

Statistics



CONTENTS

Definitions, units etc.	37
Installed capacity	38
Load	41
The grid system in the Nordic countries ..	42
Interconnections	43
Line lengths	44
Electricity generation	45
Water reservoirs	47
Exchange of electricity	48
Electricity consumption	51
Total energy supply	52
Prognoses	54

DEFINITIONS

Installed capacity (net capacity): Is given in MW and constitutes the arithmetic sum of the rated capacity of the unit installed, but excluding own consumption.

Transmission capacity: Is the rated capacity in MW of a line with due regard taken to the limits imposed by the transformers connected to it.

Electricity generation (net generation): Is usually given in GWh and represents the output ex works, i.e. excluding own production at power station.

Condense: Is defined as the output from a turbo-generator set operated by steam that is expanded in a cooling water condenser to enable the steam to be utilised exclusively for electric power generation.

Combined heat and power (CHP): Is the generation of electric energy by a generator set driven by steam which, when discharged from the turbine, is applied for a purpose irrelevant to power generation such as district heating (CHP District heating) or process steam for industry (CHP Industry). Previously designated back-pressure generation.

Imports/Exports: Is given in GWh and represents the settled values which (inclusive of compensation of loss) are registered as purchases and sales of electricity between the individual countries. *Net imports:* Is the difference between imports and exports.

Notes:

The Norwegian share of Linnvasselv is considered as exports from Sweden to Norway.
The German share of Enstedværket is considered as exports from Denmark to Germany.

Total consumption: Is given in GWh and is the sum of electricity generation and net imports.

Occasional power to electric boilers: Is given in GWh and is the supply of electricity to electric boilers on special conditions for the generation of steam or hot water, which is alternatively generated by firing with oil or other fuels.

Gross consumption (electricity available): Is usually given in GWh and is the calculated electricity consumption: the sum of domestic electricity generation and imports deducting exports and occasional power to electric boilers.

Losses: Are usually given in GWh and is the calculated expression of the difference between gross consumption and net consumption.

Pumped storage power: Is given in GWh and is the electrical energy consumed by the pumps in raising the water into the upper reservoir.

Net consumption: Is usually given in GWh and is the sum of power consumed by the consumers.

UNITS AND SYMBOLS

kW	kilowatt
MW	megawatt = 1,000 kW
J	joule
kJ	kilojoule
PJ	petajoule = 10^{15} J
kWh	kilowatt-hour = 3,600 kJ
MWh	megawatt-hour = 1,000 kWh
GWh	gigawatt-hour = 1,000,000 kWh
TWh	terawatt-hour = 1,000 GWh
~	Alternating current (AC)
=	Direct current (DC)
.	Data are nonexistent
..	Data are too uncertain
0	Less than 0.5 of the given unit
-	No value

EXAMPLE OF CALCULATION:

Electricity generation

+ Imports

- Exports

Total consumption

- Occasional power to electric boilers

Gross consumption (electricity available)

- Losses, pumped storage power etc.

Net consumption

Responsible for statistics processing:

Anne-Marie Volt - SK Power Company, Denmark

Responsible for the individual countries' statistical information:

Lisbeth Petersson - The Association of Danish Electric Utilities, Denmark

Terho Savolainen - The Association of Finnish Electric Utilities, Finland

Ólafur Pálsson - The Iceland Energy Agency, Iceland

Arne Hjelle - Statnett Market, Norway

Gunilla Kierkegaard and Yngve Wending - Vattenfall AB, Sweden

The present statistics were prepared before the 1995 official statistics for the individual countries have become available. Certain figures in the Annual Report may thus differ from the official statistics.

S1 Installed capacity 31.12.1995, MW

	Denmark	Finland	Iceland	Norway	Sweden	Nordel
Total installed capacity 1995	10 220	14 746	1 049	27 545	34 608	88 168
Commissioned in 1995	382	220	5	158	90	855
Decommissioned in 1995	544	–	–	44	519	1 107
• Hydro power	10	2 842	880	27 276	16 152 ¹⁾	47 160
• Nuclear power	.	2 310	.	.	10 045	12 355
• Other thermal power	9 609	9 588	119	265	8 344	27 925
Of which:						
Condense	5 906 ²⁾	3 673	.	73	2 712	12 364
CHP District heating	3 349	3 007	.	.	3 178	9 534
CHP Industry	65	2 030	.	157	636	2 888
Gasturbine etc.	289	878	119	35	1 818	3 139
• Other renewable power	601	6	50	4	67	728
Of which:						
Wind power	601	6	.	4	67	678
Geothermal power	.	.	50	.	.	50

¹⁾ Incl Norwegian share of Linnvasselv (25 MW)
²⁾ Incl. German share of Enstedværket (300 MW)

S2 Average-year generation of hydro power 1995, GWh

	Denmark	Finland	Iceland	Norway	Sweden	Nordel
Average-year generation 1995	–	12 600	4 950	112 187	63 645	193 382
Average-year generation 1994	–	12 530	4 950	111 697	63 600	192 777
Change	–	70	–	490	45	605

S3 Changes in installed capacity 1995

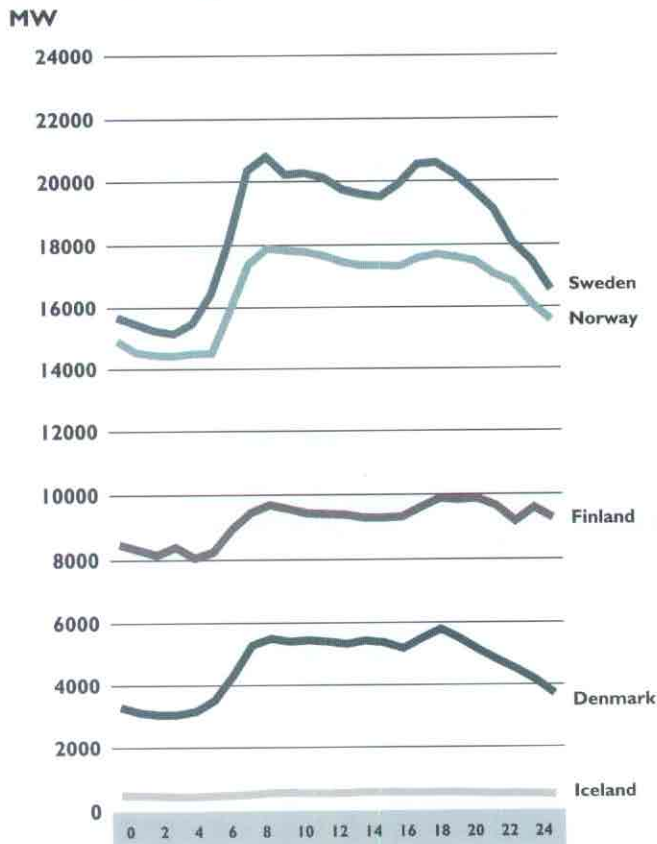
Power category	Power plant	Commissioned	Decommissioned	Change in average-year generation (Hydro power)	Type of fuel
		MW	MW	GWh	
Denmark					
• CHP District heating	Fynsværket		195		Coal/Oil
	Midtkraft		70		Coal/Oil
	Silkeborg	98			Natural gas
	Enstedværket		144		Coal/Oil
	Vestkraft		125		Coal/Oil
	Svanemølleværket	80			Natural gas
	Østkraft	37	10		Coal
	Masnødø	8			Straw
	Næstved	38			Natural gas/ Waste, refuse
	Jyderup	5			Natural gas
	Smørum	6			Natural gas
	Sorø	6			Natural gas
	Jægerspris	6			Natural gas
	Præstø	4			Straw
	Others	19			Natural gas
• Wind power	Various	75			
Finland					
• Hydro power	Koivukoski	25		20	
	Matarakoski	11		32	
	Others	4		18	
• CHP District heating	Toppila 2	105			Peat
	Rovaniemi	30			Peat
	Others	5			
• CHP Industry	Kyro	40			Natural gas
Iceland					
• Hydro power	Laxá	5		0	
Norway					
• Hydro power	Frøystul	43	23	70	
	Skree	7	0	36	
	Hekni	56	0	240	
	Trelandsfoss	8	8	-2	
	Åsebotn	16	0	85	
	Herlandsfoss	14	12	6	
	Kinso	2	0	12	
	Fossheim	9	0	29	
	Valsøyfjord	4	2	2	
	OVF Vikvatn	0	0	11	
Sweden					
• Hydro power	Juktan		335	0	
	Gideåbacka	15	8	10	
	Lofsån	4		18	
	Domnarret	2		20	
	Various changes		28	0	
• Nuclear power	Oskarshamn I	5			
• Condense	Kvarnsveden		28		Oil
• CHP District heating	Nyköping	35			Wood waste
• Gasturbine	Hallstavik		120		
• Wind power	Abt. 60 new plants	29			

S4 Decided power plants (larger than 10 MW)

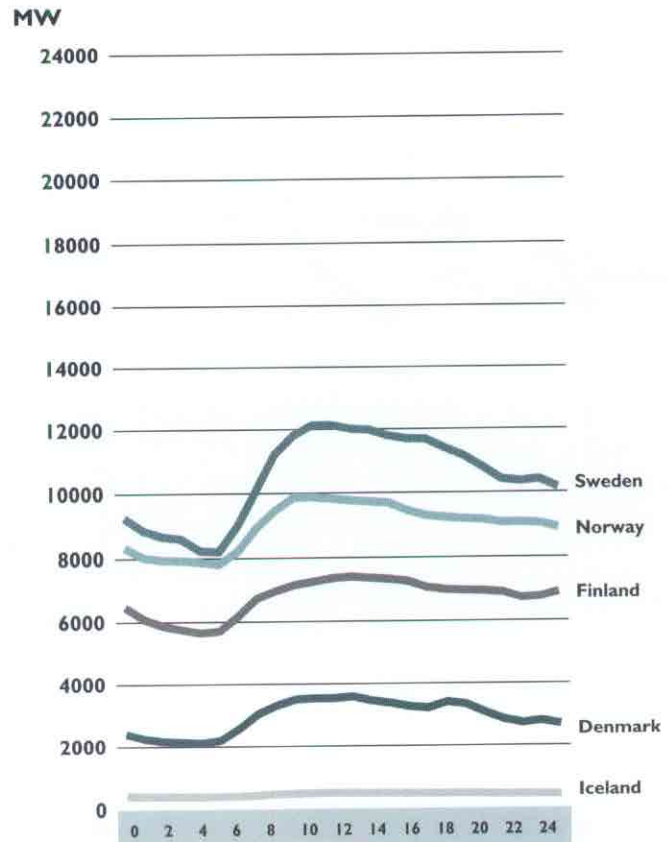
Power category	Power Plant	Capacity	Estimated commission	Average-year generation	Type of fuel
		MW	Year	GWh	
Denmark					
• CHP District heating	Skærbækværket 3	394	1997		Natural gas
	Nordjyllandsværket 3	385	1998		Coal/Oil
	Sønderborg	56	1996		Natural gas/Waste, refuse
	Avedøreværket 2	386	2000		Coal/Natural gas/ Straw/Wood waste/(Oil)
	Århusværket	88	1999		Coal/Oil/Biomass
	Ringsted	12	1996		Natural gas
Finland					
• Hydro power	Pamilo	26	1997	0	
	Vuotos	37	2001	430	
• CHP Industry	MB/Rauma	85	1996		Waste, refuse
	MB/Kemi	30	1996		Waste, refuse
	VTS/Kemi	60	1996		Waste, refuse/Peat
	PVO Nokia	45	1997		Natural gas
	Kirkniemi	70	1997		Natural gas
	Neste POVO	70	1997		Natural gas
	VTS/Oulu	50	1997		Waste, refuse
• CHP District heating	Forssa	15	1996		Wood waste/Bark
	Vuosaari B	450	1997		Natural gas
Norway					
• Hydro power	Skjerka	95	1997	80	
	Gravfoss	34	1996	78	
	Svartisen II	40	1998	251	
Sweden					
• CHP District heating	Brista	39	1996		Wood waste
	Skellefteå	39	1996		Wood waste
	Växjö	37	1996		Wood waste

S5 System load on 3rd Wednesday in January and 3rd Wednesday in July 1995

Average 24-hour load 3rd Wednesday
in January (18-01-95)



Average 24-hour load 3rd Wednesday
in July 1995 (19-07-95)



	Installed net capacity	Maximum system load	Minimum system load
GW	31.12.95	3rd Wednesday in January 1995 6:00 p.m.	3rd Wednesday in July 1995 5:00 a.m.
Denmark	10.2	5.8	2.1
Finland	14.7	9.9	5.7
Iceland	1.0	0.6	0.4
Norway	27.5	17.7	7.9
Sweden	34.6	20.6	8.2
Nordel	88.0	54.6	24.3

All hours are local time



S6 Existing interconnections between the Nordel countries

Countries Stations	Rated voltage	Transmission capacity as per design rules ¹⁾		Total lines	Of which cable
	kV	MW		km	km
Denmark-Norway		From Denmark	To Denmark		
Tjele-Kristiansand	250/350	1 040	1 040	240/pol	127/pol
Finland-Norway		From Finland	To Finland		
Ivalo-Varangerbotn	220~	100	70	228	.
Denmark-Sweden		From Sweden	To Sweden		
Teglstrupgård-Mörarp 1 and 2	132~	350 ²⁾	350 ²⁾	23	10
Hovegård-Söderåsen 1	400~	800 ²⁾	800 ²⁾	91	8
Hovegård-Söderåsen 2	400~	800 ²⁾	800 ²⁾	91	8
Vester Hassing-Göteborg	250=	290	270	176	88
Vester Hassing-Lindome	285=	380	360	149	87
Hasle (Bornholm)-Borrby	60~	60	60	48	43
Finland-Sweden		From Sweden	To Sweden		
Ossauskoski-Kalix	220~] 900 ³⁾] 700	93	.
Petäjäskoski-Letsi	400~			230	.
Keminmaa-Svartbyn	400~			134	.
Hellesby (Åland)-Skattbol	70~	35	35	77	56
Raumo-Forsmark	400=	500	500	235	198
Norway-Sweden		From Sweden	To Sweden		
Sildvik-Tornehamn	132~	125	125	39	.
Ofofen-Ritsem	400~	750	750	58	.
Rössåga-Ajaure	220~	250 ⁴⁾	250 ⁴⁾	117	.
Linnvasselv, transformer	220/66~	50	50	.	.
Nea-Järpströmmen	275~	450 ⁴⁾	450 ⁴⁾	100	.
Lutufallet-Höljes	132~	40	20	18	.
Eidskog-Charlottenberg	132~	100	100	13	.
Hasle-Borgvik	400~] 1800 ⁴⁾] 1800 ⁴⁾	106	.
Halden-Skogssäter	400~			135	.

¹⁾ Maximum permissible exchange

²⁾ Thermal limit. The total transmission capacity is +/- 1300 MW. It can be higher, however, if the practical possibilities of supply are limited, it is most often due to the import/export capacity of the Swedish or the Danish system. On the basis of Baltic Cable, Kontek and others, an analysis of an increase of the transmission capacity of the interconnections is proceeding.

³⁾ Further 100 MW for power balance deviation

⁴⁾ The transmission capacity can in certain operating situations be lower due to bottlenecks in the Norwegian network. 1800 MW implies a network protection system during operation (PDC = Production disconnection)

S7 Existing interconnections between the Nordel countries and other countries

Countries Stations	Rated voltage	Transmission capacity		Total lines	Of which cable
	kV	MW		km	km
Denmark-Germany		From Nordel	To Nordel		
Kassø-Audorf	2 × 400~] 1 400 ¹⁾] 1 400 ¹⁾	107	.
Kassø-Flensburg	220~			40	.
Ensted-Flensburg	220~			34	.
Bjæverskov-Rostock	400=	600	600	166	166
Finland-Russia		From Nordel	To Nordel		
Imatra-GES 10	110~	.	100	20	.
Ylikkälä-Viborg	±85=	.	900	.	.
Nellimö-Kaitakoski	110~	60	60	20	.
Norway-Russia		From Nordel	To Nordel		
Kirkenes-Boris Gleb	154~	50	50	10	.
Sweden-Germany		From Nordel	To Nordel		
Västra Kärrstorp - Herrenwyk	450=	600 ²⁾	600 ²⁾	250	220

¹⁾ Transmission capacity alters between 1200 and 1500 MW due to operating conditions

²⁾ Due to limitations in the German network, the transmission capacity is limited to 250 MW from Nordel and 200 MW to Nordel for the present

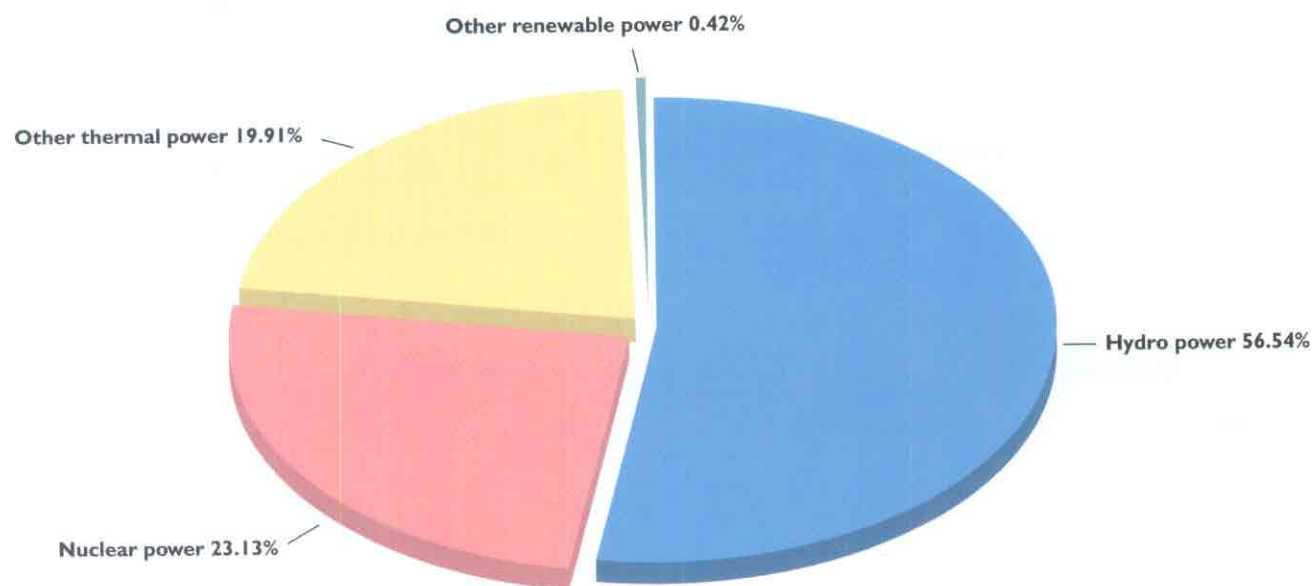
S8 Decided interconnections

Countries Stations	Rated voltage	Transmission capacity as per design rules	Total lines	Of which cable	Brought into service
	<i>kV</i>	<i>MW</i>	<i>km</i>	<i>km</i>	<i>Year</i>
Denmark -Denmark (Storebælt/The Great Belt) Elsam - Elkraft	400 =	500-600	approx 70	approx 70	¹⁾
Norway-The Netherlands (NorNed Kabel) Lista - Eemshaven	400 - 500 =	min 600	approx 550	approx 550	2001
Norway-Germany (Euro Cable) Fedra ²⁾ - Brunsbüttel	400 - 500 =	min 600	approx 550	approx 550	2002
Norway-Germany (Viking Cable) Fedra ²⁾ - Wilhelmshaven	400 - 500 =	min 600	approx 550	approx 550	2003
¹⁾ Uncompleted decision procedure ²⁾ Overhead line to Tonstad					

S9 Transmission lines 110 - 400 kV in service 31.12.1995

	400 kV, AC and DC	220-300 kV, AC and DC	110, 132, 150 kV
	<i>km</i>	<i>km</i>	<i>km</i>
Denmark	1 285 ¹⁾	540 ²⁾	3 952 ³⁾
Finland	3 821 ⁴⁾	2 660	14 750
Iceland	.	492	1 315
Norway	2 110	5 782 ²⁾	10 300
Sweden	10 657 ⁴⁾	4 621 ²⁾	15 000
¹⁾ Of which 2 km in service with 150 kV and 46 km with 132 kV ²⁾ Of which 80 km in Denmark and 96 km in Sweden (KontiSkan), 89 km in Denmark and 382 km in Norway (Skagerrak) in service with 250 kV DC and 75 km in Denmark and 74 km in Sweden (KontiSkan 2) in service with 285 kV DC ³⁾ Of which 13 km in service with 60 kV and 105 km in service with 50 kV ⁴⁾ Of which 99 km in Finland and 99 km in Sweden DC submarine cable and 34 km in Finland and 2 km in Sweden DC land cable (Fenno-Skan)			

S10 Total electricity generation within Nordel 1995



S11 Electricity generation 1995, GWh

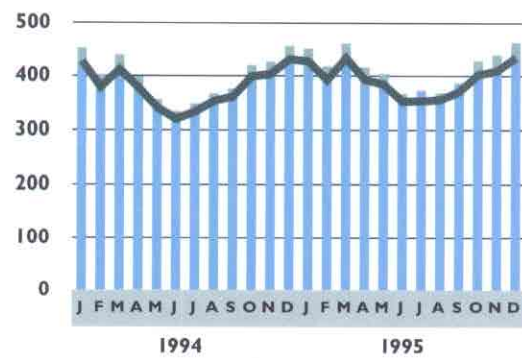
	Denmark	Finland	Iceland	Norway	Sweden	Nordel
Total generation 1995	34 339	60 610	4 975	123 481	143 311	366 716
• Hydro power	33	12 785	4 680	122 826	67 017	207 341
• Nuclear power	.	18 125	.	.	66 697	84 822
• Other thermal power	33 163	29 692	6	646	9 498	73 005
Of which:						
Condense	32 638 ¹⁾	8 783	.	90	409	41 920
CHP District heating	..	11 389	.	.	4 674	16 063
CHP Industry	525	9 513	.	368	4 214	14 620
Gasturbine etc.	—	7	6	188	201	402
• Other renewable power ²⁾	1 143	8	289	9	99	1 548
Total generation 1994	38 044	62 180	4 774	113 530	137 653	356 181
Change as against 1994	-9.7%	-2.5%	4.2%	8.8%	4.1%	3.0%

¹⁾ Incl. generation in combined heat and power stations
²⁾ Wind power. Iceland: Geothermal power

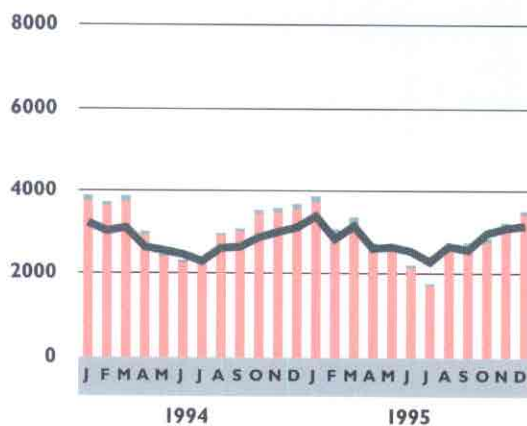
S12 Monthly electricity generation
and gross consumption 1994 -1995, GWh

- Gross consumption
- Generation by hydro power
- Generation by nuclear and other thermal power
- Generation by wind power or by geothermal power (Iceland)

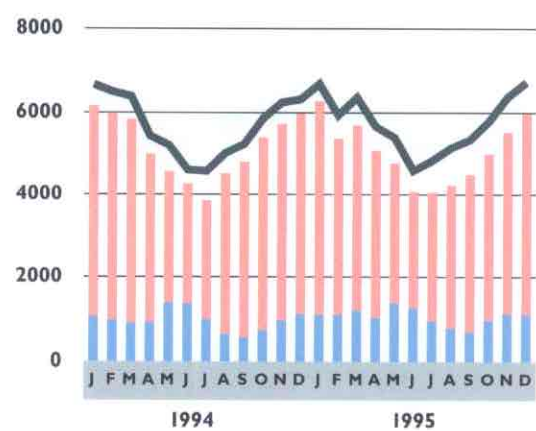
Iceland



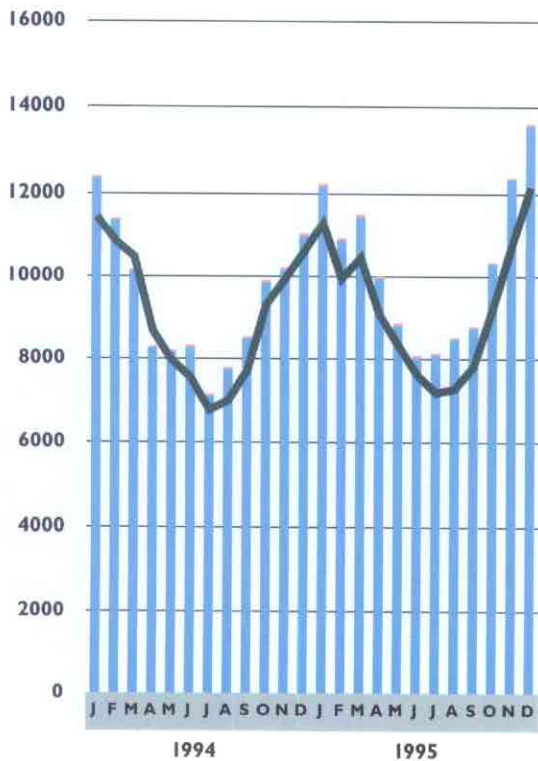
Denmark



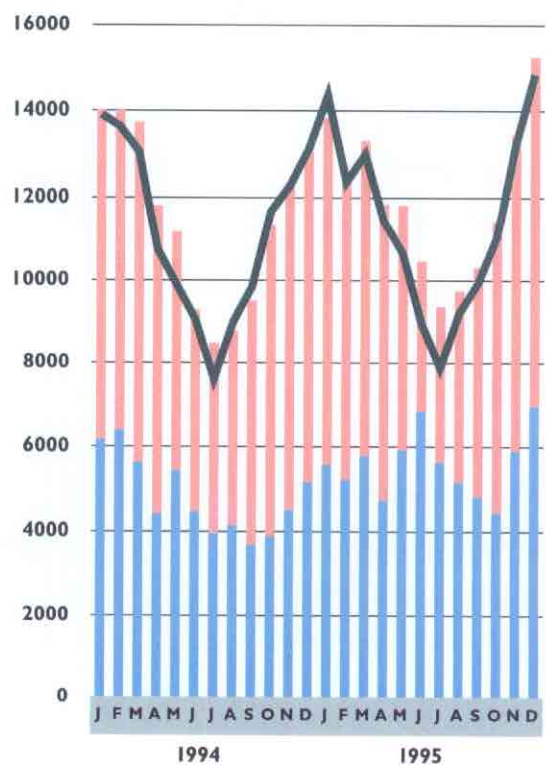
Finland



Norway



Sweden



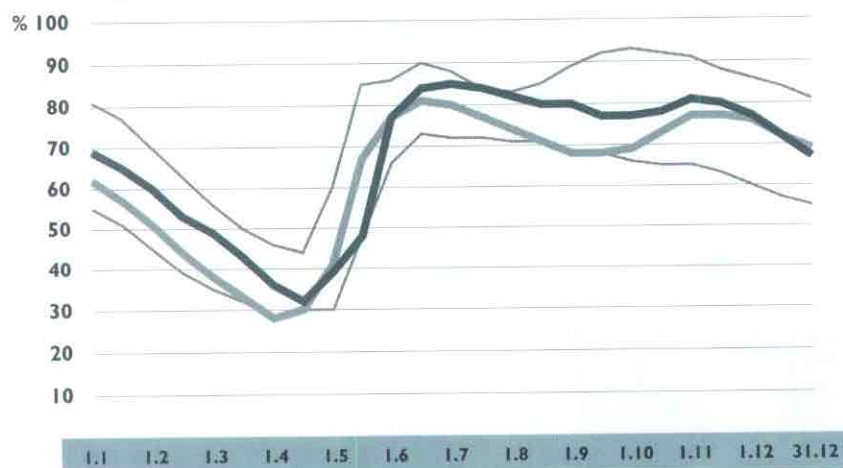
S13 Water reservoirs 1995

■ Water reservoirs 1995 shown in %

■ Water reservoirs 1994 shown in %
Norway: Average 1982-1991

■ Minimum- and maximum in %

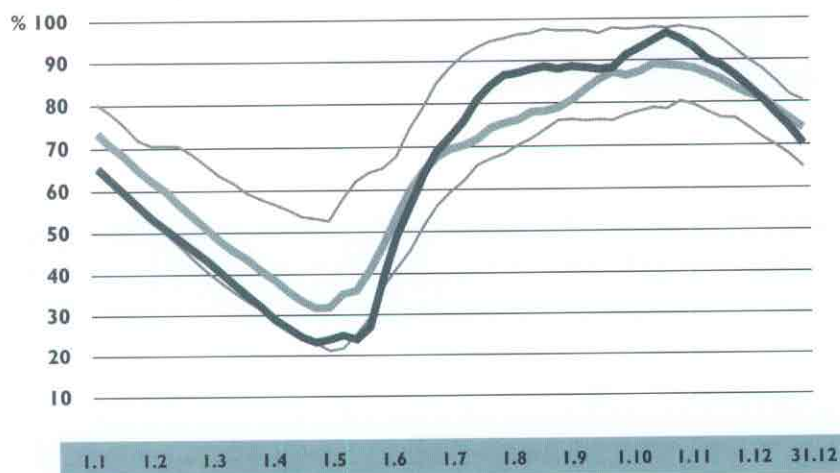
Finland



Reservoir capacity
1.1.1995: 4 900 GWh
31.12.1995: 4 900 GWh

Minimum and maximum values from data
which have been recorded 1985-1994

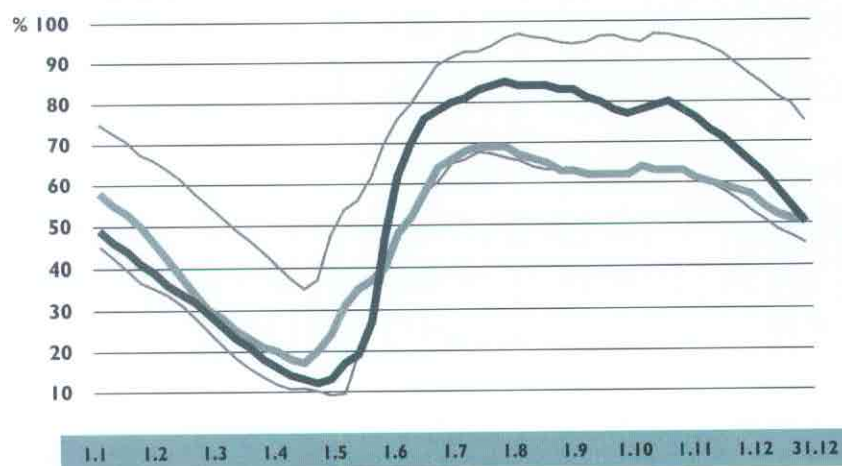
Norway



Reservoir capacity
1.1.1995: 77 073 GWh
31.12.1995: 77 888 GWh

Minimum and maximum values from data
which have been recorded 1982-1991

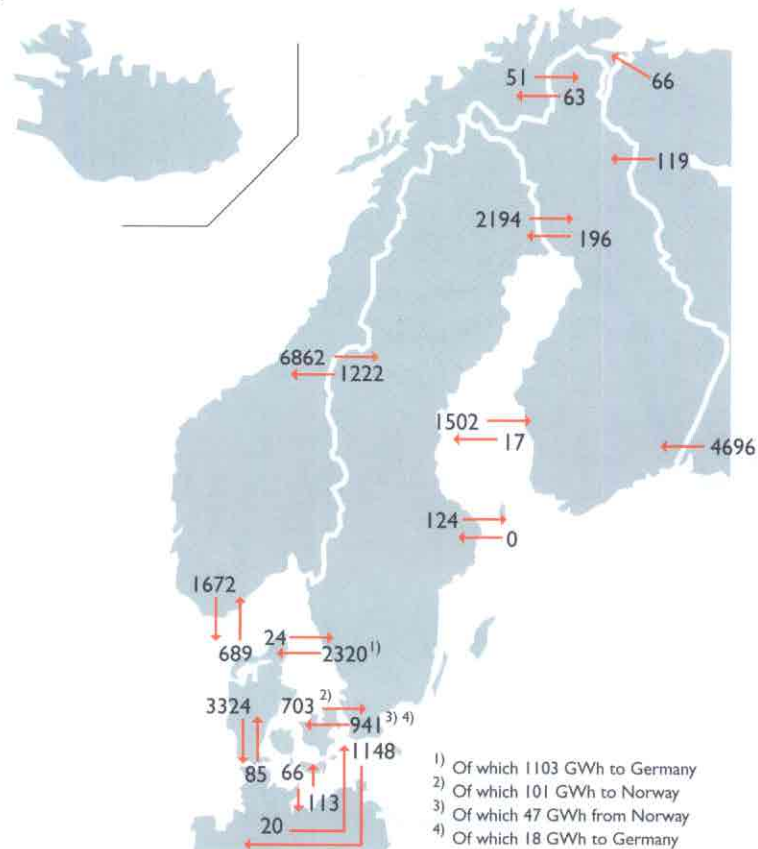
Sweden



Reservoir capacity
1.1.1995: 33 550 GWh
31.12.1995: 33 550 GWh

Minimum and maximum values from data
which have been recorded 1980-1994

SI4 Exchange of electricity 1995, GWh



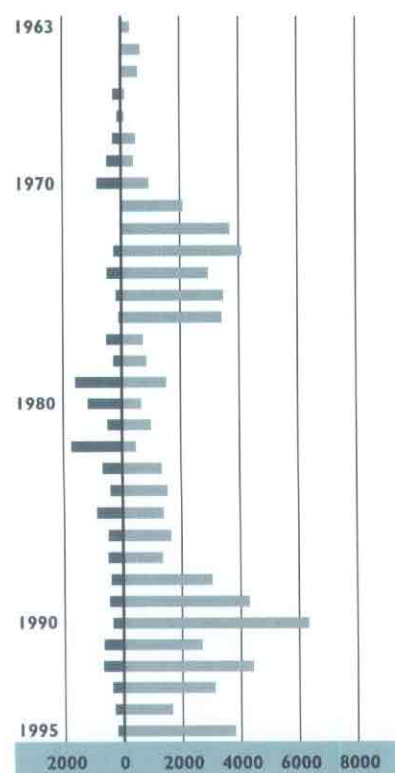
SI5 Imports/Exports 1995, GWh

	Imports to:					
	Denmark	Finland	Norway	Sweden	Other countries ¹⁾	Σ Exports
Exports from:						
Denmark	.	.	790	625	3 390	4 805
Finland	.	.	63	213	.	276
Norway	1 719	51	.	6 862	.	8 632
Sweden	2 093	3 821	1 222	.	2 270	9 406
Other countries ¹⁾	198	4 815	66	20	.	5 099
Σ Imports	4 010	8 687	2 141	7 720	5 660	28 218
	Denmark	Finland	Norway	Sweden	Nordel	
Total imports 1995	4 010	8 687	2 141	7 720	22 558	
Total exports 1995	4 805	276	8 632	9 406	23 119	
Net imports	- 795	8 411	-6 491	-1 686	- 561	
Net imports/ Gross consumption	-2.4%	12.2%	-5.8%	-1.2%	-0.2%	

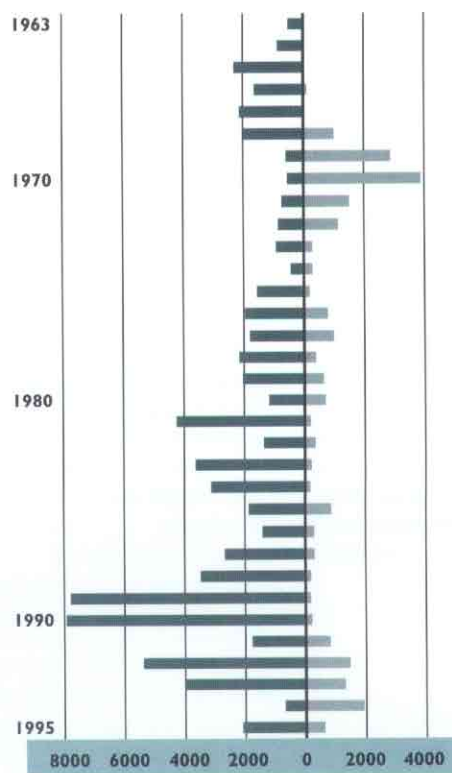
¹⁾ Germany and Russia

S16 Exchange of electricity 1963 - 1995, GWh

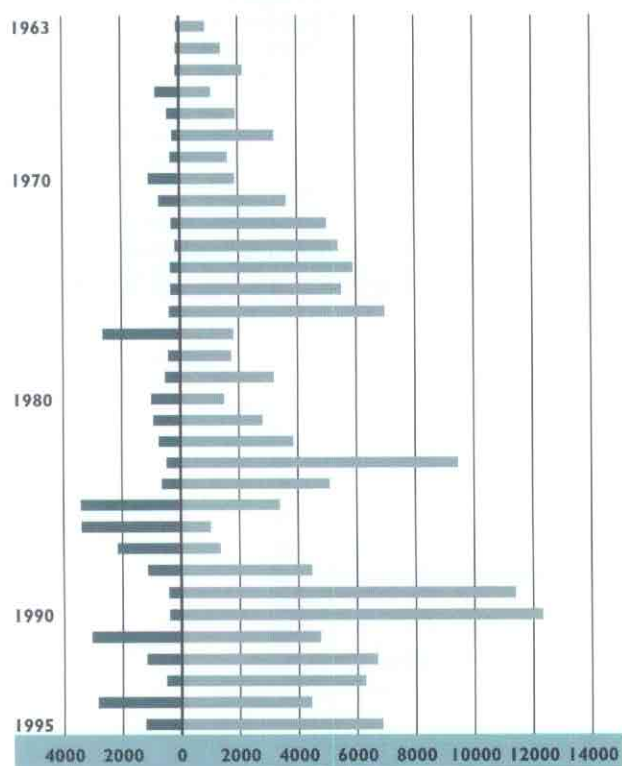
To Sweden ↔ To Finland



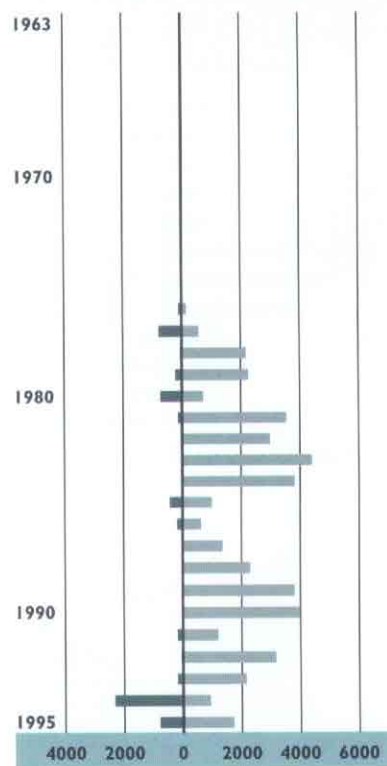
To Denmark ↔ To Sweden



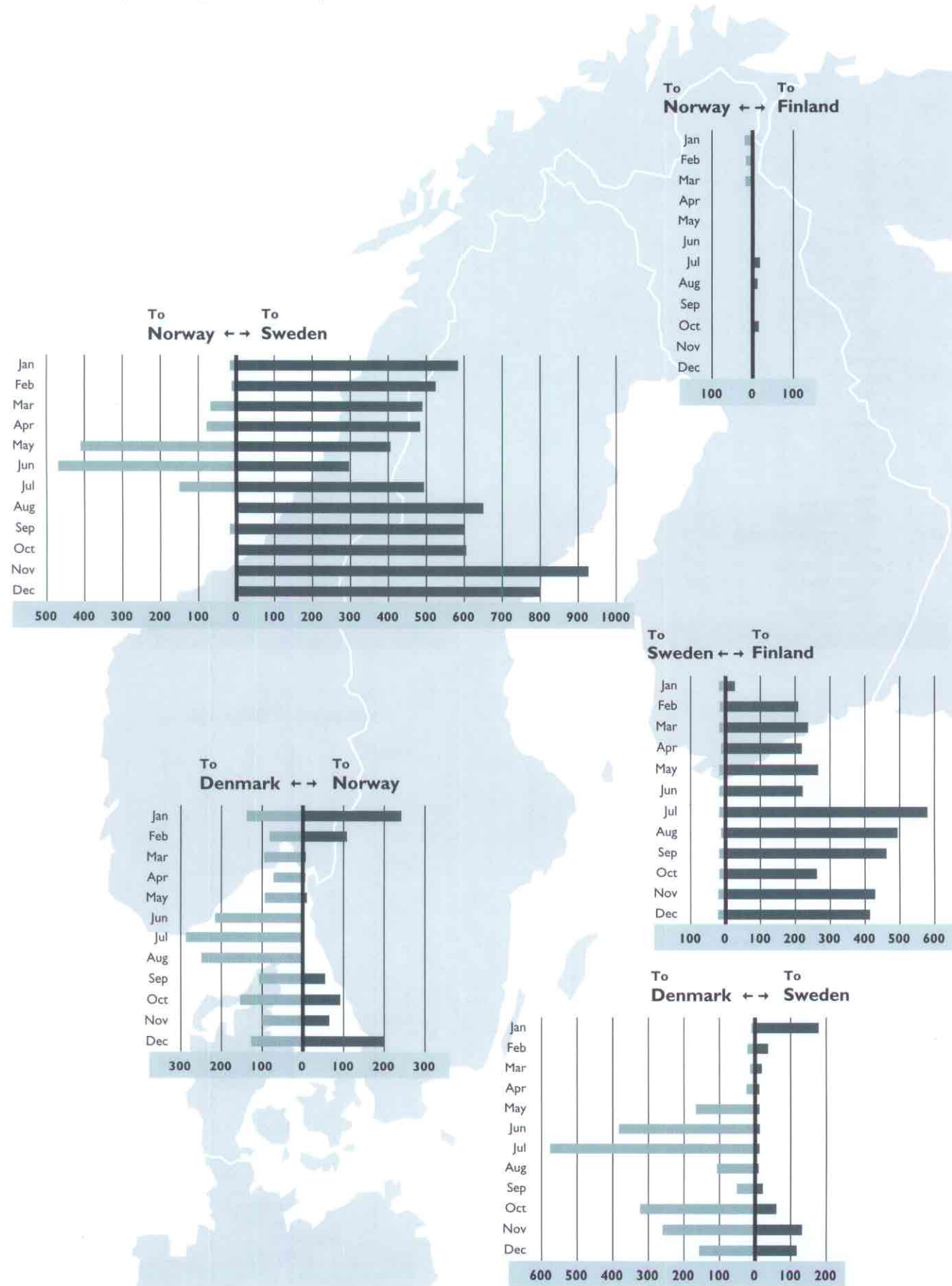
To Norway ↔ To Sweden



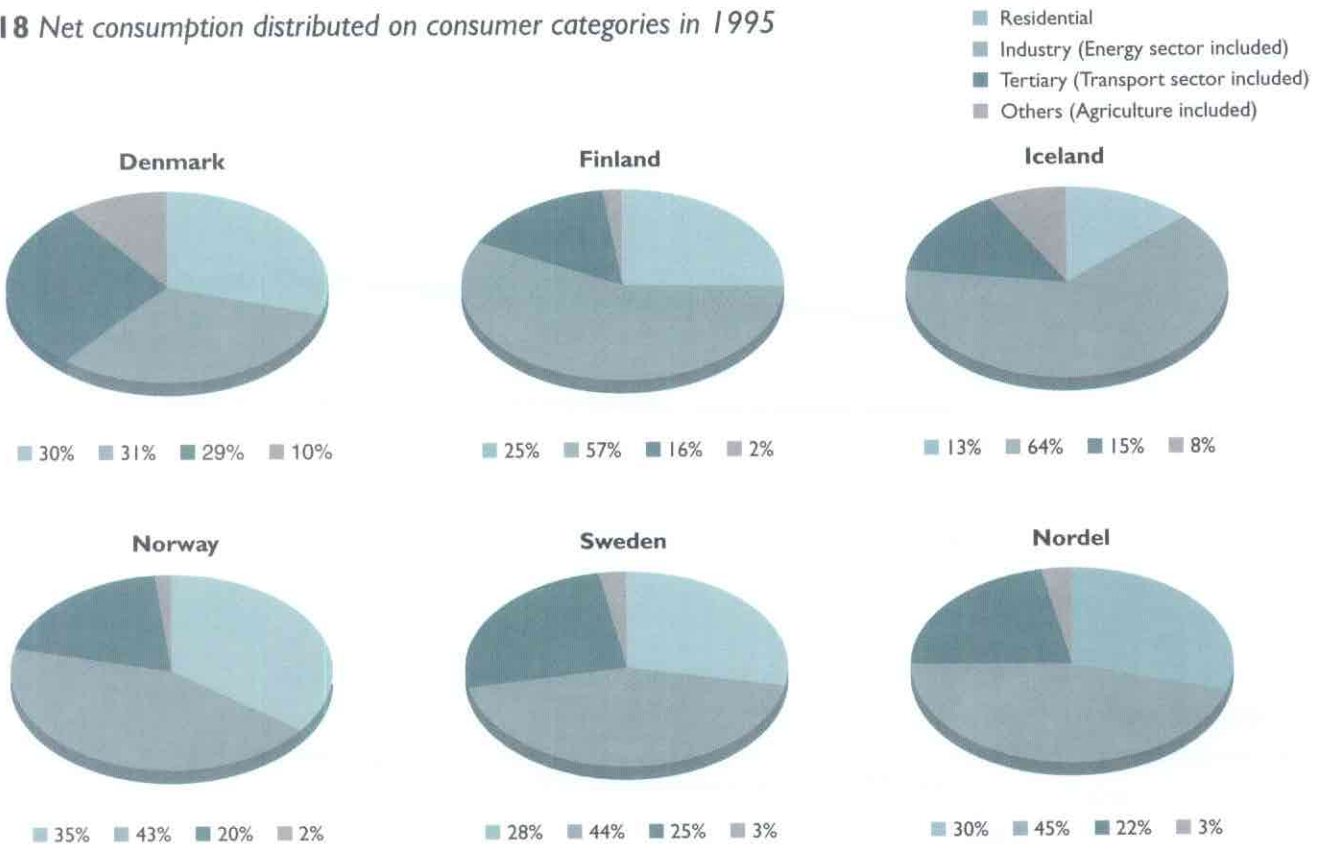
To Norway ↔ To Denmark



S17 Monthly exchange of electricity between the Nordel countries 1995, GWh



S18 Net consumption distributed on consumer categories in 1995



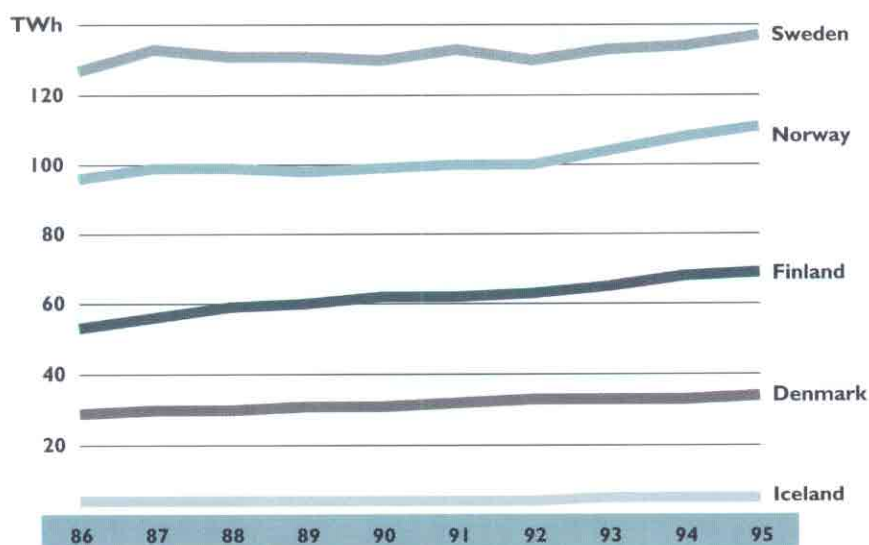
S19 Electricity consumption 1995, GWh

	Denmark	Finland	Iceland	Norway	Sweden	Nordel
Total consumption 1995	33 544	69 021	4 975	116 990	141 625	366 155
Occasional power to electric boilers	.	82	271	5 869	4 672	10 894
Gross consumption 1995	33 544	68 939	4 704	111 121	136 953	355 261
Losses, pumped storage power etc.	2 194	2 719	284	11 391 ¹⁾	8 953	25 541
Net consumption	31 350	66 220	4 420	99 730	128 000	329 720
Of which:						
Residential	9 400	16 760	580	35 200	36 000	97 940
Industry (Energy sector included)	9 700	37 820	2 830	43 480	56 000	149 830
Tertiary (Transport sector included)	9 050	10 300	660	19 450	32 500	71 960
Others (Agriculture included)	3 200	1 340	350	1 600	3 500	9 990
Average population 1995, mill. inh.	5.241	5.109	0.267	4.348	8.837	23.802
Gross consumption per inh., kWh	6 400	13 494	17 618	25 557	15 498	14 926
Gross consumption 1994	33 198	68 153	4 537	108 305	133 836	348 029
Change in gross consumption as against 1994	1.0%	1.2%	3.7%	2.6%	2.3%	2.1%

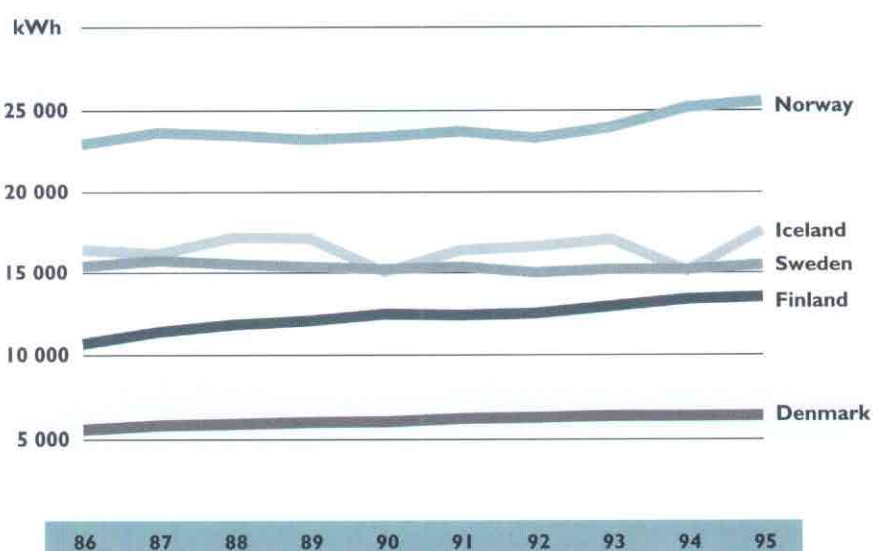
¹⁾ Of which pumped storage power 1 705 GWh

S20

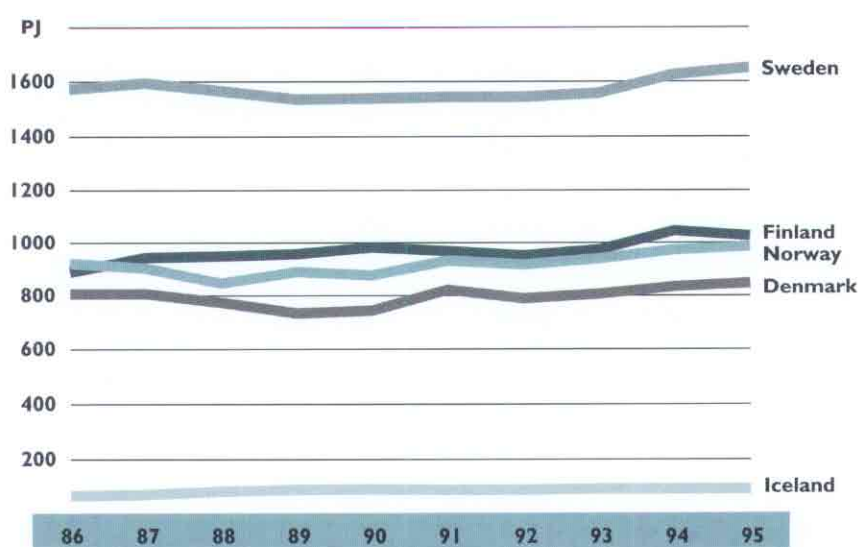
Gross consumption
1986-1995, TWh

**S21**

Gross consumption
per inhabitant
1986-1995, kWh

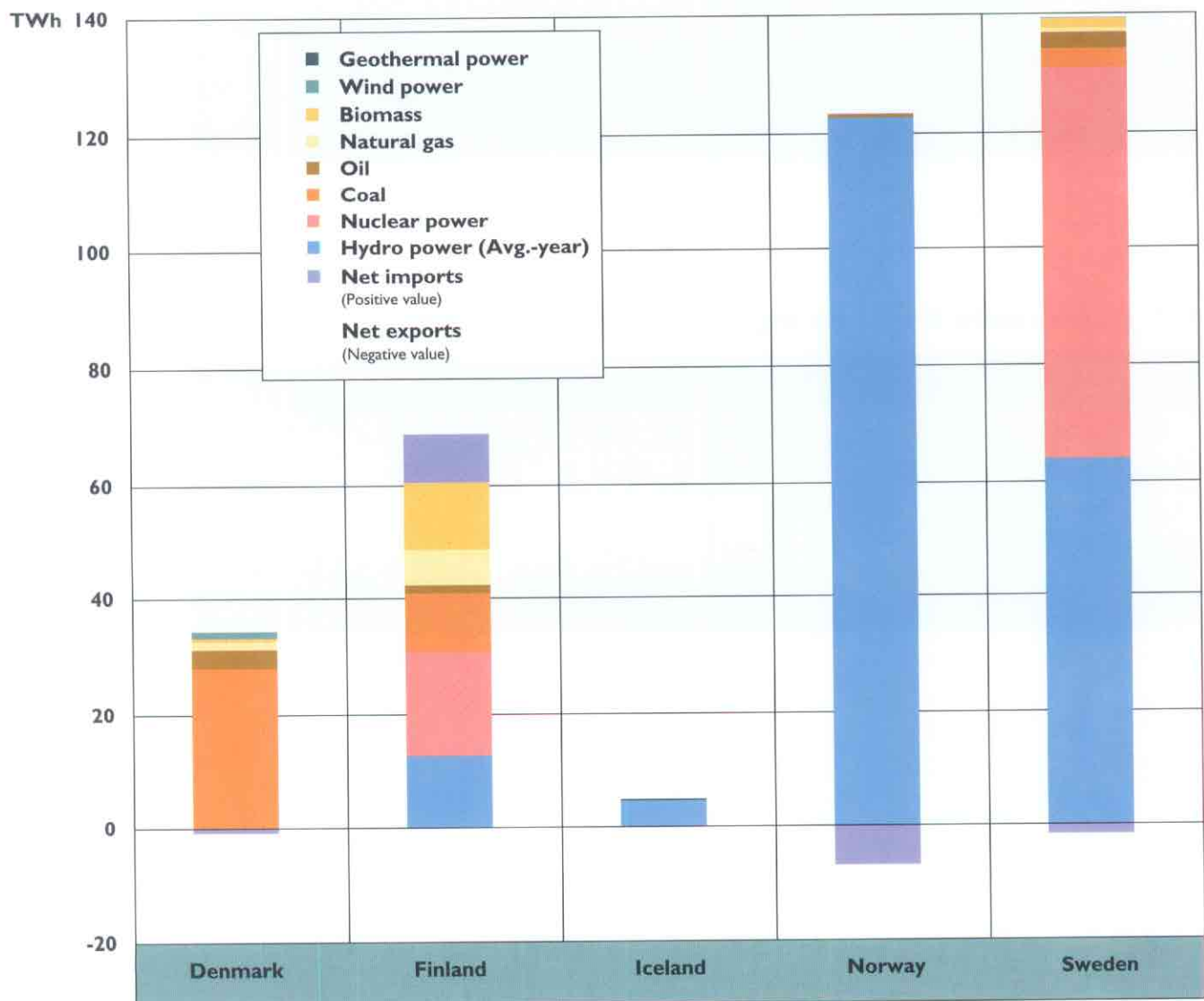
**S22**

Total energy supply
1986-1995, PJ



S23 Total consumption 1995, GWh

	Denmark	Finland	Iceland	Norway	Sweden	Nordel
Generation 1995	34 339	60 610	4 975	123 481	143 311	366 716
Net imports 1995	- 795	8 411	.	-6 491	-1 686	- 561
Total consumption 1995	33 544	69 021	4 975	116 990	141 625	366 155
Generation 1994	38 044	62 180	4 774	113 530	137 653	356 181
Net imports 1994	-4 846	6 077	.	90	256	1 577
Total consumption 1994	33 198	68 257	4 774	113 620	137 909	357 758
Change in total consumption	1.0%	1.1%	4.2%	3.0%	2.7%	2.3%

S24 Distribution of total consumption on energy sources 1995, TWh

S25 Gross consumption in 1995 and prognoses for 2000 and 2005, TWh

Year	Denmark	Finland	Iceland	Norway	Sweden
1995	34	69	4.7	111	137
2000	38	81	6.2	¹⁾	142
2005	39	89	6.4	¹⁾	151

¹⁾ No official prognoses are available

S26 Peak load demand in 1995 and prognoses for 2000 and 2005, MW

Year	Denmark	Finland	Iceland	Norway	Sweden
1995	6 910	10 730	742	20 302 ¹⁾	24 435
2000	8 198 ²⁾	14 200	887	³⁾	28 400
2005	9 002 ²⁾	15 600	933	³⁾	30 200

¹⁾ Excl. reserve requirements

²⁾ Of which 350 MW at VEAG's disposal

³⁾ No official prognoses are available

S27 Installed capacity in 1995 and prognoses for 2000 and 2005, MW

Year	Denmark	Finland	Iceland	Norway	Sweden
1995	10 220	14 746	1 049	27 545	34 608
2000	9 835 ¹⁾	16 000	1 084	²⁾	34 700
2005	8 778 ¹⁾	²⁾	1 134	²⁾	35 000

¹⁾ Excl. capacity of autoproducers

²⁾ No official prognoses are available