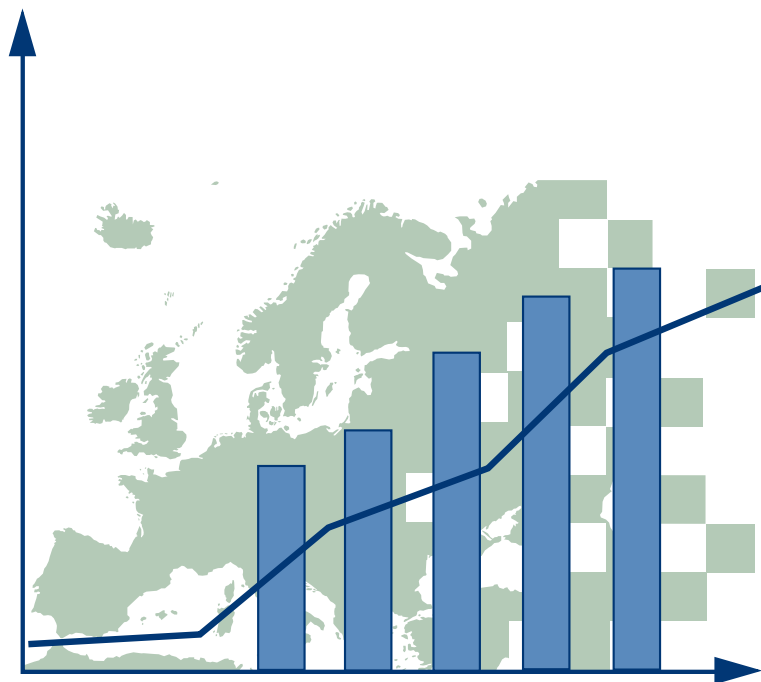


Natural Gas in Western Europe

1998
publication of
gas statistics
& prospects



eurogas

eurogas – the European Union of the Natural Gas Industry – is a non-profit international association based in Brussels. It represents the European natural gas industry towards the European Union, all relevant bodies at national and international level, and last but not least public opinion.

eurogas membership at January 1998:

A	FACHVERBAND DER GAS- UND WÄRMEVERSORGUNGSUNTERNEHMUNGEN
B	FEDERATION DE L'INDUSTRIE DU GAZ (FIGAZ)
CH	ASSOCIATION SUISSE DE L'INDUSTRIE GAZIERE
D	BUNDESVERBAND DER DEUTSCHEN GAS- UND WASSERWIRTSCHAFT (B G W)
DK	DANSK NATURGAS A/S KOMGAS I/S
E	SOCIEDAD PARA EL ESTUDIO Y DESARROLLO DE LA INDUSTRIA DEL GAS (SEDIGAS)
F	GAZ DE FRANCE
FIN	GASUM FINNISH NATURAL GAS ASSOCIATION
GB	BRITISH GAS plc CENTRICA plc
I	SOCIETA ITALIANA PER IL GAS (ITALGAS) SNAM
IRL	BORD GAIS EIREANN
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Natural Gas in Western Europe 1998

This is the 5th **eurogas** annual statistical review of energy and natural gas in Western Europe. Its purpose is to give each year an accurate and up-to-date picture of the natural gas industry and to document the significance of natural gas in Europe.

It also contains clear figures and data on the effects of the use of natural gas on climate and environment. These may be subject to updating in future issues in accordance with energy efficiency and emission improvements as gas technologies improve over time.

The figures in this publication are largely based on data collected directly from the gas industry. In addition, where needed, data from other sources has been used.

As usual, the tables and graphics on primary energy consumption, on natural gas demand and on gas supply show the detailed country figures for the members of **eurogas**. They also include the figures for the Czech Republic, Hungary and Slovak Republic who are associate members of **eurogas**. The "EU 15" columns, however, display in each case the total figures for the European Union (thus not counting the latter countries, and adding Greece, Luxembourg and Portugal).

The demand and supply outlook is based on individual countries outlooks taking account of national expected developments regarding GDP, economic/energy/environmental and other policies and energy markets. The indigenous production shown is based on the current knowledge of production potential.

Table of Contents

1. Primary Energy Consumption	page 3
1.1. PEC in eurogas Member Countries / EU15	page 3
1.2. PEC per capita and per Unit of GDP	page 4
2. Final Energy Consumption	page 4
2.1. FEC in eurogas Member Countries / EU15	page 4
3. Natural Gas Sales and Supplies	page 5
3.1. Inland Sales of Natural Gas by Sector in eurogas Member Countries / EU15	page 5
1996-1997 Gas Demand Growth Rate by sector, EU15	page 5
3.2. Natural Gas Supplies in eurogas Member Countries / EU15	page 6
Breakdown of Western Europe's Natural Gas Supplies	page 6
3.3. EU Share of World Gas Trade	page 6
4. The European Natural Gas Grid 1998 (map)	page 7
5. Natural Gas Demand and Supply Outlook to 2020	page 9
5.1. Demand and Supply Outlook, EU15	page 9
5.2. Outlook on the Share of Natural Gas in PEC, EU15	page 9
5.3. Expected Import Dependency, EU15 / Western Europe	page 9
5.4. Natural Gas Demand Outlook by Sector, EU15	page 9
6. Natural Gas Reserves	page 10
6.1. Definition of World Gas and Oil Reserves	page 10
6.2. World Reserves / Production Ratios, Gas vs. Oil	page 10
7. Gas Supply Industry Key Figures	page 11
7.1. Number of Customers at 1 January 1998	page 11
7.2. Number of Employees at 1 January 1998	page 11
7.3. Investments in 1997	page 11
7.4. Total Transmission and Distribution Pipeline Lengths at 1 January 1998	page 11
7.5. Natural Gas Storage at 1 January 1998	page 11
8. Energy Efficiency and Greenhouse Gas Emissions	page 12
8.1. CO ₂ Formed by the Combustion of Fossil Fuels	page 12
8.2. Efficiencies and CO ₂ Emissions from Fossil-Fuelled Power Plants	page 12
8.3. CO ₂ Emissions from Heat Supply Systems	page 12
8.4. Methane Emissions	page 13
9. Definitions and Conversion Factors	page 14
10. Sources	page 14

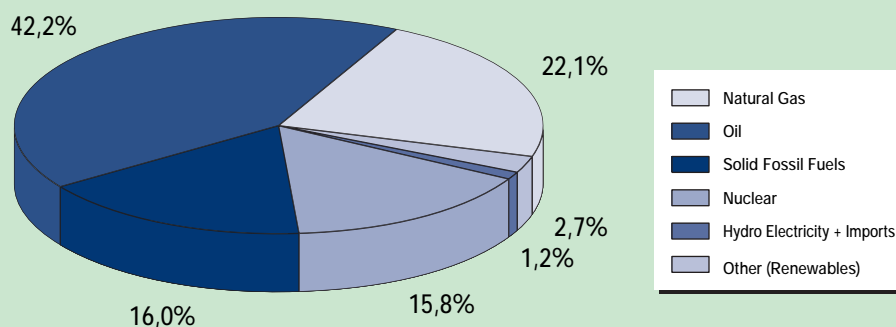
1. Primary energy consumption

1997 - Primary Energy Consumption in euogas Member Countries (EU 15)

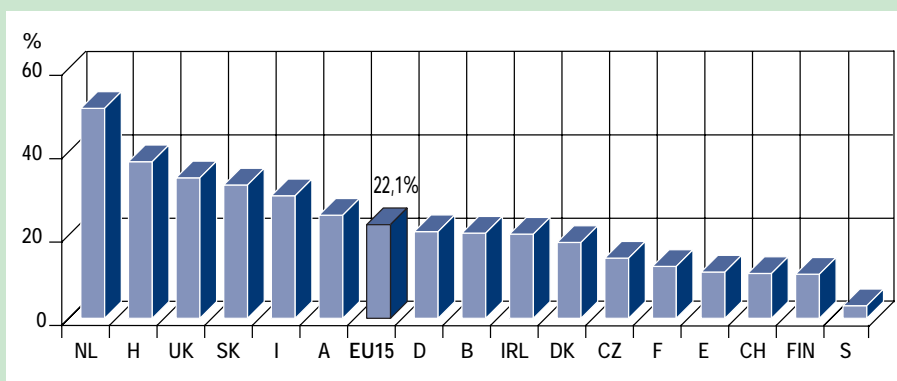
MTOE	A	B	CH	CZ (3)	D	DK	E	F	FIN	H	I	IRL	NL	S	SK(3)	UK (4)	EU15
Oil	11,5	23	12,2	7,8	137,2	9,2	57,4	95,9	8,4	7,2	94	6,02	23,9	17,7	5,4	75,8	588,8
Solid Fossil Fuels	3,6	8,2	0,1	22,8	86,8	6,7	17,6	13,6	6,4	4,1	12,9	2,83	8,8	2,1	5,4	40,8	223,9
Natural Gas	6,6	11,3	2,3	7,6	71,5	3,9	11,1	31	2,9	9,6	47,7	2,32	35,6	0,9	6,9	82,9	308,4
Nuclear Electricity 1)	0	11,7	6,2	3,2	44,4	0	14,4	103,1	5,2	3,6	0	0	0,6	17,5	1	23	219,9
Hydro Electricity 1)	3,2	0,1	3	0,2	1,7	0	3,1	5,8	1	0,0	3,8	0,06	0	5,9	0,4	0,3	27,2
Electricity Net Import	-0,1	0,7	-0,6	0	-0,2	-0,6	-0,3	-17	0,7	0,2	3,1	0	1,1	-0,2	0,3	1,4	-10,8
Renewables 2)	3,4	0	0,4	0	5,1	1,8	3,7	4,2	5,9	0,3	3,1	0,18	0	7,4	0	1,4	36,2
Other	0,4	0	0,9	0	0	0	0	0	0	0,1	0	0	1,3	0,3	0,6	0	2
Total	28,6	55	24,5	41,6	346,5	21	107	236,6	30,4	25,2	164,6	11,4	71,3	51,6	20,1	225,6	1.395,6

- Notes : 1) Domestically produced
 2) Renewables includes biomass, wind, solar and geothermal energy.
 3) 1996 figures
 4) UK figures are gross CV

1997
Primary
Energy
Consumption
by fuel (EU15)



1997
Share of
Natural Gas
in Primary
Energy
Consumption



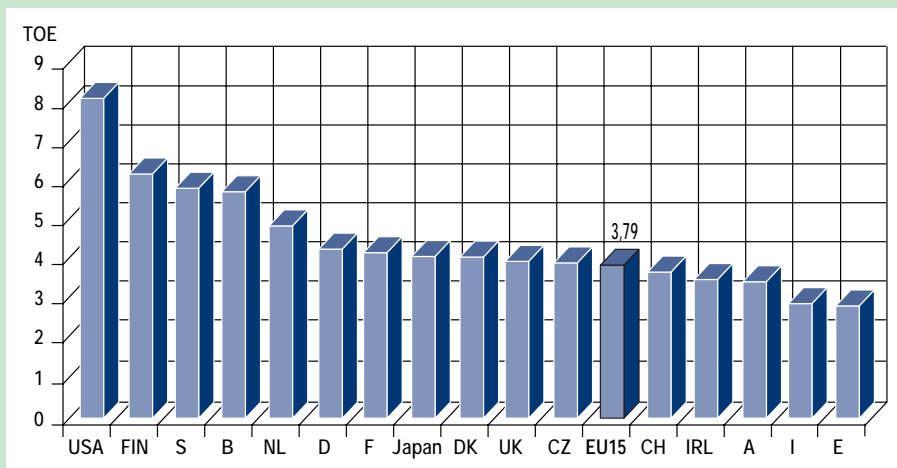
1997 Primary Energy Consumption (PEC) per capita / per unit of GDP

	A	B	CH	CZ	D	DK	E	F	FIN	I	IRL	NL	S	UK	EU 15
PEC per capita 1)	3,39	5,64	3,65	3,8	4,27	4,02	2,74	4,17	6,17	2,84	3,45	4,78	5,79	3,87	3,79
PEC/GDP-ratio 2)	0,15	0,26	0,11	1,44	0,19	0,14	0,19	0,19	0,22	0,14	0,18	0,22	0,21	0,21	0,19

Notes : 1) IEA – estimate (for 1997) measured as total primary energy supply in TOE per inhabitant.

2) IEA – estimate (for 1997) measured as total primary energy supply in TOE per \$ 1000 of GDP at 1990 prices and exchange rates

1997 Primary Energy Consumption per Capita



2. Final energy consumption

1997 Final Energy Consumption in eurogas Member Countries (EU15)

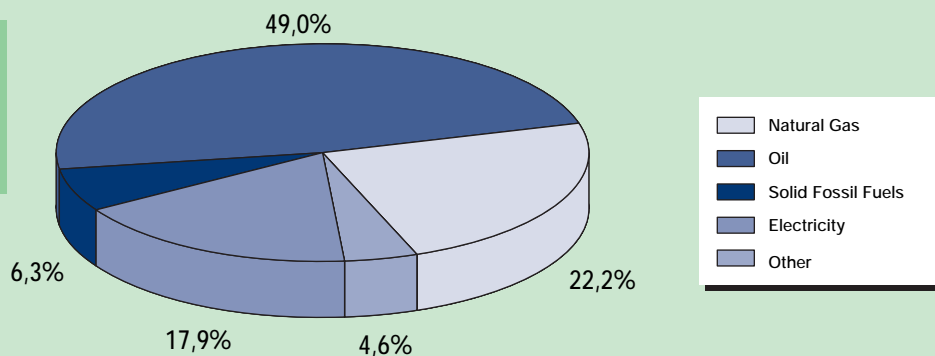
MTOE	A	B (3)	CH	CZ (3)	D	DK (3)	E	F	FIN (3)	H	I	IRL	NL	S	SK (3)	UK	EU15
Oil	10,2	20,9	11,7	6,7	104,2	7,7	50,1	89,2	9,4	4,7	63,7	5,3	18,7	12,2	2,5	67,1	480,6
Solid Fossil Fuels	1,5	3,4	0,1	6,3	16,7	0,4	2,3	8,2	1,2	1,6	5,8	0,7	2,3	6,5	2,8	10,2	61,3
Natural Gas	3,7	10,2	2,1	6	51,7	1,8	8,2	29,9	1,3	6	35,4	0,8	23	0,5	6,3	50,7	218,0
Electricity 1)	4,2	6	4,2	4,4	39,7	2,8	13,4	30,6	5,8	2,4	21,4	1,5	7,6	10,8	1,9	26,2	175,9
Other 2)	4,3	0	1	4,1	13,9	3,1	3,3	4,1	5,5	2,4	0	0	4,4	4		1,2	44,8
Total	23,9	40,5	19,1	27,5	226,2	15,8	77,3	162	23,2	17,1	126,3	8,3	56	34	13,5	155,4	980,5

Notes : 1) Includes electricity produced by CHP-plants. Heat produced by CHP-plants is included in "Other".

2) Includes heat (e.g. district heating) and non-electricity generating renewables (e.g. biomass generated heat).

3) 1996 figures

1997 Final Energy Consumption by Source (EU15)



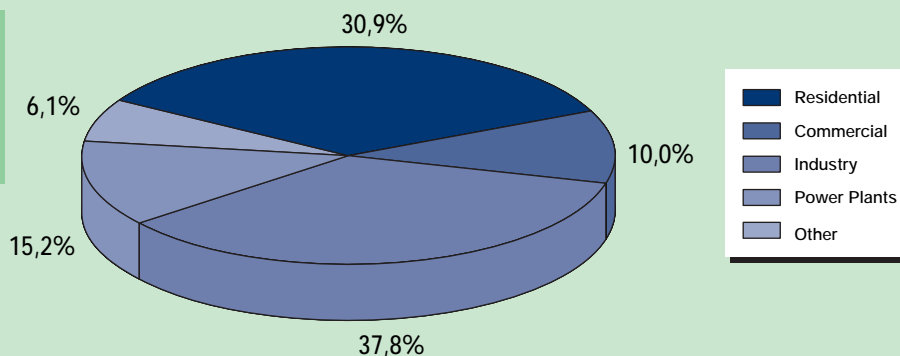
3. Natural Gas Sales and Supplies

1997 - Inland Sales of Natural Gas by Sector in eurogas Member Countries / EU 15

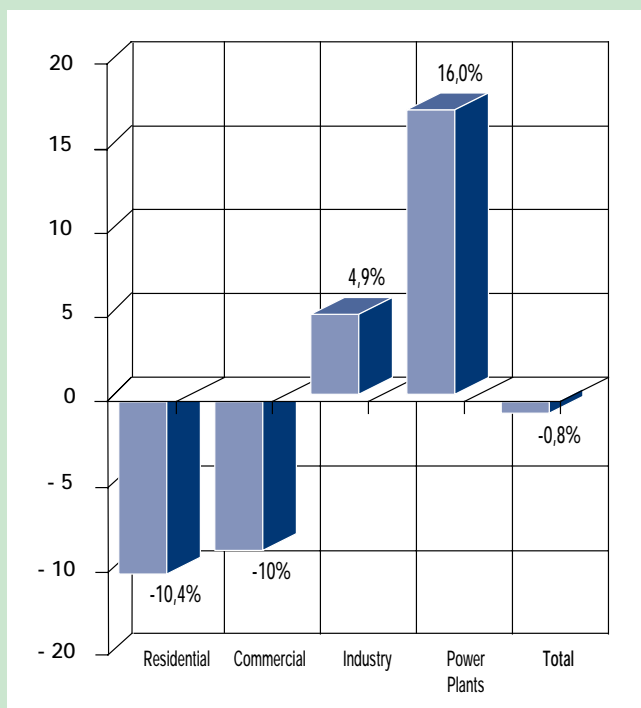
PJ	A	B	CH	CZ	D	DK	E	F	FIN	H	I	IRL	NL	S	SK	UK	EU15
Residential	104	148,7	38,4	95,3	1060,6	26,7	58,5	532,2	0,9	141,3	674,4	13,3	435,2	2,3	60,1	1.162	4.229,3
Commercial	n.a.	67,7	17,6	65,4	127,6	14,2	19,5	232,6	1,3	58,3	190,2	9,6	323,6	3,6	15	369	1.361,4
Industry	129	212,3	42,2	116,2	1336,5	41,8	362,9	669,2	69,4	116,1	975,7	39	598,1	13,7	176,7	702	5.164,0
Power Plants	55	95,1	0	64,3	249,6	16,4	73,6	0,5	28,1	76,8	324,2	62,5	268,9	0	0	894	2.073,3
Others	17	0	8,5	6,5	447,9	61,3	0	18,3	35,3	58,6	38,6	2,4	5,6	13,7	3,8	198	838,1
Total	305	523,8	106,7	347,7	3222,2	160,4	514,5	1.452,8	135	451,1	2.203,1	126,8	1.631,4	33,3	255,6	3.325	13.666,1

With an assumed energy content of 1m³ of 39 MJ (GCV), Total Inland Sales corresponds to 350 BCM (approx. 294 MTOE (NCV))

1997 Natural Gas Sales by Sector (EU 15)



1997 Gas Demand Growth Rate by Sector (EU15)

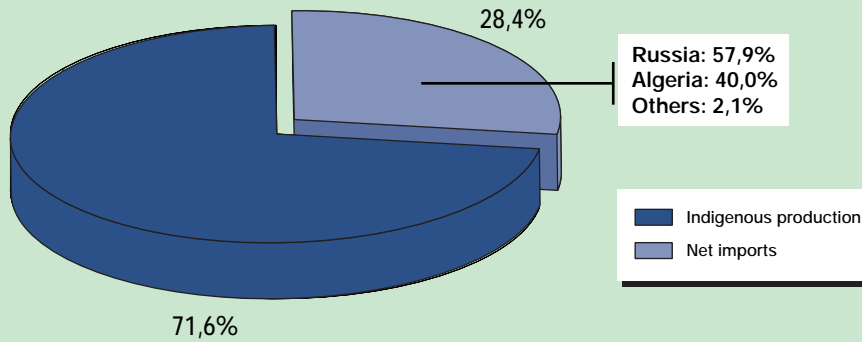


1997 - Supplies of Natural Gas in eurogas Member Countries / EU 15

PJ	A	B	CH	CZ	D	DK	E	F	FIN	H	I	IRL	NL	S	SL	UK	EU15	% EU15
Indigenous Production	57	0	0	3,8	741,7	305,3	6,9	94,2	0	154,7	729	88,7	2.795,4	0	11,3	3.391	8.214,5	60,1%
+ Net Imports																		
- from EU-members	12	179,4	92,8	16,9	900,8	-129,9	40,3	147,9	0	63,1	190,5	40,3	-1.364,6	33,3	7,5	-78	0,4	0%
- from Non-EU-members	228	345,3	13,9	335	1.808,9	0	495,6	1.217,4	135,1	241,7	1.297	0	187	0	244,4	51	5.770,3	42,2%
+/- changes in stocks 1) and other balances	8	-0,9	0	-6	-229,2	-15,7	-28,4	-6,7	-0,1	-8,4	-13,4	0	13,6	0	3,8	-41	-319,6	-2,3%
= Net Supplies	305	523,8	106,7	349,7	3.222,2	159,7	514,4	1.452,8	135	451,1	2.203,1	129	1.631,4	33,3	267	3.323	13.665,6	100%

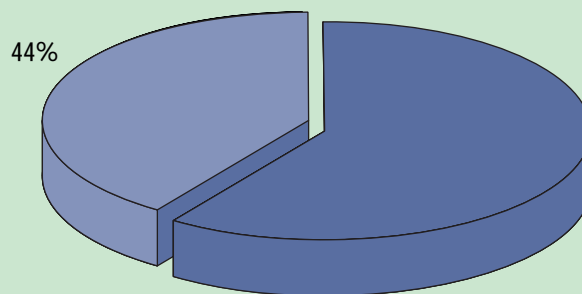
Notes : 1) - Increase in stocks. + Decrease in stocks

1997 Breakdown of Western Europe's Natural Gas Supplies



Note: Western Europe = EU + Norway + Switzerland

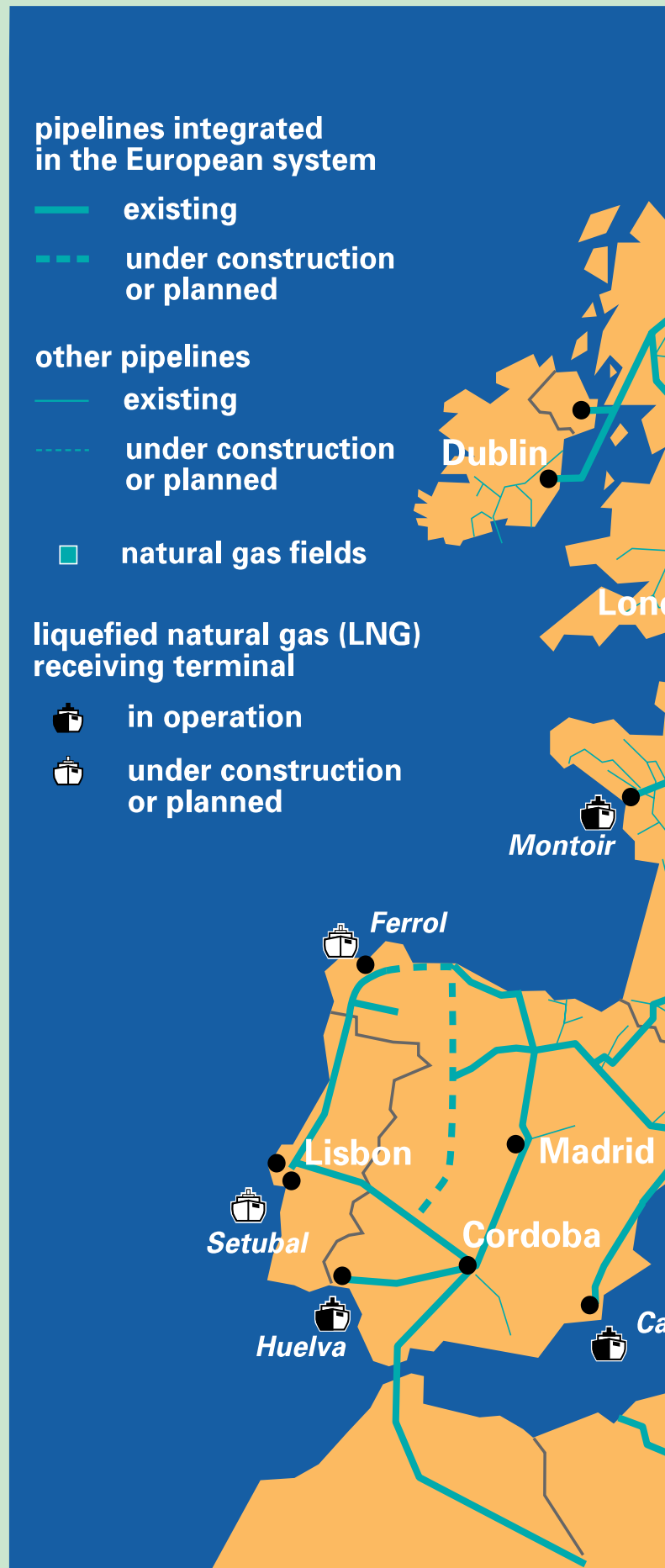
1997 EU Share of World Gas Trade



In 1997 world natural gas trade (import/export) totalled to some 393 MTOE of which 44% was imported by EU-countries.

Source : eurogas and Cedigaz

4. The European Natural Gas Grid 1998



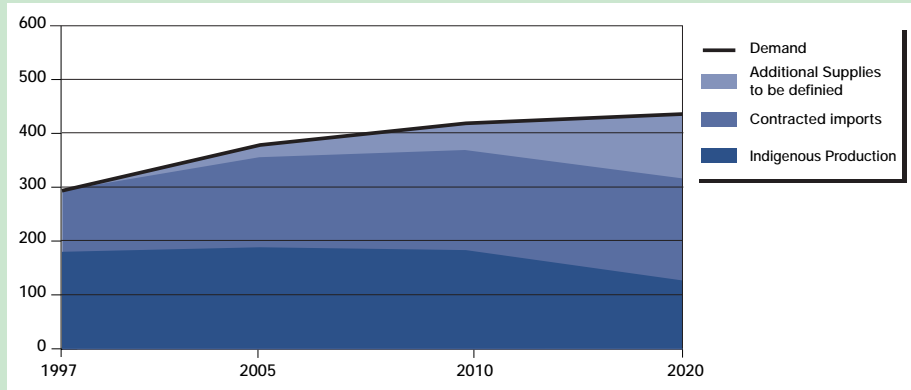


5. Natural Gas Demand and Supply Outlook to 2020

eurogas Long-term Natural Gas Demand & Supply Outlook / EU15

MTOE (N.C.V.)	1997	2005	2010	2020
Total Demand	300	380	410	435
Indigenous Production	180	190	180	125
Net Contracted Imports	120	180	195	190
Additional Supplies to be Defined	-	10	35	120
Share of Primary Energy Consumption	22%	25%	26%	27%

EU Natural Gas Demand & Supply Outlook 1998-2020 (MTOE)

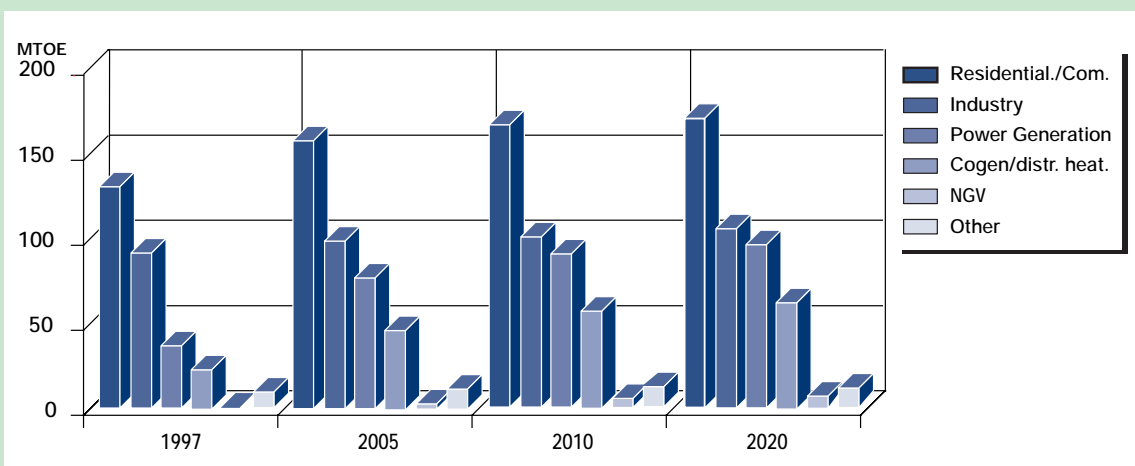


Expected Import Dependency EU15 / Western Europe

MTOE	1997	2005	2010	2020
European Union	40%	50%	56%	71%
Western Europe	29%	31%	37%	51%

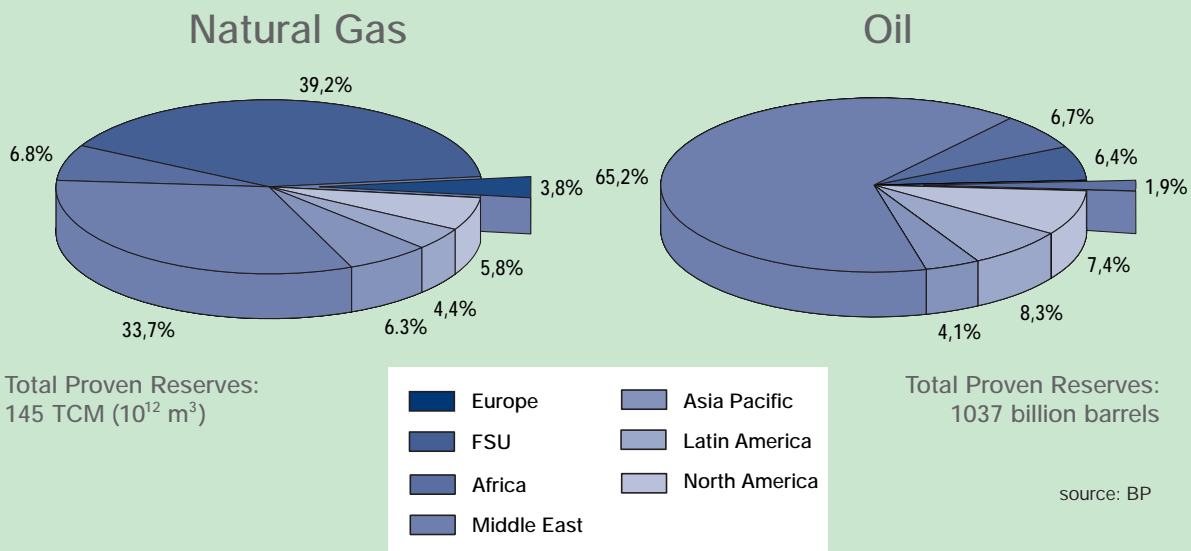
Western Europe = EU + Norway + Switzerland

Natural Gas Demand Outlook by Sector, EU15

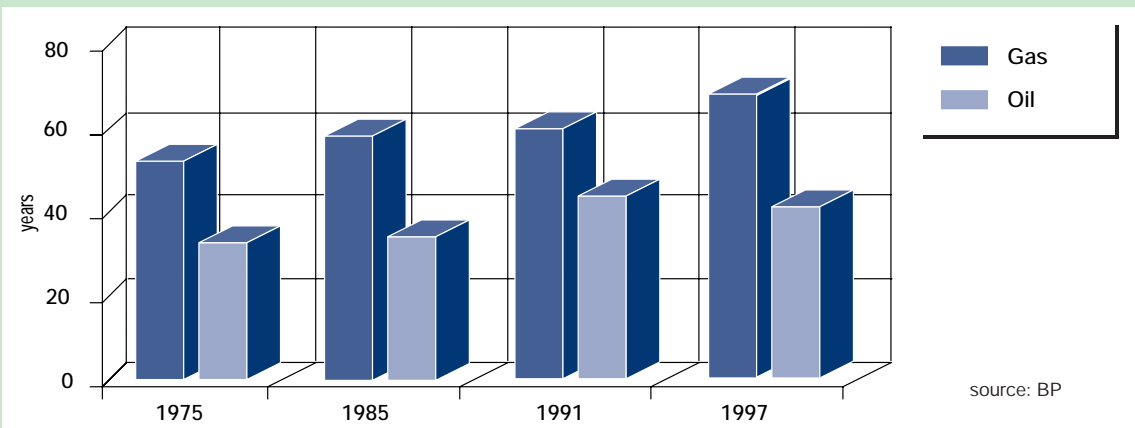


6. Natural Gas Reserves

Definition of World Gas and Oil Reserves by Region, 1997



World Reserves / Production Ratios, Gas vs Oil



The bars indicate years of lifetime of the proven reserves at given consumption level; taking into account today's known additional recoverable reserves, real lifetimes of reserves will be much higher, well exceeding 100 years.

7. Gas Supply Industry Key Figures

Number of Gas Customers (in thousands, rounded) at 1 January 1998

	A	B	CH	CZ (2)	D (1)	DK	E	F	FIN	H	I	IRL	NL	S (2)	SK	UK	EU15
Domestic	1.207	2.303	406	2.221	15.720	298	3.156	9.590	34	2.577	14.100	279	n.a.	52	1.164	19.897	66642
Non-Domestic	2	85	24	n.a.	680	7	63	514	1	130	900	10	n.a.	3	44	390	2656
Total	1.209	2.388	430	n.a.	16.400	305	3.219	10.104	35	2.707	15.000	289	6.390	55	1.208	20.287	75688

Number of Employees at 1 January 1998

	A	B	CH	CZ	D	DK	E	F	FIN	H	I	IRL	NL	S	SK	UK	EU15
Total for Transmission and Distribution	3.063	4.184	1.650	8.076	44.000	1.264	4.134	25.000	310	9.500	34.000	735	10.450	225	6.375	35.000	163023

Investments in 1997 (mio ECU-average July 1997 rates)

	A	B	CH	CZ	D	DK	E	F	FIN	H	I	IRL	NL	S	SK	UK	EU15
Total for Transmission and Distribution	186	279	122	n.a.	3.000	102	498	1019	35	n.a.	1.710	71	417	4	242	674	8441

Pipeline Lengths at 1 January 1998 (km)

	A	B	CH	CZ	D	DK	E	F	FIN	H	I	IRL	NL	S	SK	UK	EU15
Transmission	5.172	3.488	1.976	3.354	55.000	1.127	7.141	32.500	900	5.048	29.300	1.035	11.389	527	5.580	18.000	166967
Distribution	20.219	43.000	12.416	40.897	285.000	16.415	19.881	144.000	1.070	48.799	170.000	5.756	110.500	3.000	15.923	254.800	1076148
Total	25.391	46.488	14.392	44.251	340.000	17.542	27.022	176.500	1.970	53.847	199.300	6.791	121.889	3.527	21.503	272.800	1243115

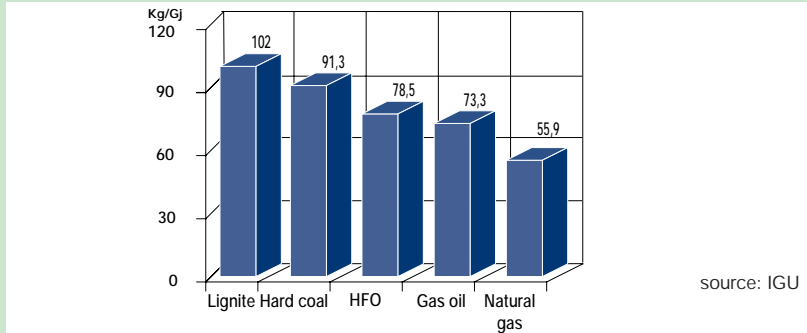
Natural Gas Storage at 1 January 1998

	A	B	CH (3)	CZ (3)	D	DK	E	F	FIN	H	I	IRL	NL	S	SK	UK
Number of Storage Facilities	5	3	{1}	5 + {2}	37	2	2	15	0	4	8	0	3	0	1 + {1}	7
Maximum Working Volume, mill m ³	2.630	675	appr. 50	1.670+(900)	14.098	730	1.119	10.400	0	2.620	14.700	0	1500	0	1.285	3.497
Maximum Withdrawal Capacity, mill m ³ /day	27	appr. 19	appr. 1.4	20.5+(9.9)	353	appr. 20	9,15	219	0	appr.34	263	0	100	0	n.a.	134

Notes : 1) preliminary
2) approximate
3) { } = Storage facilities abroad

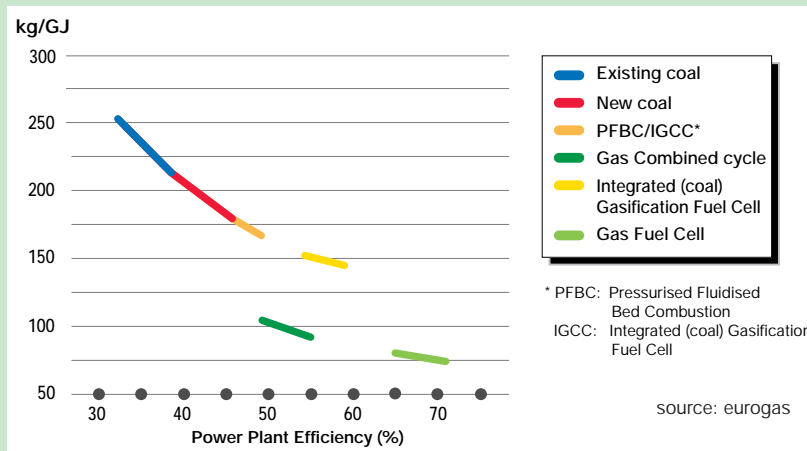
8. Energy Efficiency and Greenhouse Gas Emissions

CO₂ Formed by the Combustion of Fossil Fuels



For the same amount of energy supplied, natural gas generates less CO₂ than other fossil fuels.

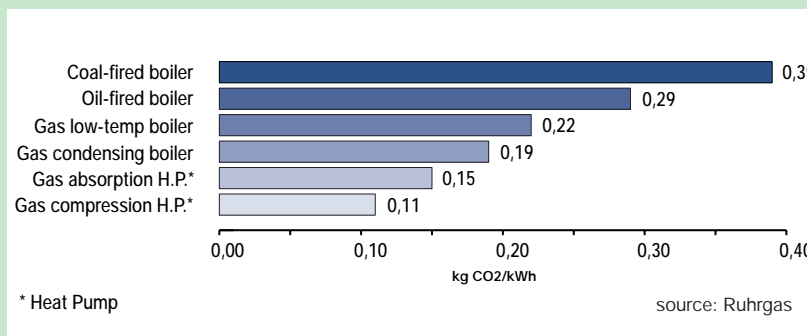
Efficiencies and CO₂ Emissions from Fossil-Fuelled Power Plants



For a given energy performance, less energy supply is required with natural gas owing to the high energy efficiency of natural gas fired technologies :

- easy processing
- efficient combustion
- clean combustion gas for high heat recovery and protection of process equipment

CO₂ Emissions from Heat Supply Systems

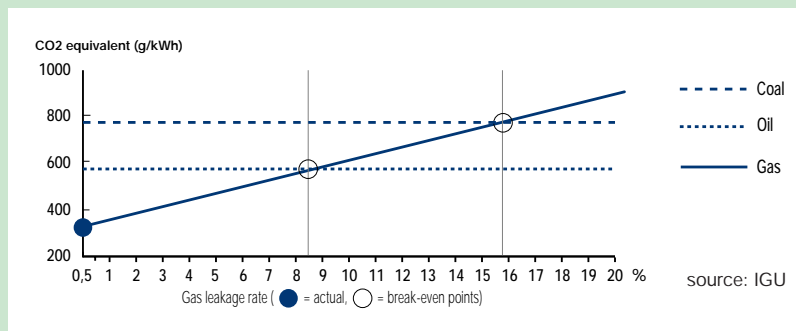


Methane Emissions

Though methane is the main component of natural gas, methane leakages from the total natural gas chain operations (from production to final distribution) are so low that natural gas clearly maintains its "greenhouse" advantage over other fossil fuels.

From a comparison among fossil fuels of total greenhouse gas emissions from the overall fuel chain in terms of CO₂ equivalent, it is possible to determine the theoretical leakage rates of methane from gas supply operations at which gas would break even with coal or oil regarding global warming impact:

Break-Even Leakage Rates - Gas vs Oil and Coal (power generation efficiencies: coal 46%, oil 50%, natural gas 58%)



Methane leakages from natural gas networks in the USA and Western Europe including Scandinavia are estimated at 0.05-0.66% of throughput (source: IGU), far below the break even rates that would negate the climate change advantage of natural gas. With the ongoing replacement of older, low pressure distribution systems, this figure will gradually be reduced further.

9. Definitions and Conversion Factors

Internationally agreed statistical methods and definitions have been applied.

Primary Energy Consumption is defined as the total gross energy supply (indigenous production plus net imports) before any conversion of the primary energy into final energy forms has taken place.

Final Energy Consumption is the Primary Energy Consumption less net energy losses in the production of electricity and synthetic gas, refinery use and other energy sector uses and losses.

Natural Gas Sales and Supplies have been stated in PJ because of different national gas qualities. With an assumed energy content of 1 m³ of natural gas of 39 MJ (Gross Calorific Value), 1 PJ corresponds to approx. 25.6 mill. m³ of natural gas.

Conversion Factors

1PJ (GCV)	=	25.6 million m ³ gas	
1 m ³ of natural gas	=	39 megajoules (MJ - GCV)	= 10.8 kWh
1 MTOE	=	1 Million Tonnes of Oil Equivalent	= 41.86 PJ (NCV)
1000 m ³ of natural gas	=	0.9 ton oil equivalent (toe - crude oil)	
1 BCM	=	1 Billion Cubic Meters	
1 cubic meter (m ³)	=	35.315 cubic feet (cf)	
1 million m ³ of LNG	=	593 million m ³ of gas	
Net Calorific Value (NCV)	=	0.9 Gross Calorific Value (GCV)	
1 Megajoule	=	10 ⁶ Joules	
1 Gigajoule	=	10 ⁹ Joules	
1 Terajoule	=	10 ¹² Joules	
1 Petajoule	=	10 ¹⁵ Joules	

Heat units

Equivalent to :	GJ	kWh	MBtu	th	therm
1 gigajoule (GJ)	1	277.8	0.948	283.9	9.479
1 kilowatt-hour (kWh)	3.6 10 ⁻³	1	3.411 10 ⁻³	0.86	3.411 10 ⁻²
1 million British Thermal Units (MBtu)	1.055	293.2	1	252	10
1 thermie (th)	4.186 10 ⁻³	1.162	3.968 10 ⁻³	1	3.968 10 ⁻²
1 therm	0.1055	29.32	1 10 ⁻¹	25.2	1

10. Sources

IGU: International Gas Union

Cedigaz: Natural Gas in the World, 1998 Survey

IEA: International Energy Agency, Energy Balances and National Accounts of OECD Countries

BP: British Petroleum Statistical Review of World Energy 1998

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