hand side scale is for carbon dioxide.

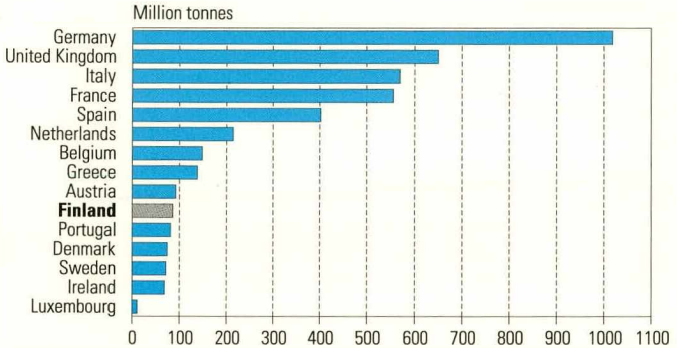
## Emissions from Energy Production and Consumption by Sector 2004



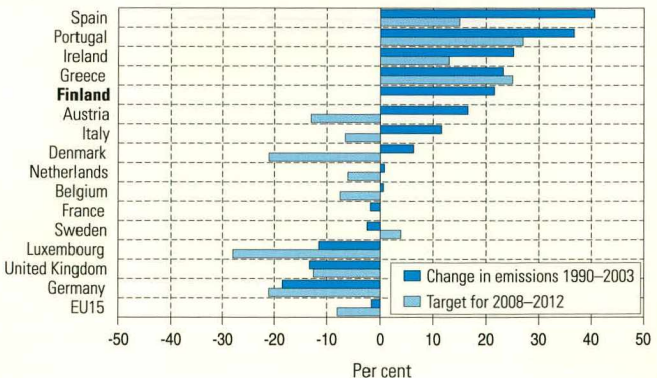
Sulphur dioxide and particles include also emissions from processes.

# Air Emissions

## Greenhouse gas emissions in EU15 countries in 2003



## Change in actual GHG emissions and the EU15 Member States' commitments

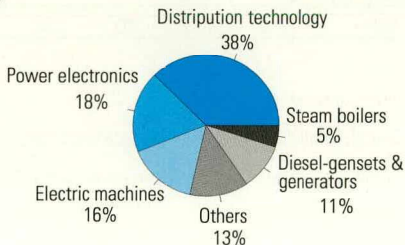


# Imports and Exports

## Imports and Exports of Energy and Energy Technology 2004

	Imports	Exports
<b>Coal</b>	427 € mil. 7 436 000 t	0.3 € mil. 2 000 t
<b>Natural gas</b>	487 € mil. ..	
<b>Crude oil</b>	2 649 € mil. 12 250 000 t	
<b>Other petroleum products</b>	1 156 € mil. 4 144 000 t	1 872 € mil. 5 537 000 t
<b>Nuclear fuel</b>	57 € mil. 67 tU	
<b>Electricity</b>	259 € mil. 11 983 GWh	204 € mil. 6 997 GWh
<b>Others</b>	26 € mil.	10 € mil.
<b>Total</b>	<b>5 061 € mil.</b>	<b>2 087 € mil.</b>
<b>Energy technology total</b>	<b>2 099 € mil.</b>	<b>2 087 € mil.</b>

### Exports of Energy Technology





## Energy Imports 2004

		Russia	Den- mark	Norway	Kazakstan	EU25	OECD	Total	
								Amount	Value mil. €
Hard coal	1 000 t	5 422	—	72	1	1 371	1 431	<b>6 922</b>	<b>327</b>
Coke	1 000 t	..	..	..	..	..	..	<b>514</b>	<b>100</b>
Natural gas	mil. m <sup>3</sup>	4 606	—	—	—	—	—	..	<b>487</b>
Crude oil	1 000 t	9 511	1 576	585	498	1 656	2 241	<b>12 250</b>	<b>2 649</b>
Motor gasoline	1 000 t	5	—	348	—	1	349	<b>354</b>	<b>121</b>
Middle distillates	1 000 t	1 324	18	128	175	186	439	<b>1 990</b>	<b>540</b>
Heavy fuel oil	1 000 t	36	162	18	—	591	609	<b>654</b>	<b>103</b>
LPG	1 000 t	25	0	43	62	66	107	<b>196</b>	<b>60</b>
Other petro- leum prod.	1 000 t	554	1	18	1	258	284	<b>840</b>	<b>292</b>
Methanol	1 000 t	142	—	—	—	0	0	<b>142</b>	<b>25</b>
MTBE	1 000 t	66	0	0	—	44	44	<b>110</b>	<b>41</b>
Peat	1 000 t	5	—	0	—	42	37	<b>47</b>	<b>1</b>
Nuclear fuel	tU	15	—	—	—	52	52	<b>67</b>	<b>57</b>
Electricity	GWh	11 124	—	—	—	859	859	<b>11 983</b>	<b>259</b>
<b>Value</b>	<b>mil. €</b>	<b>3 538</b>	<b>393</b>	<b>330</b>	<b>175</b>	<b>850</b>	<b>1 224</b>	<b>5 061</b>	

Import of wood fuels is excluded.

Source: Board of Customs /Foreign Trade Statistics

In addition, energy technology imports totalled € 2 099 million in 2004.

Source: Etlatieto Oy

## Energy Exports 2004

		Sweden	Germany	United States	Canada	EU25	OECD	Total	
								Amount	Value mil. €
Coke	1 000 t	–	–	–	–	0	2	<b>2</b>	<b>0</b>
Motor gasoline	mil. l	822	350	816	484	1 377	2 625	<b>2 774</b>	<b>913</b>
Jet fuel	1 000 t	118	–	–	–	118	118	<b>118</b>	<b>40</b>
Middle distillates	1 000 t	840	531	–	10	1 872	1 882	<b>1 882</b>	<b>610</b>
Heavy fuel oil	1 000 t	1	–	–	–	141	141	<b>141</b>	<b>15</b>
LPG	1 000 t	0	–	–	–	2	2	<b>2</b>	<b>1</b>
Other petroleum prod.	1 000 t	138	14	0	0	528	523	<b>620</b>	<b>293</b>
Peat	1 000 t	31	14	0	0	99	108	<b>115</b>	<b>10</b>
Electricity	GWh	6 994	–	–	–	6 994	6 994	<b>6 997</b>	<b>204</b>
Value	mil. €	839	290	259	166	1 523	1 925	<b>2 087</b>	

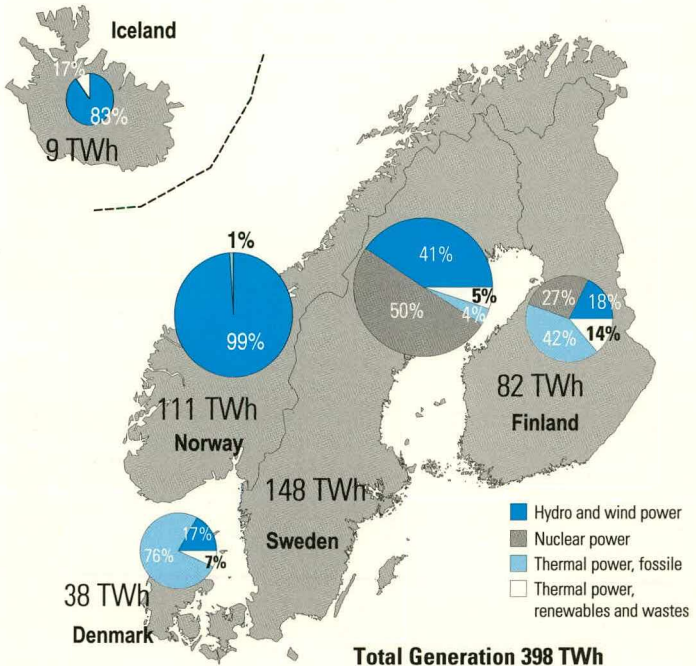
Export of wood fuels is excluded.

Source: Board of Customs /Foreign Trade Statistics

In addition, energy technology exports totalled € 3 035 million in 2004.

Source: Etlatieto Oy

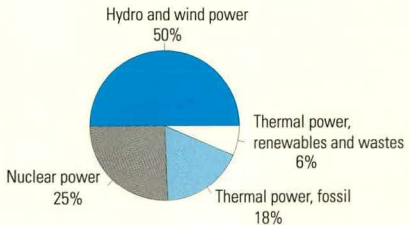
## Electricity Generation in Nordic Countries 2004



## Electricity Consumption in Nordic Countries 2004, TWh

Iceland	9
Norway	122
Sweden	146
Finland	87
Denmark	36
<b>Total</b>	<b>400</b>

Source: Nordel Annual Report 2004



## Spot Prices of the Nordic Power Exchange NordPool by Price Area, €/MWh

Year	Month	Oslo	Stockholm	Helsinki	Odense	Copenhagen	System <sup>1)</sup>	Volume (GWh)
1998	1-12	13.73	13.54	13.78	—	—	13.78	57 240
1999	1-12	13.10	13.58	13.65	—	—	13.46	75 373
2000	1-12	12.06	14.24	14.88	16.41	—	12.75	95 687
2001	1-12	23.08	22.86	22.83	23.74	23.54	23.15	110 589
2002	1-12	26.57	27.62	27.28	25.47	28.59	26.91	123 622
2003	1-12	37.11	36.49	35.30	33.68	36.80	36.69	117 899
2004	1-12	29.40	28.08	27.68	28.80	28.35	28.92	165 748
2004	1	29.22	28.80	28.53	26.53	29.29	29.03	17 910
	2	27.67	27.33	27.03	26.01	27.65	27.50	15 981
	3	29.81	28.56	27.28	27.92	28.58	29.19	15 481
	4	29.94	26.54	25.81	27.35	26.49	28.76	12 955
	5	28.13	27.08	26.74	29.31	27.09	27.89	12 583
	6	32.28	31.76	31.10	32.76	32.23	32.02	11 482
	7	29.89	25.94	25.93	30.07	26.13	28.15	11 574
	8	32.86	32.52	31.67	33.99	33.59	32.64	11 667
	9	29.22	28.40	28.08	30.72	28.40	28.96	11 779
	10	27.90	26.37	26.37	27.09	26.37	27.75	13 798
	11	29.59	28.17	28.13	28.28	28.18	29.20	14 805
	12	26.26	25.54	25.48	25.53	26.24	25.96	15 733
2005	1	22.91	23.17	26.26	25.54	25.48	25.53	16 677
	2	24.57	25.41	25.59	26.08	26.75	25.11	15 543
	3	28.75	30.85	30.76	31.22	38.16	29.46	16 390
	4	30.69	30.89	30.89	34.50	30.93	30.72	16 390
	5	30.53	31.35	30.64	36.13	31.73	30.90	13 846
	6	26.11	26.79	26.74	44.17	28.78	26.27	13 133
	7	28.66	29.09	29.99	42.52	29.10	28.84	12 269
	8	30.82	31.20	35.07	38.30	31.79	31.01	12 348
	9	29.43	29.50	29.97	44.98	31.93	29.37	12 771
	10	32.22	32.28	33.86	42.70	36.75	32.14	13 458

1) Since 4.10.2005 includes a new bidding area, Kontek

Sources: Nordel and EL-EX NordPool



## Total Consumption of Energy in EU and some of the OECD Countries, PJ

	1985	1990	1995	2000	2001	2002	2003
Austria	990	1 040	1 120	1 190	1 280	1 260	1 370
Belgium	1 840	1 980	2 110	2 390	2 330	2 200	2 340
Cyprus	..	80	80	100	100	100	110
Czech Republic	..	1 990	1 710	1 690	1 730	1 740	1 830
Denmark	820	750	850	820	840	830	870
Estonia	..	410	220	190	210	210	230
<b>Finland</b>	<b>1 120</b>	<b>1 200</b>	<b>1 210</b>	<b>1 360</b>	<b>1 390</b>	<b>1 470</b>	<b>1 550</b>
France	8 540	9 480	10 040	10 820	11 150	11 150	11 330
Germany	15 040	14 910	14 150	14 240	14 670	14 350	14 420
Greece	770	930	1 010	1 180	1 210	1 240	1 260
Hungary	..	1 180	1 060	1 040	1 060	1 080	1 120
Ireland	370	440	460	590	620	630	640
Italy	5 590	6 410	6 750	7 220	7 240	7 260	7 610
Latvia	..	200	200	170	180	180	180
Lithuania	..	670	350	300	340	360	380
Luxembourg	130	150	140	150	160	170	180
Malta	..	20	30	30	30	40	40
Netherlands	2 550	2 800	3 070	3 170	3 250	3 270	3 370
Poland	..	4 190	4 190	3 800	3 800	3 740	3 940
Portugal	520	710	820	1 010	1 040	1 090	1 060
Slovakia	..	880	720	710	780	790	790
Slovenia	..	230	250	270	280	290	290
Spain	3 170	3 740	4 280	5 140	5 280	5 450	5 610
Sweden	1 960	1 970	2 110	2 000	2 160	2 150	2 130
United Kingdom	8 530	8 840	9 130	9 650	9 710	9 480	9 620
<b>EU 25</b>	<b>..</b>	<b>65 190</b>	<b>66 060</b>	<b>69 250</b>	<b>70 840</b>	<b>70 530</b>	<b>72 270</b>
Canada	8 100	8 750	9 700	10 550	10 400	10 430	10 910
Japan	15 320	18 650	20 920	22 130	21 810	21 800	21 650
United States	74 600	80 710	87 440	96 470	94 560	95 840	95 490
<b>OECD Total</b>	<b>..</b>	<b>204 720</b>	<b>..</b>	<b>222 980</b>	<b>222 110</b>	<b>224 000</b>	<b>225 870</b>

Source: Eurostat, IEA /Energy Balances of OECD Countries 2002–2003



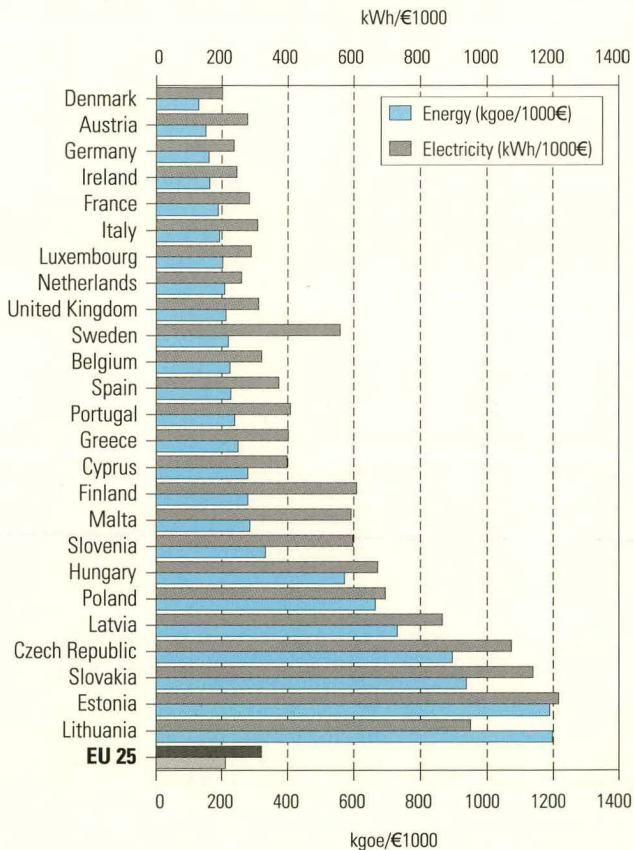
## International Energy Statistics

### Electricity Consumption in EU and some of the OECD Countries, TWh

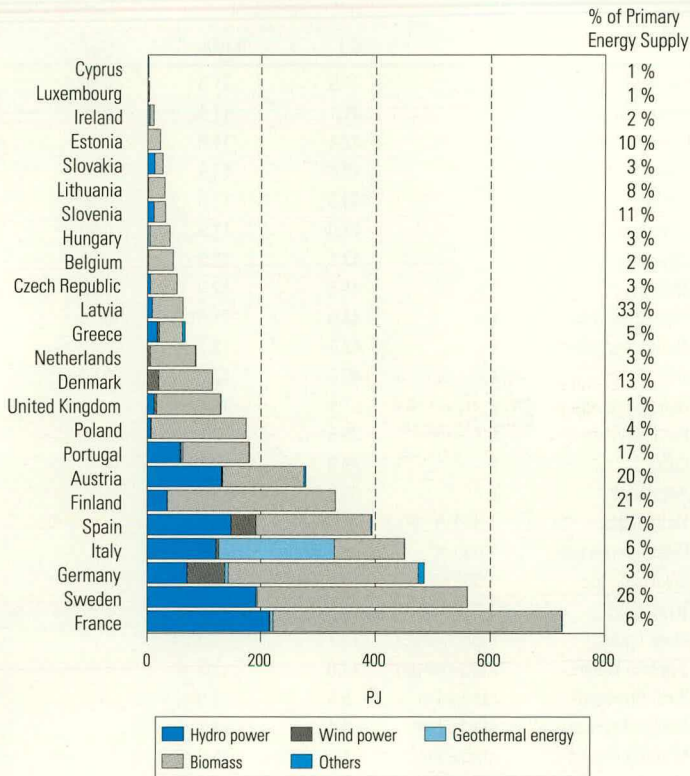
	1985	1990	1995	2000	2001	2002	2003
Austria	37.0	42.7	46.0	51.8	53.9	54.9	60.7
Belgium	48.4	58.0	68.4	77.5	78.1	78.4	79.7
Cyprus	..	1.8	2.2	3.0	3.1	3.4	3.6
Czech Republic	43.3	48.2	48.0	49.4	50.9	50.8	52.4
Denmark	25.4	29.3	31.2	32.5	32.6	32.5	32.4
Estonia	..	6.8	4.5	5.0	5.1	5.3	5.6
<b>Finland</b>	<b>48.5</b>	<b>58.9</b>	<b>65.3</b>	<b>75.4</b>	<b>77.3</b>	<b>79.7</b>	<b>80.8</b>
France	252.9	301.9	342.6	385.1	395.5	393.4	408.4
Germany	424.6	446.5	452.6	482.6	505.3	498.8	509.3
Greece	23.8	28.5	34.1	43.2	44.5	46.6	48.6
Hungary	30.2	31.6	27.7	29.4	30.5	31.5	31.4
Ireland	9.8	11.9	14.8	20.2	20.9	21.8	23.0
Italy	173.7	214.1	237.7	272.5	277.3	282.3	291.0
Latvia	..	8.7	4.5	4.4	4.5	4.8	5.2
Lithuania	..	12.0	6.3	6.2	6.4	6.7	7.1
Luxembourg	3.8	4.1	5.0	5.7	5.6	5.7	6.0
Malta	..	0.9	1.3	1.6	1.6	1.7	1.8
Netherlands	61.5	73.5	83.1	97.9	99.4	99.7	100.4
Poland	92.1	95.8	89.6	96.7	96.9	95.5	98.3
Portugal	17.4	23.5	28.8	38.4	39.9	41.5	43.2
Slovakia	21.5	23.4	21.7	22.0	23.5	22.7	23.0
Slovenia	..	9.7	9.4	10.5	10.9	11.8	12.5
Spain	102.8	125.8	140.9	188.5	201.0	206.5	220.0
Sweden	113.6	120.3	124.6	128.7	132.7	131.3	129.8
United Kingdom	242.1	274.4	293.9	329.5	333.0	333.3	337.4
<b>EU 25</b>	<b>..</b>	<b>2 052.3</b>	<b>2 184.3</b>	<b>2 457.8</b>	<b>2 530.5</b>	<b>2 540.5</b>	<b>2 611.5</b>
Canada	371.1	431.0	467.0	503.4	501.0	512.4	527.7
Japan	599.3	765.1	880.2	949.8	929.4	956.3	946.8
United States	2 325.7	2 712.6	3 135.8	3 589.6	3 434.1	3 559.3	3 569.6
<b>OECD Total</b>	<b>5 424.2</b>	<b>6 563.7</b>	<b>7 425.6</b>	<b>8 453.6</b>	<b>8 372.1</b>	<b>8 613.3</b>	<b>8 727.4</b>

Source: Eurostat, IEA /Energy Statistics of OECD Countries 2002–2003

## Consumption of Energy and Electricity per GDP-unit in EU Countries 2003



## Production of Renewable Energy in EU Countries 2003



In EU25 countries the share of renewable energy in primary energy supply was 6%

Lähde: Eurostat

## Net Heat Contents and Densities of Energy Sources

Fuels	Unit	Net heat content		Density
		GJ	MWh	t/m <sup>3</sup>
Crude oil	t	41.8	11.6	0.86
Heavy fuel oil	t	41.1	11.4	0.98
Light fuel oil	t	42.4	11.8	0.85
Diesel fuel	t	42.8	11.9	0.84
Jet fuel	t	43.3	12.0	0.80
Lamp kerosine	t	43.0	11.9	0.80
Other kerosines	t	43.1	12.0	0.81
Naphtha	t	44.3	12.3	0.70
Motor gasolines	t	43.0	11.9	0.75
Aviation gasolines	t	43.7	12.1	0.71
LPG	t	46.0	12.8	0.51
Refinery gases	t	51.9	14.4	
Hard coal	t	25.5	7.1	
Coke	t	29.3	8.1	
Anthracite	t	33.5	9.3	
Natural gas	1 000 m <sup>3</sup> (0°C)	36.0	10.0	
Blast furnace gas	1 000 m <sup>3</sup>	3.8	1.1	
Coke oven gas	1 000 m <sup>3</sup>	16.7	4.6	
Town gas	1 000 m <sup>3</sup>	15.5	4.3	
Black liquor	t (dry matter)	11.7	3.3	
Sulphite liquors	t (dry matter)	12.0	3.3	
Birch firewood	stacked m <sup>3</sup>	5.4	1.5	
Pine and spruce	stacked m <sup>3</sup>	4.4	1.2	
Mixed firewood	stacked m <sup>3</sup>	4.5	1.3	
Chips	loose m <sup>3</sup>	3.3	0.9	
Milled peat	t	10.1	2.8	0.32
Sod peat	t	12.3	3.4	0.38

## Conversion Factors between Energy Units

	toe	MWh	GJ	Gcal
toe	1	11.63	41.868	10
MWh	0.086	1	3.6	0.86
GJ	0.02388	0.2778	1	0.2388
Gcal	0.1	1.163	4.1868	1

Example: 1 toe (tonne of oil equivalent) = 11.63 MWh

## Prefix

k = kilo	= $10^3$	= 1 000
M = mega	= $10^6$	= 1 000 000
G = giga	= $10^9$	= 1 000 000 000
T = tera	= $10^{12}$	= 1 000 000 000 000
P = peta	= $10^{15}$	= 1 000 000 000 000 000

## Carbon Dioxide Factors for Some Fuels

	g CO <sub>2</sub> /MJ
Motor gasoline	73.2
Diesel fuel	73.2
Light fuel oil	74.1
Residual fuel oil	78.8
Jet fuel	73.2
LPG	65.0
Other fuels	72.7–79.2
Hard coal	94.6
Coke	108.0
Natural gas	55.04
Milled peat	105.9
Bark, wood fuel	109.6
Industrial wood residue	109.6
Black liquor	109.6



## Note

Hydro power, wind power and imported electricity have been made commensurate with fuels according to directly obtained electricity (at the efficiency ratio of 100 per cent) and nuclear power at the efficiency ratio of 33 per cent.

## Calculation Method for Heating Energy

Net heating energy for buildings is calculated by subtracting boiler losses from fuels according to the following default efficiencies:

Small combustion of wood	55%
Peat	60%
Coal	60%
Heavy fuel oil	83%
Light fuel oil	78%
Natural gas	90%
District heating	100%
Electric heating	100%

Sources: Technical Research Centre of Finland (VTT) and Tampere University of Technology.

## Explanation of Symbols

..	Data not available
—	Magnitude zero
0	Magnitude less than half of unit employed
*	Preliminary
-----	Break in the time series



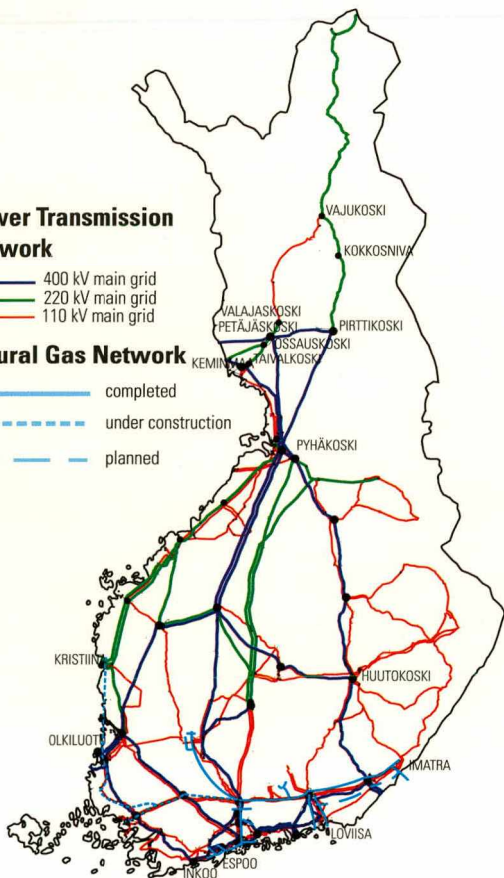
# Power Transmission and Natural Gas Networks 2004

## Power Transmission Network

- 400 kV main grid
- 220 kV main grid
- 110 kV main grid

## Natural Gas Network

- completed
- - - under construction
- · - · - planned





Statistics Finland  
Sales Services  
P.O.Box 4C  
FI-00022 STATISTICS FINLAND  
Tel. +358 9 1734 2011  
Fax +358 9 1734 2500  
[myynti@stat.fi](mailto:myynti@stat.fi)

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