

INSTALLERAD EFFEKT				
31.12.1997, MW				
	Danmark	Finland	Island	Norge
	11 546	15 836	2 921	1 129
	10	2 370	928	27 661
	10 461	10 533	3 073	27 120
	5 569	3 540	3 540	120
	4 803	3 540	3 540	120

## Definitions, Units and Symbols

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**Installed Capacity**

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## DEFINITIONS, UNITS AND SYMBOLS

### Installed capacity (net capacity):

The sum of the rated capacities of the individual power plant units (expressed in MW), excluding the power plant's own consumption of electricity.

### Transmission capacity:

The power (in MW) that a high-voltage line can transmit under normal conditions, taking into account any limitations that may be imposed on the rated capacity.

### Electricity generation (net generation):

The output of a power plant, excluding the plant's own consumption; usually expressed in GWh.

### Generation of condensing power:

Generation at a conventional steam power plant where the energy of the steam is used solely for electricity generation and where the steam is condensed to water after the turbine.

### Combined heat and power (CHP) generation:

Generation at a steam power plant where some of the energy of the steam is used for electricity generation and some for another purpose, e.g. for district heating or as process steam for industry. Previously known as back-pressure generation.

### Imports/exports:

Since 1 January 1996, the monthly sums (in GWh) of the physically registered MWh values for each connection between the individual countries, per hour of exchange. Until 31 December 1995, imports and exports referred to the quantities of energy recorded as purchases and sales between the respective countries when accounts were settled. Net imports is the difference between imports and exports. The Norwegian share of Linnvasselv is recorded as imports to Norway and the German share of Enstedværket is recorded as exports to Germany.

### Total consumption:

The sum of electricity generation and net imports, expressed in GWh.

### Occasional power to electric boilers:

Expressed in GWh, this refers to the supply of electricity to electric boilers on special conditions for the generation of steam or hot water, which may alternatively be generated using oil or some other fuel. As of the reorganisation of its electricity market on 1 January 1996, Sweden can no longer determine monthly values for occasional power to electric boilers. The yearly statistics, too, only give the supply of power to electric boilers at district heating plants. Thus the values for gross and net consumption of electricity in Sweden also include the supply of power to electric boilers in industry.

### Gross consumption:

The sum of domestic generation and imports minus exports and occasional power to electric boilers; usually expressed in GWh. For Sweden, the value for gross consumption of electricity also includes supply of power to certain electric boilers (see the definition under Occasional power to electric boilers).

### Losses:

The difference between gross consumption and net consumption plus pumped storage power; usually expressed in GWh.

### Pumped storage power:

The electricity used for pumping water up to a reservoir, for the generation of electricity on a later occasion; expressed in GWh.

### Net consumption:

The sum of the energy used by consumers of electricity; usually expressed in GWh.

### UNITS AND SYMBOLS

kW	kilowatt
MW	megawatt = 1,000 kW
GW	gigawatt = 1,000 MW
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 MWh
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 unit given
-	No value

### CALCULATION OF ELECTRICITY CONSUMPTION

Electricity generation
+ Imports
- Exports
-----
= <b>Total consumption</b>
- Occasional power to electric boilers
-----
= <b>Gross consumption</b>
- Losses, pumped storage power, etc.
-----
= <b>Net consumption</b>

### Responsible for statistical data on the individual countries:

Lisbeth Petersson - Association of Danish Electric Utilities, Denmark  
Tapani Jylhä - Finnish Energy Industries Federation (Finergy), Finland  
Ólafur Pálsson - Iceland Energy Agency, Iceland  
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Lars Munter - Svenska Kraftnät, Sweden

### Responsible for processing of the statistics:

Laura Karjalainen - Imatran Voima Oy, Finland

The statistical data and selected sections of the rest of the Annual Report can also be read on Nordel's Internet pages at [www.nordel.org](http://www.nordel.org).

The present statistics were prepared before the 1997 official statistics for the individual countries had become available. Certain figures in the Annual Report may thus differ from the official statistics.

## INSTALLED CAPACITY

### S1 INSTALLED CAPACITY ON 31 DEC. 1997, MW

	Denmark	Finland	Iceland	Norway	Sweden	Nordel
<b>Installed capacity, total</b>	11 546	15 836	1 129	27 661	34 044	<b>90 216</b>
<b>Hydropower</b>	10	2 921	928	27 364	16 246 <sup>1)</sup>	<b>47 469</b>
<b>Nuclear power</b>	.	2 370	.	.	10 056	<b>12 426</b>
<b>Other thermal power</b>	10 461	10 533	121	293	7 620	<b>29 028</b>
- condensing power	5 569 <sup>2)</sup>	3 673	.	73	2 777	<b>12 092</b>
- CHP, district heating	4 403	3 567	.	.	2 354	<b>10 324</b>
- CHP, industry	200	2 415	.	185	776	<b>3 576</b>
- gas turbines, etc.	289	878	121	35	1 713	<b>3 036</b>
<b>Other renewable power</b>	1 075	12	80	4	122	<b>1 293</b>
- wind power	1 075	12	.	4	122	<b>1 213</b>
- geothermal power	.	.	80	.	.	<b>80</b>
Commissioned in 1997	598	873	80	119	115	<b>1 785</b>
Decommissioned in 1997	44	0	0	89	229	<b>362</b>

<sup>1)</sup> Includes the Norwegian share of Linnvasselv (25 MW)  
<sup>2)</sup> Includes the German share of Enstedværket (300 MW)

### S2 AVERAGE-YEAR GENERATION OF HYDROPOWER IN 1997, GWH

	Denmark	Finland	Iceland	Norway	Sweden	Nordel
<b>Average-year generation 1997</b>	-	12 690	5 500	112 800	63 700	<b>194 690</b>
<b>Average-year generation 1996</b>	-	12 608	4 950	112 600	63 645	<b>193 803</b>
<b>Change</b>	-	82	550	200	55	<b>887</b>

### S3 CHANGES IN INSTALLED CAPACITY IN 1997

Power category	Power Plant	Commissioned	Decommissioned	Change in average-year generation (hydropower)	Type of fuel
		MW	MW	GWh	
<b>Denmark</b>					
CHP, district heating	Enstedværket	30			Coal/Oil Natural gas
	Skærbækværket	434			
	Others	75	44		
Wind power	Several small plants	59			
<b>Finland</b>					
Hydropower	Anjalankoski	3		25	
	Hämeenkyrö	12		15	
	Merikoski	2		9	
	Pamilo	27		1	
	Raasakka	20		25	
	Seitakorva II	6		5	
Nuclear power	Olkiluoto	20			
CHP, district heating	Ikaalinen	6			Natural gas
	Kotka	47			Natural gas
	Säkylä	5			Natural gas
	Vuosaari B	472			Natural gas
CHP, industry	Kirkniemi	75			Natural gas
	Neste POVO	70			Natural gas
	PVO Nokia	45			Natural gas
	VTS/Oulu	57			Wood chips/Bark/Peat
<b>Iceland</b>					
Hydropower	Burfell	50		380	
Geothermal power	Krafla	30			
<b>Norway</b>					
Hydropower	Skjerka	96		99	
	Svartisen	350	340	47	
	Others	13	89	13	
<b>Sweden</b>					
Hydropower	Kvarnsveden	29		55	
	flera små effektändringar	14		0	
Nuclear power	Ringhals	1			
Condensing power	Öresundsverket		65		Oil
CHP, district heating	Brista	41			Wood chips Natural gas Waste, refuse Oil
	Högsbo	13			
	Sävenäs		10		
	Öresundsverket		154		
Wind power	Several small plants	17			

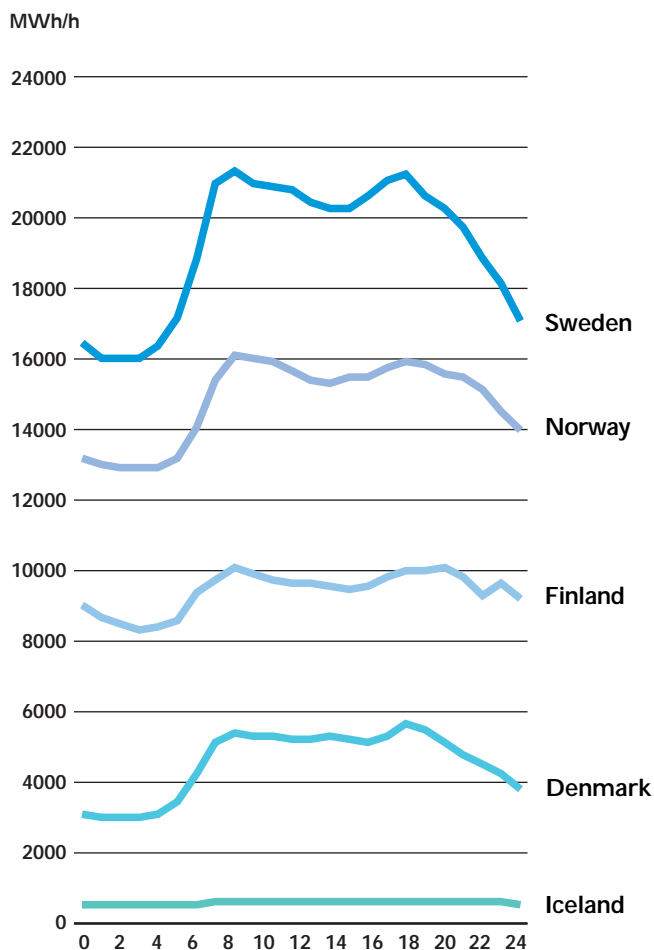
#### S4 POWER PLANTS (LARGER THAN 10 MW): DECISIONS TAKEN

Power category	Power Plant	Capacity	Estimated start-up	Average-year generation (hydropower)	Type of fuel		
		MW	Year	GWh			
<b>Denmark</b> CHP, district heating	DTU 2	38	1998		Natural gas		
	Nordjyllandsværket 3	385	1998		Coal/Oil		
	Maribo / Saksøbing	10	2000		Biofuel		
	Avedøreværket 2	540	2001		Natural gas/Straw/ Wood chips/(Oil)		
<b>Finland</b>	Hydropower	Taivalkoski I-III	15	1998	13		
	Nuclear power	Loviisa	60	1998-2000			
		Olkiluoto	220	1998			
	CHP, district heating	Vaasa	40	1998			Oil
	CHP, industry	Joutseno	68	1998			Natural gas
Condensing power	Vaskiluoto	230	1998	Coal			
<b>Iceland</b>	Hydropower	Sultartangi	120	1999	880		
	Geothermal power	Nesjavellir	60	1998			

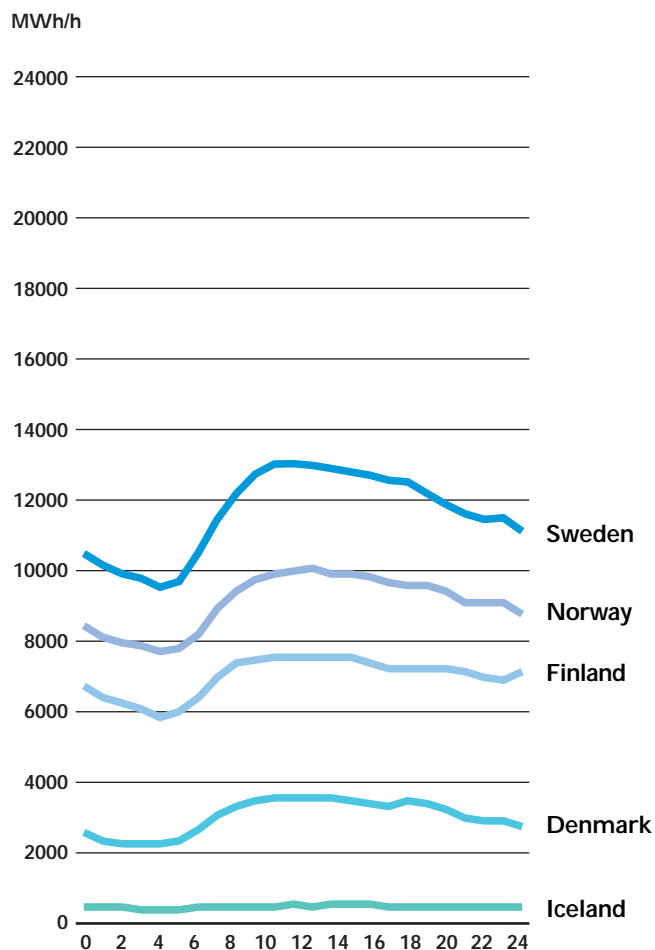
## SYSTEM LOAD

### S5 SYSTEM LOAD 3RD WEDNESDAY IN JANUARY AND 3RD WEDNESDAY IN JULY 1997

**Average 24-hour load 3rd Wednesday in January (15-1-97)**



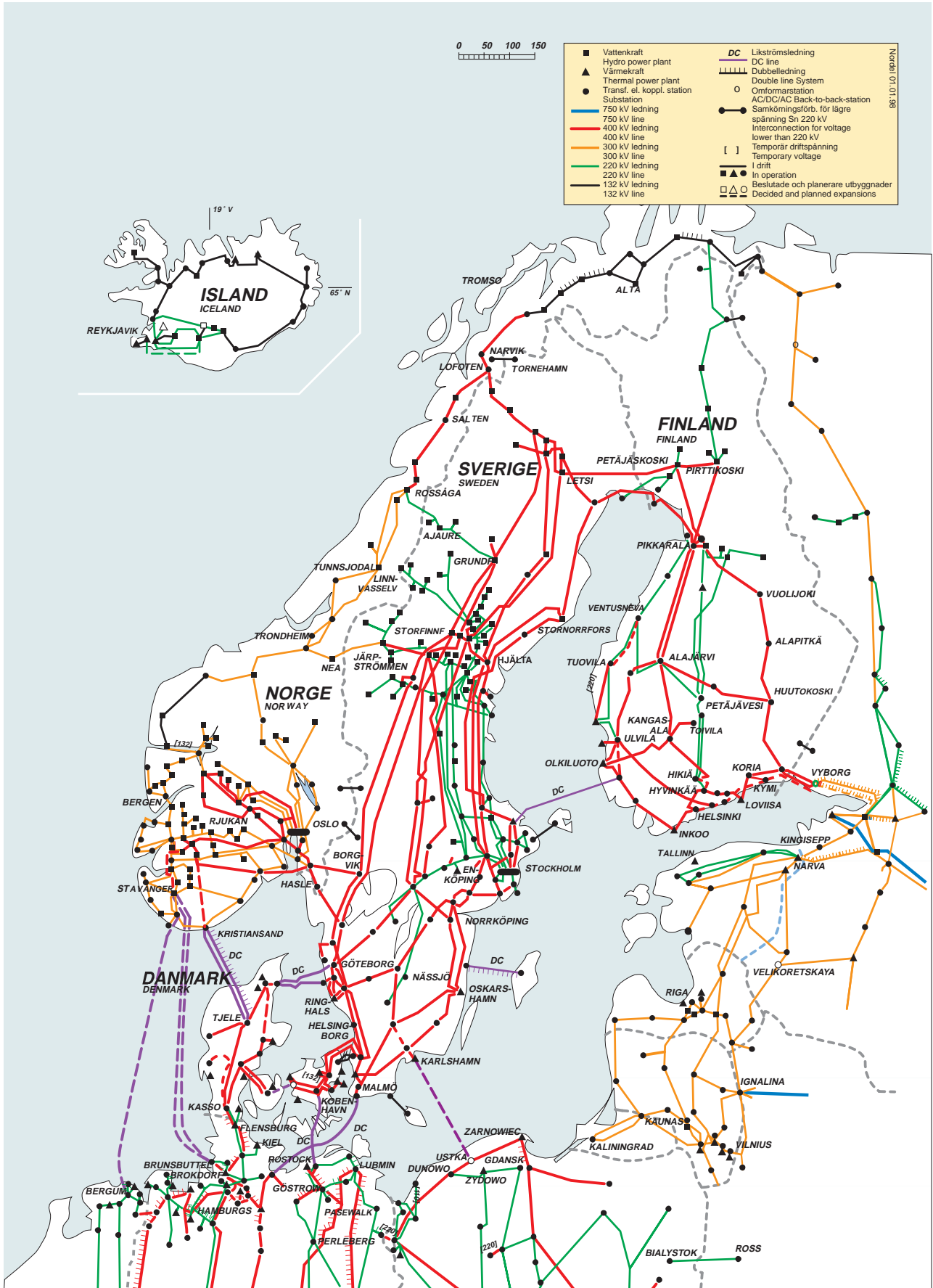
**Average 24-hour load 3rd Wednesday in July (16-7-97)**



	Installed net capacity	Maximum system load	Minimum system load
	31 Dec. 1997	3rd Wednesday in Jan. 1997 8:00-9:00 p.m.	3rd Wednesday in July 1997, 4:00-5:00 a.m.
	GW	GWh/h	GWh/h
Denmark	11.5	5.4	2.3
Finland	15.8	10.1	5.9
Iceland	1.1	0.6	0.4
Norway	27.7	16.2	7.8
Sweden	34.0	21.4	9.5
<b>Nordel</b>	<b>90.1</b>	<b>53.7</b>	<b>25.9</b>

All hours are local time

# THE GRID SYSTEM IN THE NORDIC COUNTRIES



## INTERCONNECTIONS

### S6 EXISTING INTERCONNECTIONS BETWEEN THE NORDEL COUNTRIES

Countries Stations	Rated voltage	Transmission capacity as per design rules <sup>1)</sup>		Total length of line	Of which cable
	kV	MW		km	km
<b>Denmark - Norway</b> Tjele-Kristiansand	250/350	From Denmark 1040	To Denmark 1040	240/pol	127/pol
<b>Denmark - Sweden</b> Teglstrupgård - Mörarp 1 and 2 Hovegård - Söderåsen 1 Hovegård - Söderåsen 2 Vester Hassing - Göteborg Vester Hassing - Lindome Hasle (Bornholm) - Borrby	132~ 400~ 400~ 250= 285= 60~	From Sweden 350 <sup>2)</sup> 800 <sup>2)</sup> 800 <sup>2)</sup> 290 380 60	To Sweden 350 <sup>2)</sup> 800 <sup>2)</sup> 800 <sup>2)</sup> 270 360 60	23 91 91 176 149 48	10 8 8 88 87 43
<b>Finland - Norway</b> Ivalo - Varangerbotn	220~	From Finland 70	To Finland 70	228	.
<b>Finland - Sweden</b> Ossauskoski - Kalix Petäjaskoski - Letsi Keminmaa - Svartbyn Hellesby (Åland) - Skattbol Raumo - Forsmark	220~ 400~ 400~ 70~ 400=	From Sweden 1300 <sup>3)</sup> 35 500	To Sweden 700 <sup>4)</sup> 35 500	93 230 134 77 235	. . . 56 198
<b>Norway - Sweden</b> Sildvik - Tornehamn Ofoten - Ritsem Rössåga - Ajaure Linnasselv, transformer Nea - Järpströmmen Lutufallet - Höljes Eidskog - Charlottenberg Hasle - Borgvik Halden - Skogssäter	132~ 400~ 220~ 220/66~ 275~ 132~ 132~ 400~ 400~	From Sweden 50 1350 285 <sup>6)</sup> 50 450 <sup>6)</sup> 40 100 1650 <sup>6)</sup>	To Sweden 120 1350 <sup>5)</sup> 285 <sup>5, 6)</sup> 50 450 <sup>6)</sup> 20 100 1800 <sup>6, 7)</sup>	39 58 117 . 100 18 13 106 135	. . . . . . . . .

<sup>1)</sup> Maximum permissible transmission.  
<sup>2)</sup> Thermal limit. The total transmission capacity is 1,600 MW to Denmark and 1,800 MW to Sweden.  
<sup>3)</sup> Further 100 MW for power balance deviation.  
<sup>4)</sup> 900 MW can be transmitted during reduced transmission in Finland.  
<sup>5)</sup> Thermal limit. Stability problems and generation in nearby power plants may lower the limit.

### S7 EXISTING INTERCONNECTIONS BETWEEN THE NORDEL COUNTRIES AND OTHER COUNTRIES

Countries Stations	Rated voltage	Transmission capacity		Total length of line	Of which cable
	kV	MW		km	km
<b>Denmark - Germany</b> Kassø - Audorf Kassø - Flensburg Ensted - Flensburg Bjæverskov - Rostock	2 x 400~ 220~ 220~ 400=	From Nordel 1400 <sup>1)</sup> 600	To Nordel 1400 <sup>1)</sup> 600	107 40 34 166	. . . 166
<b>Finland - Russia</b> Imatra - GES 10 Yliskälä - Viborg Nellimö - Kaitakoski	110~ ±85= 110~	From Nordel . . 60	To Nordel 100 1000 60	20 . 20	. . .
<b>Norway - Russia</b> Kirkenes - Boris Gleb	154~	From Nordel 50	To Nordel 50	10	.
<b>Sweden - Germany</b> Västra Kärrstorp - Herrenwyk	450=	From Nordel 600 <sup>2)</sup>	To Nordel 600 <sup>2)</sup>	250	220

<sup>1)</sup> Transmission capacity varies between 1,200 and 1,500 MW, depending on operating conditions.  
<sup>2)</sup> Owing to restrictions in the German network, transmission capacity is currently limited to 450 MW from Nordel and 400 MW to Nordel.



## S8 INTERCONNECTIONS: DECISIONS TAKEN

Countries Stations	Rated voltage	Transmission capacity as per design rules	Total length of line	Of which cable	Estimated commis- sioning
	kV	MW	km	km	Year
<b>Denmark - Denmark</b> (Storebælt / The Great Belt) Elsam - Elkraft	400=	500 - 600	ca 70	ca 70	<sup>1)</sup>
<b>Finland - Russia</b> Ylikkalä - Viborg	±85=	300	43		1999
<b>Norway - The Netherlands</b> (NorNed Kabel) Feda - Eemshaven	400-600=	min 600	ca 550	ca 550	2001
<b>Norway - Germany</b> (Euro Cable) Øksendal (Tonstad) <sup>2)</sup> - Brunsbüttel	400-600=	min 600	ca 600	ca 550	2002
<b>Norway - Germany</b> (Viking Cable) Øksendal (Tonstad) <sup>2)</sup> - Wilhelmshaven	400-600=	min 600	ca 600	ca 550	2003
<b>Sweden - Poland</b> (SwePol Link) Stärnö <sup>3)</sup> - Slupsk	450=	600	252	237	1999

<sup>1)</sup> According to plans, the Great Belt connection will be in operation in 2003. The Minister of the Environment and Energy has the authority to decide on the connection.

<sup>2)</sup> Cable to Lista, overhead line to Tonstad.

<sup>3)</sup> The valve room still needs a building permit.

## LINE LENGTHS

### S9 TRANSMISSION LINES OF 110-400 KV IN SERVICE ON 31 DEC. 1997

	400 kV, AC and DC	220-300 kV, AC and DC	110, 132, 150 kV
	km	km	km
<b>Denmark</b>	1 313 <sup>1)</sup>	453 <sup>2)</sup>	3 964 <sup>3)</sup>
<b>Finland</b>	3 905 <sup>4)</sup>	2 665	14 900
<b>Iceland</b>	.	492	1 315
<b>Norway</b>	2 113	5 635 <sup>2)</sup>	10 430
<b>Sweden</b>	10 807 <sup>4)</sup>	4 602 <sup>2)</sup>	15 000

<sup>1)</sup> Of which 2 km in service with 150 kV and 46 km with 132 kV.

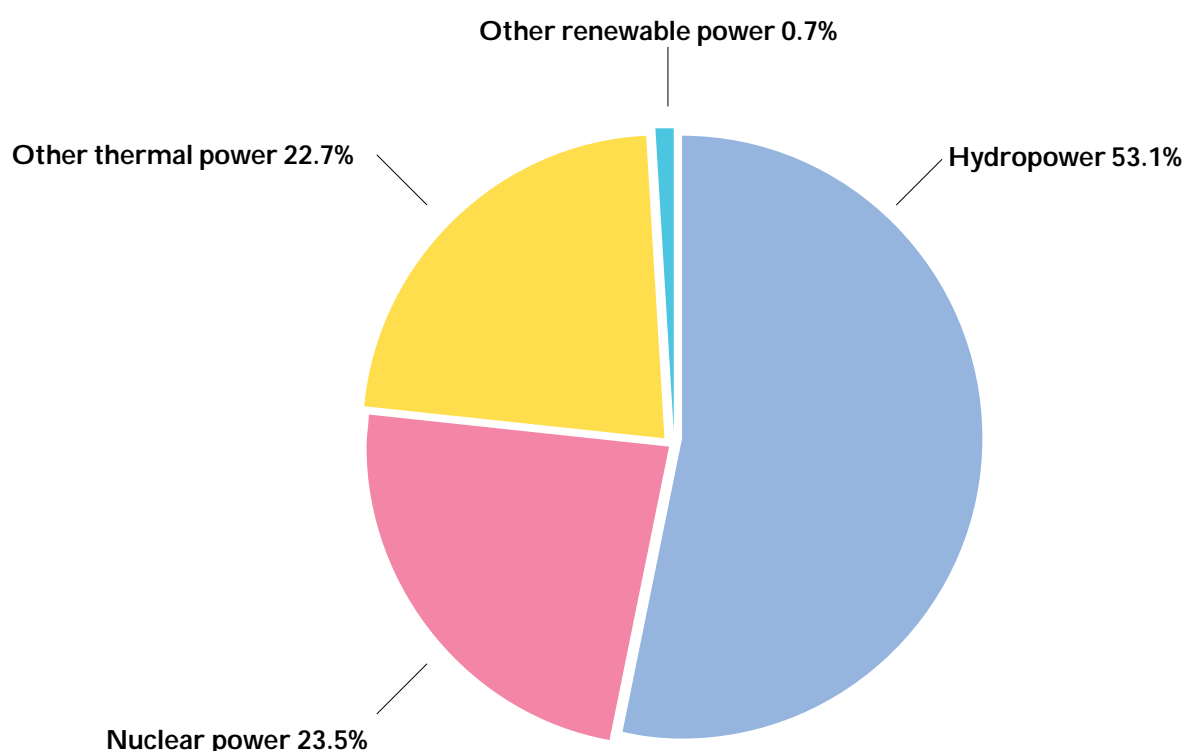
<sup>2)</sup> Of which 80 km in Denmark and 96 km in Sweden (KontiSkan), 89 km in Denmark and 382 km in Norway (Skagerrak) in service with 250 kV DC, and 75 km in Denmark and 74 km in Sweden (KontiSkan 2) in service with 285 kV DC.

<sup>3)</sup> Of which 13 km in service with 60 kV and 105 km with 50 kV.

<sup>4)</sup> Consisting of submarine cable (DC), 99 km in Finland and 99 km in Sweden; and land cable (DC), 34 km in Finland and 2 km in Sweden (Fenno-Skan).

## ELECTRICITY GENERATION

### S10 TOTAL ELECTRICITY GENERATION WITHIN NORDEL 1997



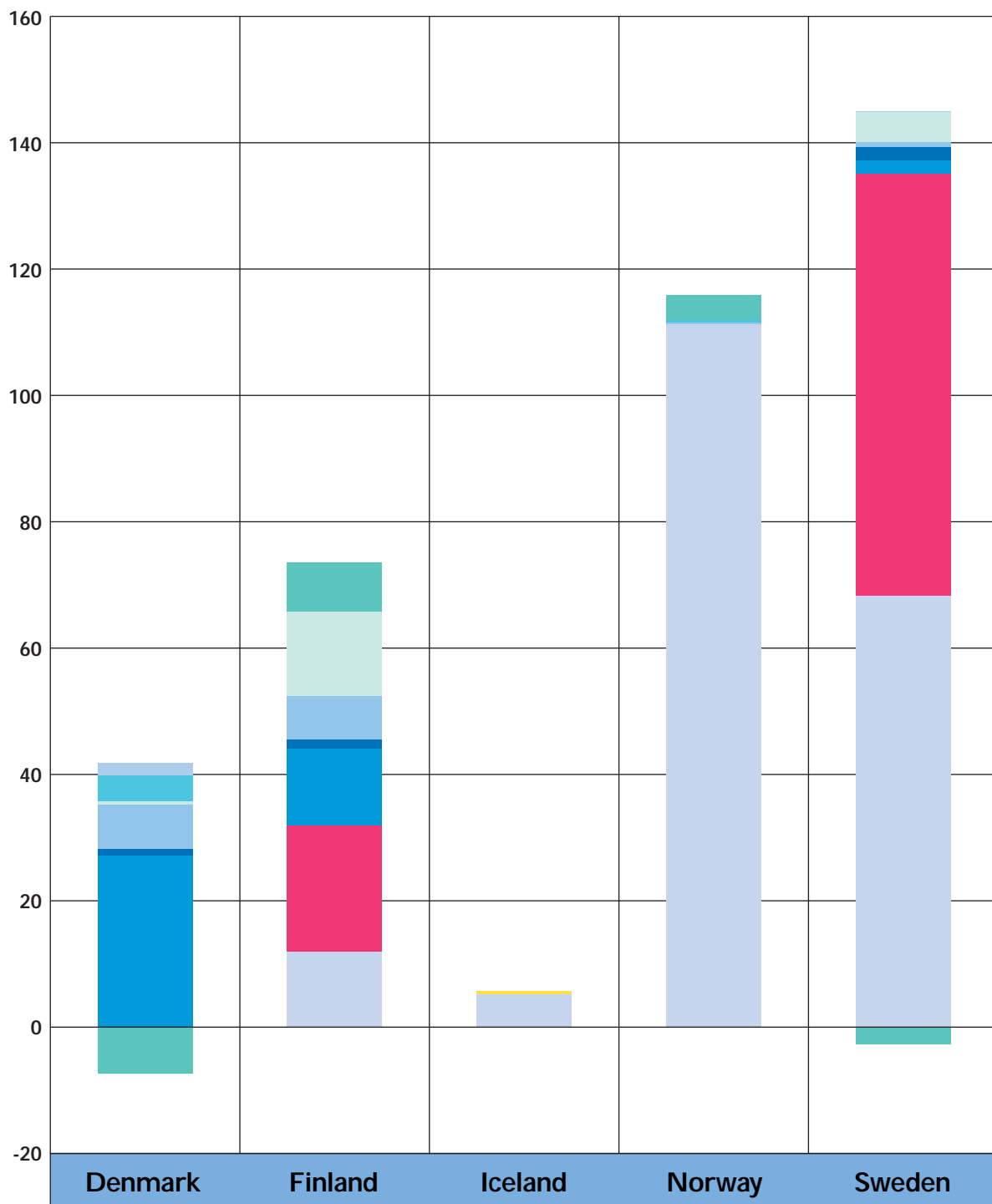
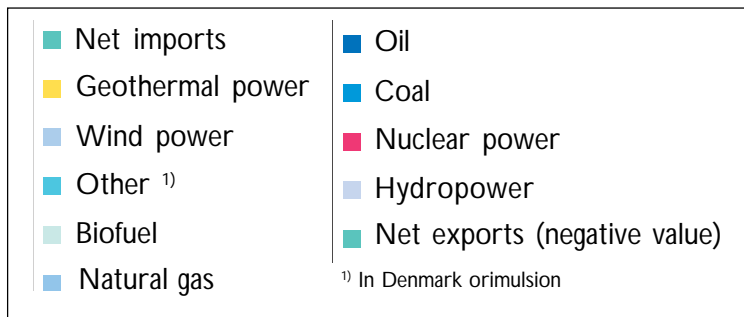
### S11 ELECTRICITY GENERATION 1997, GWH

	Denmark	Finland	Iceland	Norway	Sweden	Nordel
<b>Total generation</b>	41 747	65 883	5 580	112 008	144 926	<b>370 144</b>
<b>Hydropower</b>	21	11 857	5 202	111 343	68 277	<b>196 700</b>
<b>Nuclear power</b>	.	20 035	.	.	66 912	<b>86 947</b>
<b>Other thermal power</b>	39 854	33 974	3	657	9 533	<b>84 021</b>
- condensing power	38 887 <sup>1)</sup>	11 012	.	108	464	<b>50 471</b>
- CHP, district heating	..	12 090	.	.	4 772	<b>16 862</b>
- CHP, industry	967	10 834	.	314	4 291	<b>16 406</b>
- gas turbines, etc.	-	38	3	235	6	<b>282</b>
<b>Other renewable power<sup>2)</sup></b>	1 872	17	375	8	204	<b>2 476</b>
Total generation 1996	50 367	66 357	5 113	104 878	136 013	<b>362 728</b>
Change as against 1996	-17.1%	-0.7%	9.1%	6.8%	6.6%	<b>2.0%</b>

<sup>1)</sup> Includes generation in combined heat and power stations

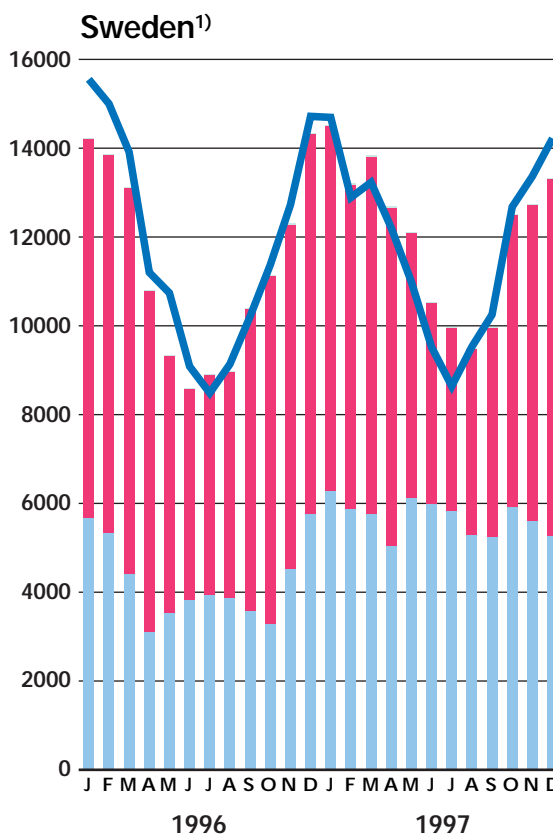
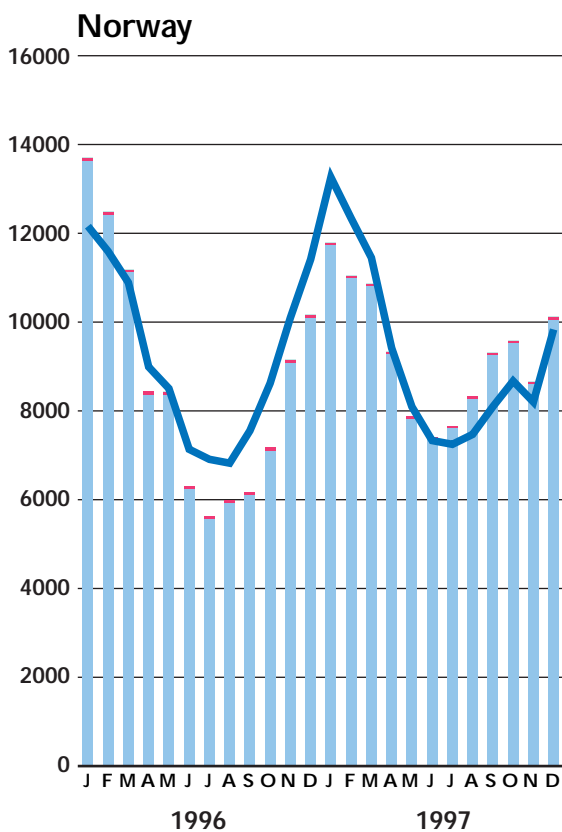
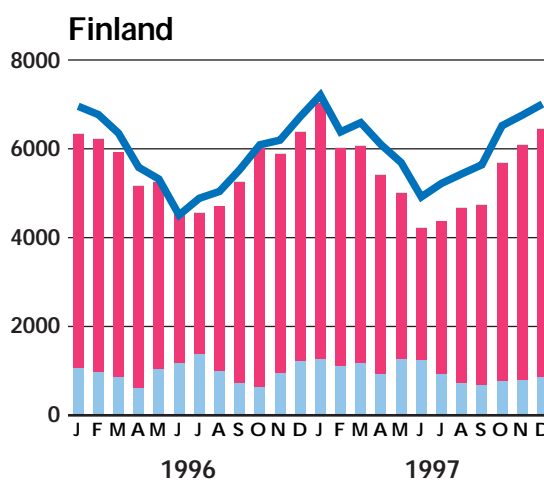
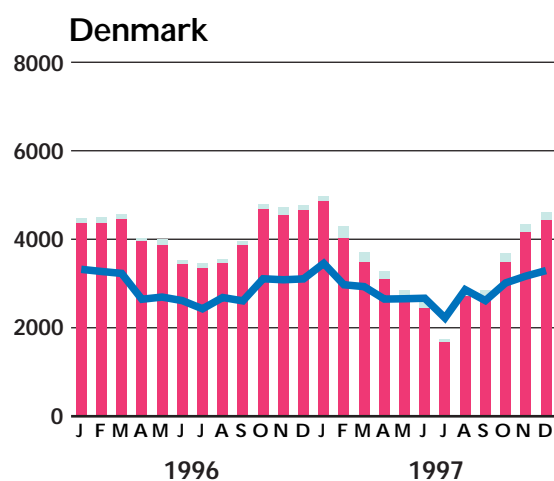
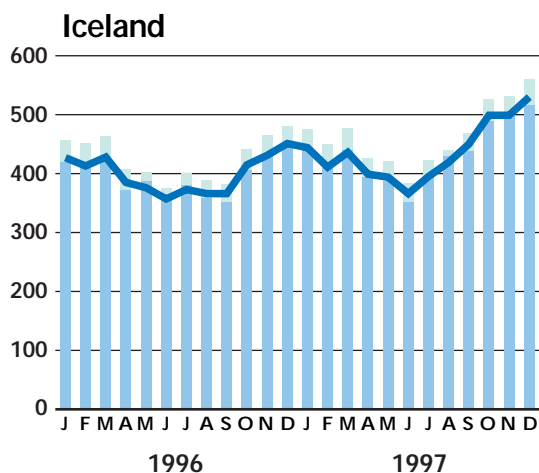
<sup>2)</sup> Wind power and, for Iceland, geothermal power

**S12 TOTAL ELECTRICITY GENERATION  
BY ENERGY SOURCE, AND NET IMPORTS AND EXPORTS 1997, TWH**



**S13 MONTHLY GENERATION AND GROSS CONSUMPTION OF ELECTRICITY 1996-1997, GWH**

- Gross consumption
- Wind power or geothermal power
- Nuclear power and other thermal power
- Hydropower

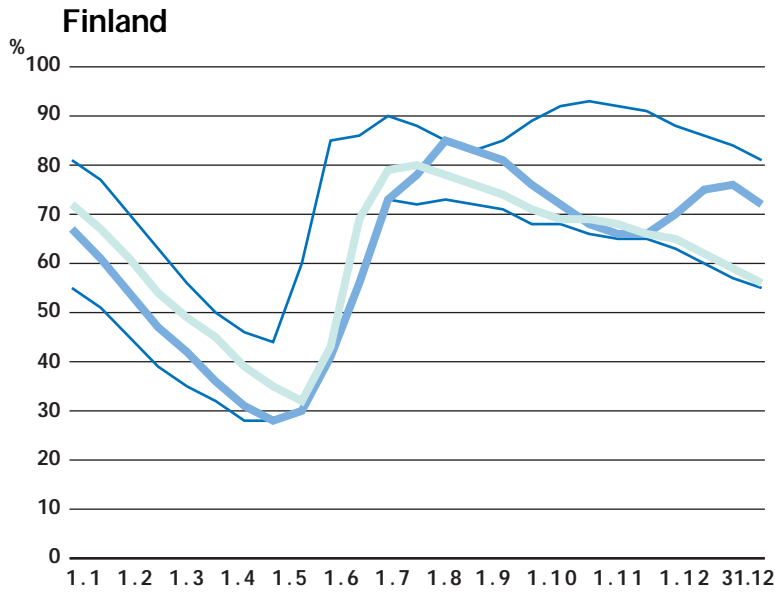


<sup>1)</sup> Consumption also includes supply to electric boilers

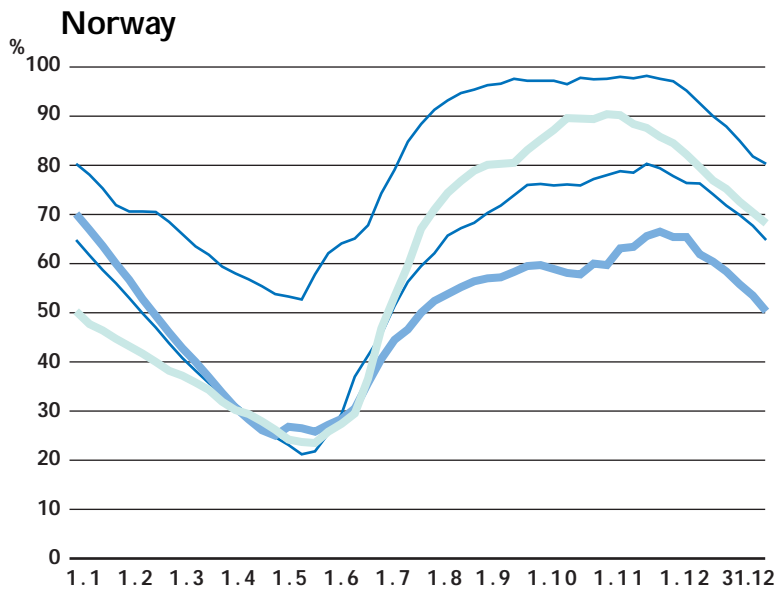
# WATER RESERVOIRS

## S14 WATER RESERVOIRS 1997

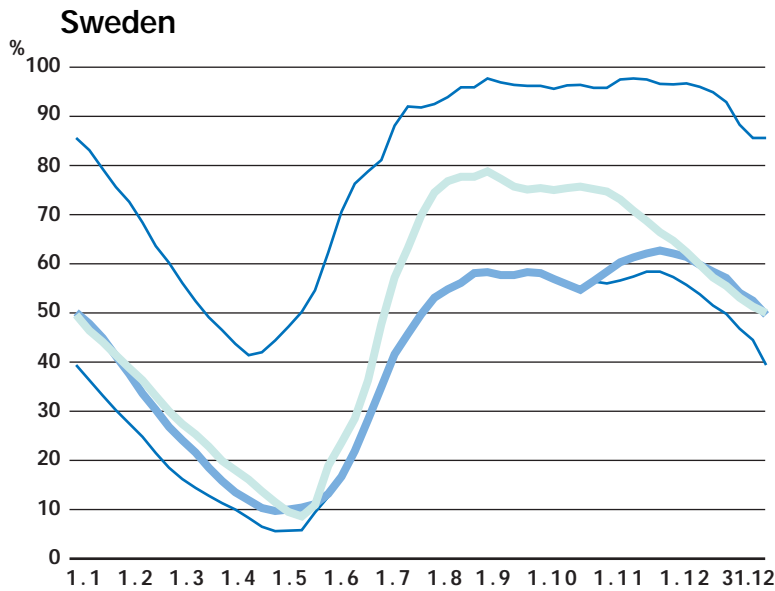
- Water reservoirs 1997 expressed in %
- Water reservoirs 1996 expressed in %
- Minimum and maximum values in %



**Reservoir capacity 4 900 GWh**  
 Minimum and maximum limits are based on values for the years 1987-1996



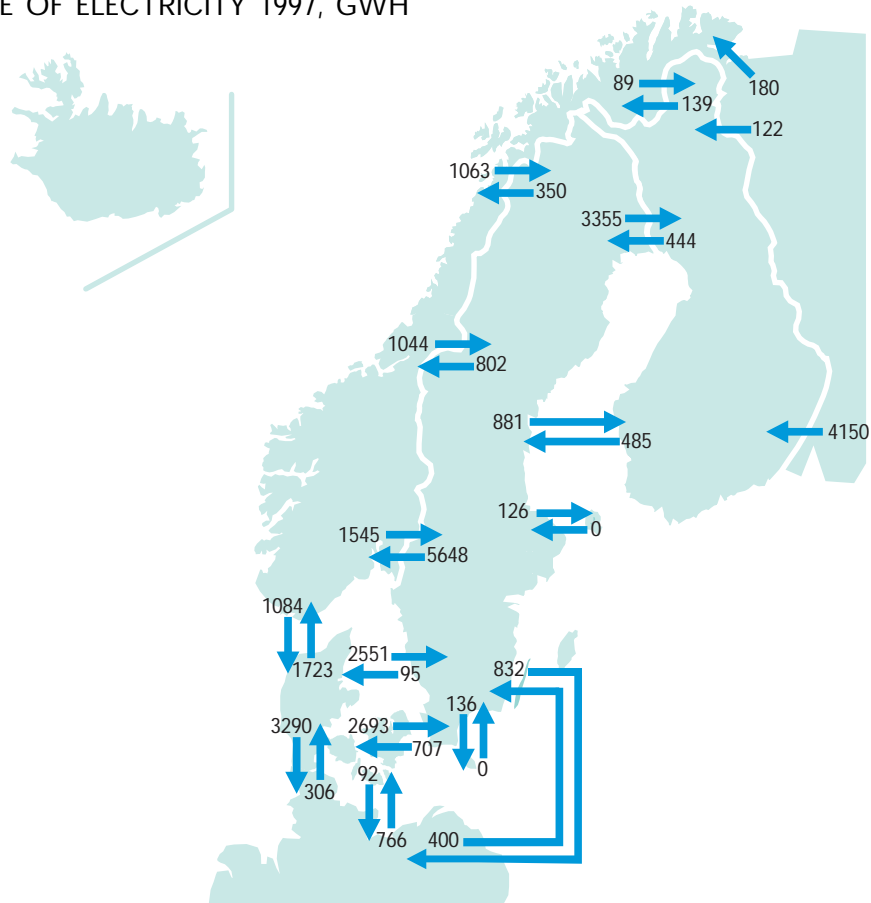
**Reservoir capacity**  
 1.1.1997 78 121 GWh  
 31.12.1997 80 356 GWh  
 Minimum and maximum limits are based on values for the years 1982-1991



**Reservoir capacity 33 550 GWh**  
 Minimum and maximum limits are based on values for the years 1950-1996

## EXCHANGE OF ELECTRICITY

### S15 EXCHANGE OF ELECTRICITY 1997, GWH

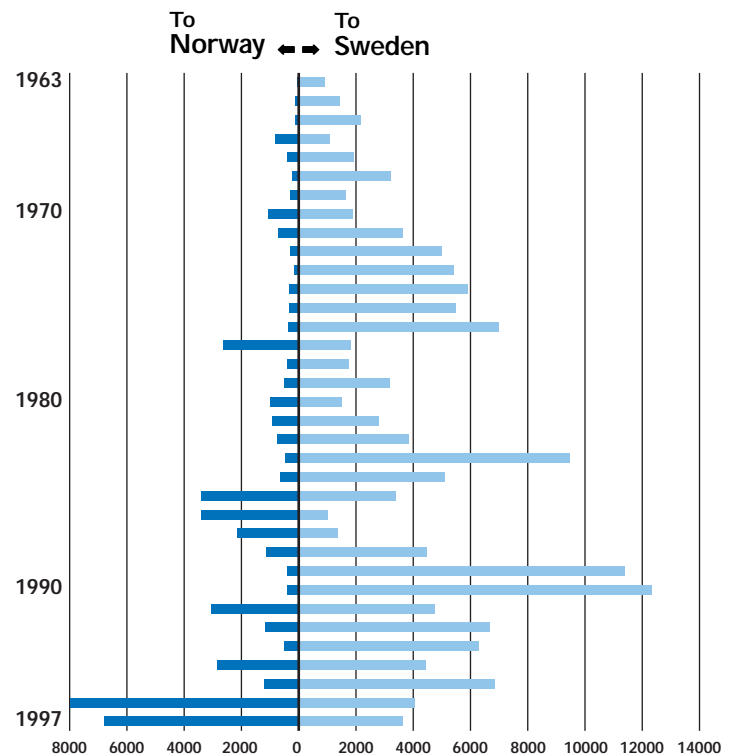
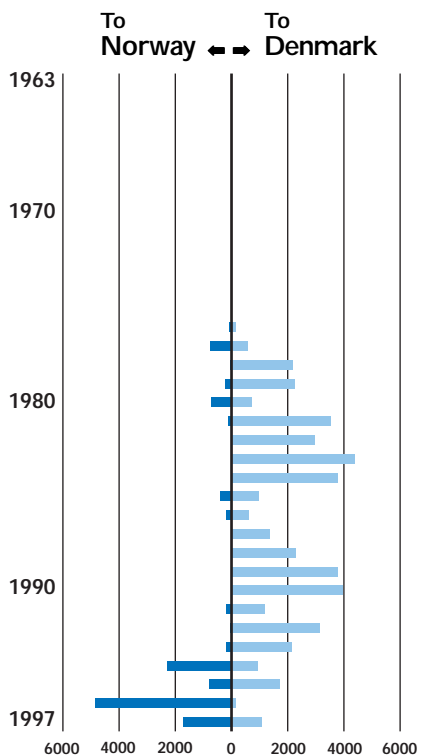
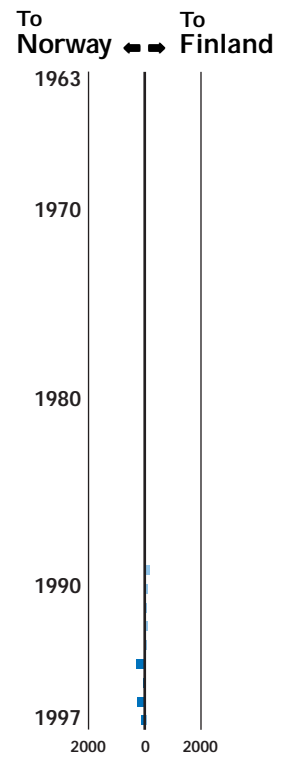
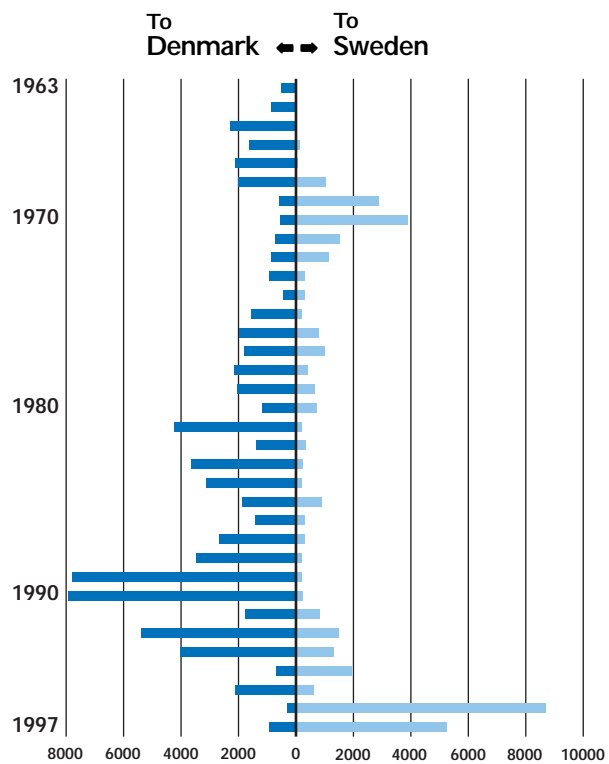
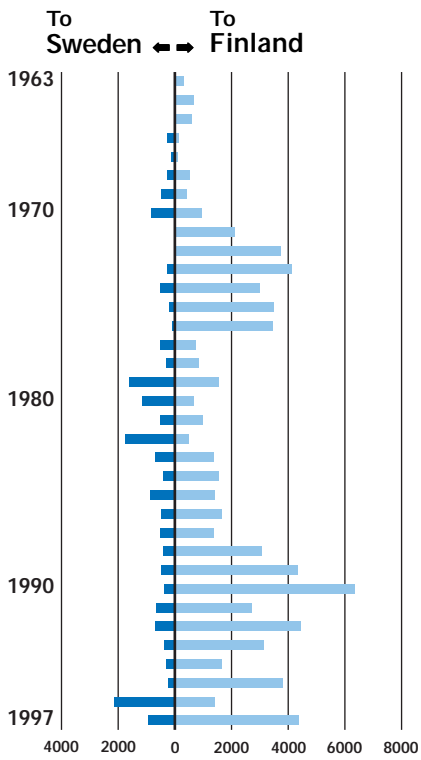


### S16 IMPORTS AND EXPORTS 1997, GWH

	Imports to:					Σ Exports
	Denmark	Finland	Norway	Sweden	Other countries <sup>1)</sup>	
<b>Exports from:</b>						
<b>Denmark</b>	.	.	1 723	5 244	3 382	<b>10 349</b>
<b>Finland</b>	.	.	139	929	.	<b>1 068</b>
<b>Norway</b>	1 084	89	.	3 652	.	<b>4 825</b>
<b>Sweden</b>	938	4 362	6 800	.	832	<b>12 932</b>
<b>Other countries<sup>1)</sup></b>	1 072	4 272	180	400	.	<b>5 924</b>
<b>Σ Imports</b>	<b>3 094</b>	<b>8 723</b>	<b>8 842</b>	<b>10 225</b>	<b>4 214</b>	<b>35 098</b>
	Denmark	Finland	Norway	Sweden	Nordel	
Total imports	3 094	8 723	8 842	10 225	<b>30 884</b>	
Total exports	10 349	1 068	4 825	12 932	<b>29 174</b>	
<b>Net imports</b>	<b>-7 255</b>	<b>7 655</b>	<b>4 017</b>	<b>-2 707</b>	<b>1 710</b>	
<b>Net imports / gross consumption</b>	<b>-21.0%</b>	<b>10.4%</b>	<b>3.6%</b>	<b>-1.9%</b>	<b>0.5%</b>	

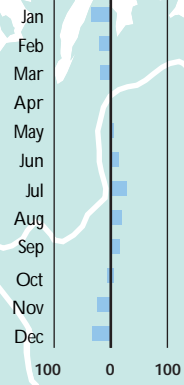
<sup>1)</sup> Germany and Russia

**S17 EXCHANGE OF ELECTRICITY BETWEEN THE NORDEL COUNTRIES 1963 - 1997, GWH**

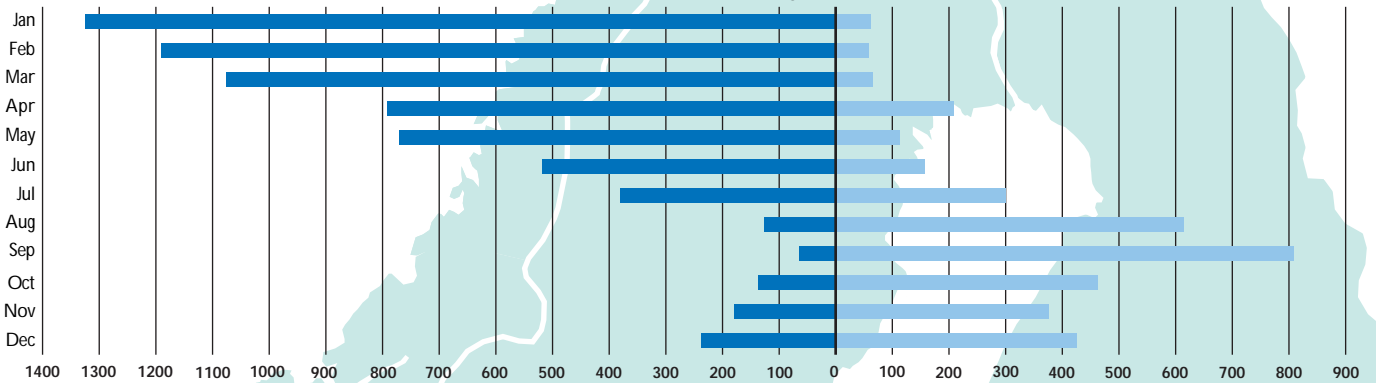


**S18 MONTHLY EXCHANGE OF ELECTRICITY BETWEEN THE NORDEL COUNTRIES 1997, GWH**

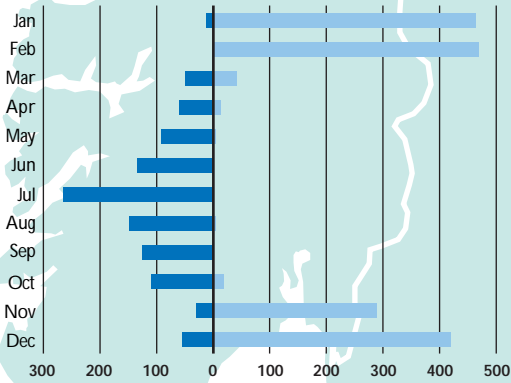
To Norway ← → To Finland



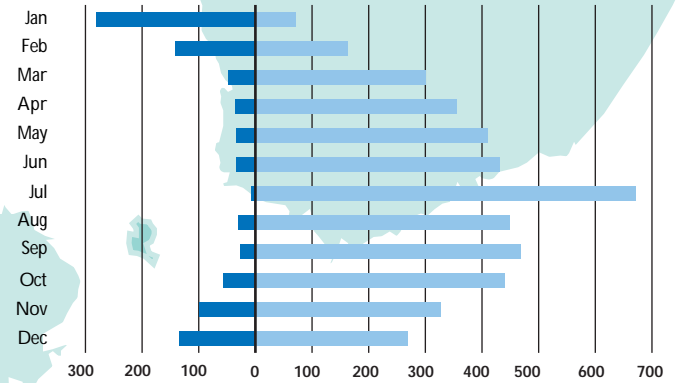
To Norway ← → To Sweden



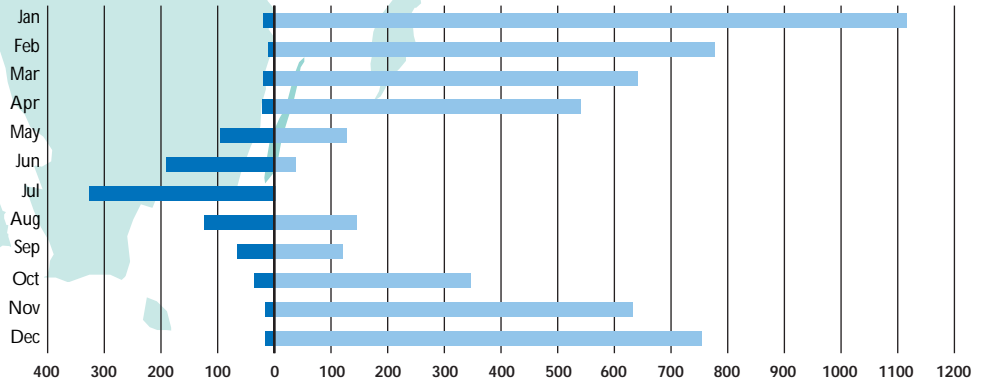
To Denmark ← → To Norway



To Sweden ← → To Finland



To Denmark ← → To Sweden

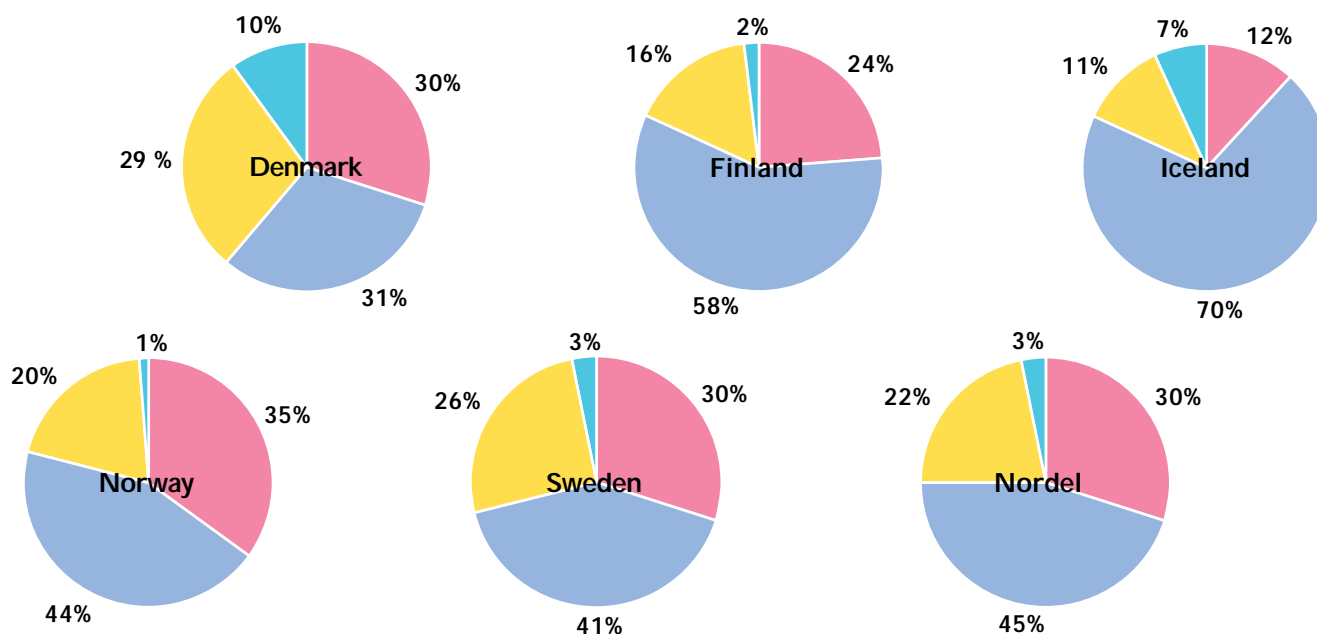




## ELECTRICITY CONSUMPTION

### S19 NET CONSUMPTION OF ELECTRICITY 1997, BY CONSUMER CATEGORY

- Housing
- Industry (incl. energy sector)
- Trade and services (incl. transport)
- Other (incl. agriculture)



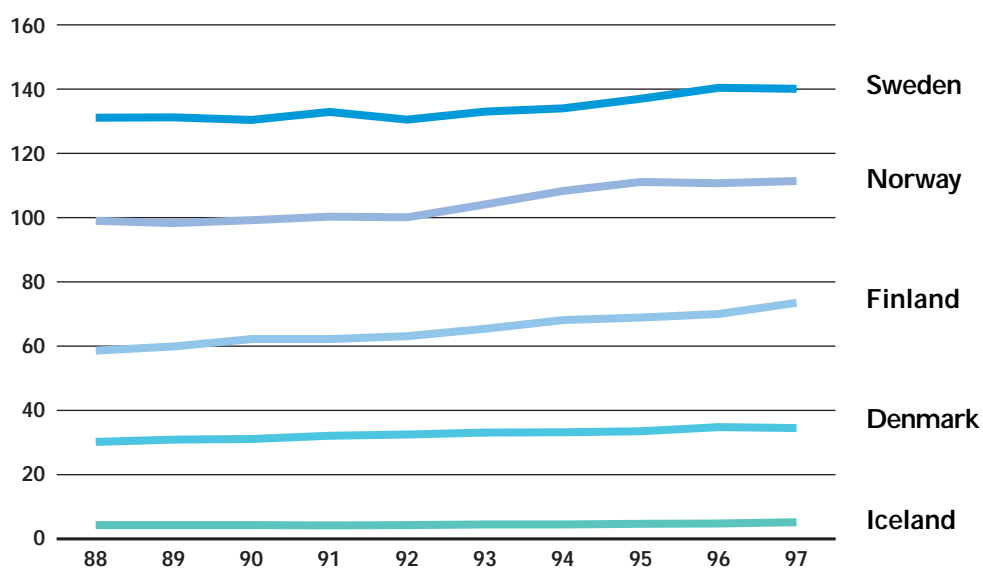
### S20 ELECTRICITY CONSUMPTION 1997, GWH

	Denmark	Finland	Iceland	Norway	Sweden	Nordel
<b>Total consumption</b>	34 492	73 538	5 580	116 025	142 219	371 854
Occasional power to electric boilers	.	71	338	4 610	2 100 <sup>1)</sup>	7 119
<b>Gross consumption</b>	34 492	73 467	5 242	111 415	140 119	364 735
Losses, pumped storage power	2 352	2 801	353	10 685 <sup>2)</sup>	9 719	25 910
<b>Net consumption</b>	32 140	70 666	4 889	100 730	130 400	338 825
- housing	9 710	17 404	580	35 250	39 500	102 444
- industry (incl. energy sector)	9 810	40 798	3 423	43 940	53 300	151 271
- trade and services (incl. transport)	9 330	11 094	524	19 940	34 200	75 088
- other (incl. agriculture)	3 290	1 370	362	1 600	3 400	10 022
<b>Population (million)</b>	5.3	5.1	0.3	4.4	8.9	24.0
<b>Gross consumption per capita, kWh</b>	6 508	14 293	19 415	25 299	15 831	15 219
Gross consumption 1996	34 783	69 955	4 788	110 697	140 438	360 661
Change as against 1996, %	-0.8%	5.0%	9.5%	0.6%	-0.2%	1.1%

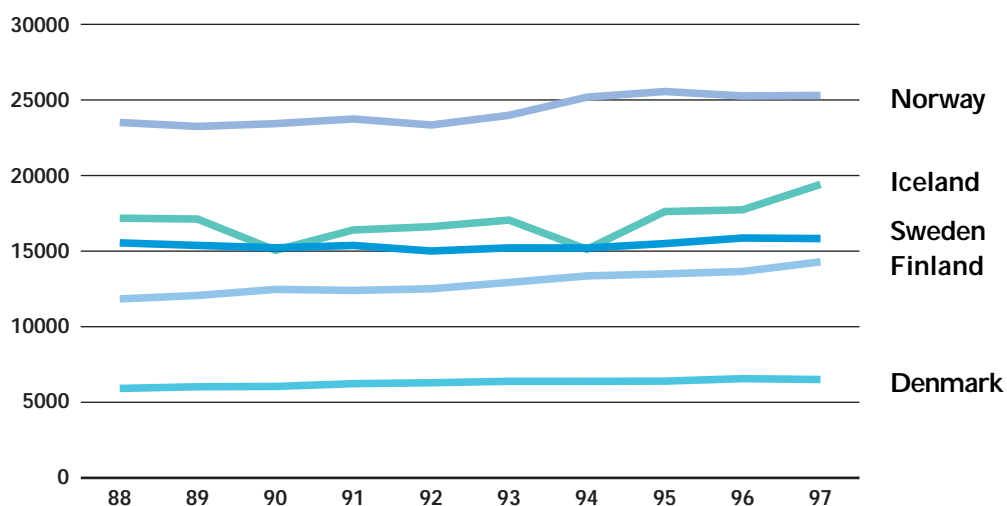
<sup>1)</sup> Only electric boilers at district heating plants shown

<sup>2)</sup> Pumped storage power accounts for 1659 GWh

### S21 GROSS CONSUMPTION 1988 - 1997, TWH



### S22 GROSS CONSUMPTION PER CAPITA 1988 - 1997, KWH

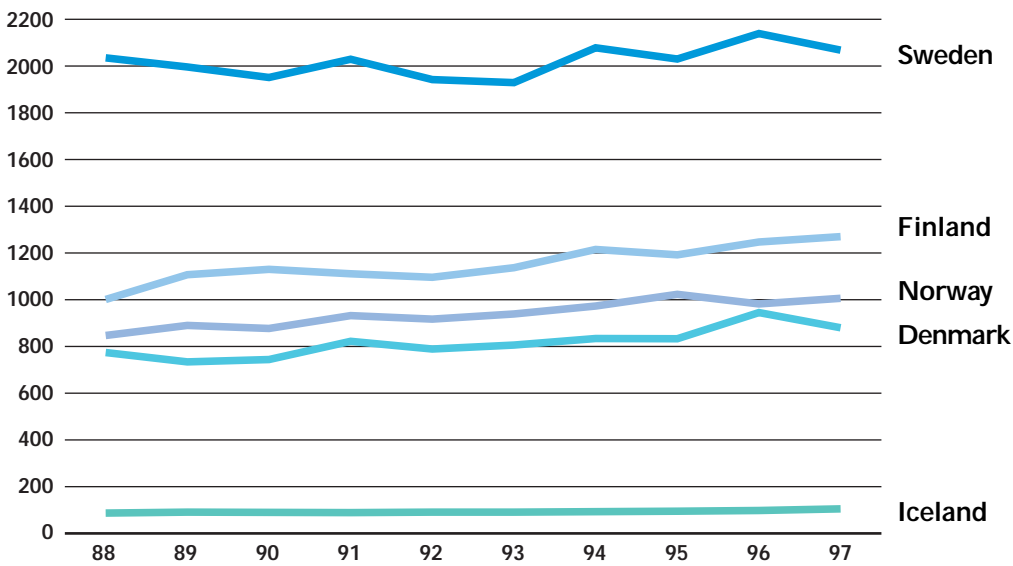


### S23 TOTAL CONSUMPTION 1997, GWH

	Denmark	Finland	Iceland	Norway	Sweden	Nordel
<b>Generation 1997</b>	41 747	65 883	5 580	112 008	144 926	<b>370 144</b>
<b>Net imports 1997</b>	-7 255	7 655		4 017	-2 707	<b>1 710</b>
<b>Total consumption 1997</b>	34 492	73 538	5 580	116 025	142 219	<b>371 854</b>
Generation 1996	50 367	66 357	5 113	104 878	136 013	<b>362 728</b>
Net imports 1996	-15 584	3 656		9 041	6 127	<b>3 240</b>
<b>Total consumption 1996</b>	34 783	70 013	5 113	113 919	142 140	<b>365 968</b>

## TOTAL ENERGY SUPPLY

S24 TOTAL ENERGY SUPPLY 1988 - 1997, PJ



N.B.  
Energy supply is now recorded according to the international practice, which means that the figure for nuclear power includes energy conversion losses.

## PROGNOSES

S25 GROSS CONSUMPTION OF ELECTRICITY 1997 AND PROGNOSES FOR 2000 AND 2005, TWH

Year	Denmark	Finland	Iceland	Norway	Sweden
1997	34	73	5,2	111	140
2000	35	78	7,3	117 <sup>1)</sup>	146 <sup>2)</sup>
2005	37	85	7,6	125 <sup>1)</sup>	148 <sup>2)</sup>

<sup>1)</sup> Total consumption

<sup>2)</sup> Prognoses based on the Climate Report issued by NUTEK

S26 PEAK LOAD DEMAND 1997 AND PROGNOSES FOR 2000 AND 2005, MW

Year	Denmark	Finland	Iceland	Norway <sup>1)</sup>	Sweden
1997	7 260	12 700	877	22 650	25 000
2000	7 577	13 700 <sup>1)</sup>	1 070	22 897	27 450 <sup>2)</sup>
2005	7 854	15 000 <sup>1)</sup>	1 125	24 999	27 890 <sup>2)</sup>

<sup>1)</sup> Excl. reserve requirements

<sup>2)</sup> Prognoses based on the Climate Report issued by NUTEK

S27 INSTALLED CAPACITY 1997 AND PROGNOSES FOR 2000 AND 2005, MW

Year	Denmark	Finland	Iceland	Norway	Sweden
1997	11 546	15 836	1 129	27 661	34 044
2000	9 561 <sup>1)</sup>	17 150	1 309	28 833	<sup>2)</sup>
2005	9 024 <sup>1)</sup>	<sup>2)</sup>	1 309	30 533	<sup>2)</sup>

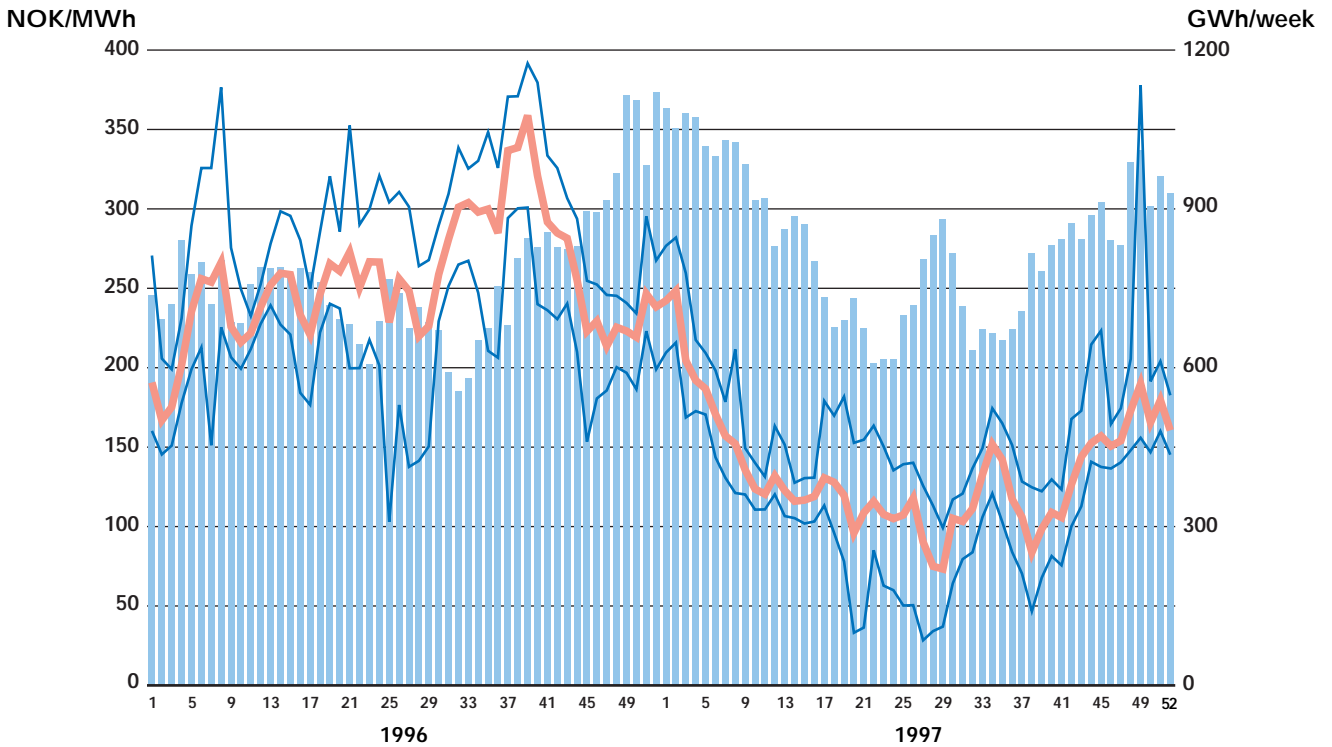
<sup>1)</sup> Excl. capacity of autoproducers

<sup>2)</sup> Prognoses not available

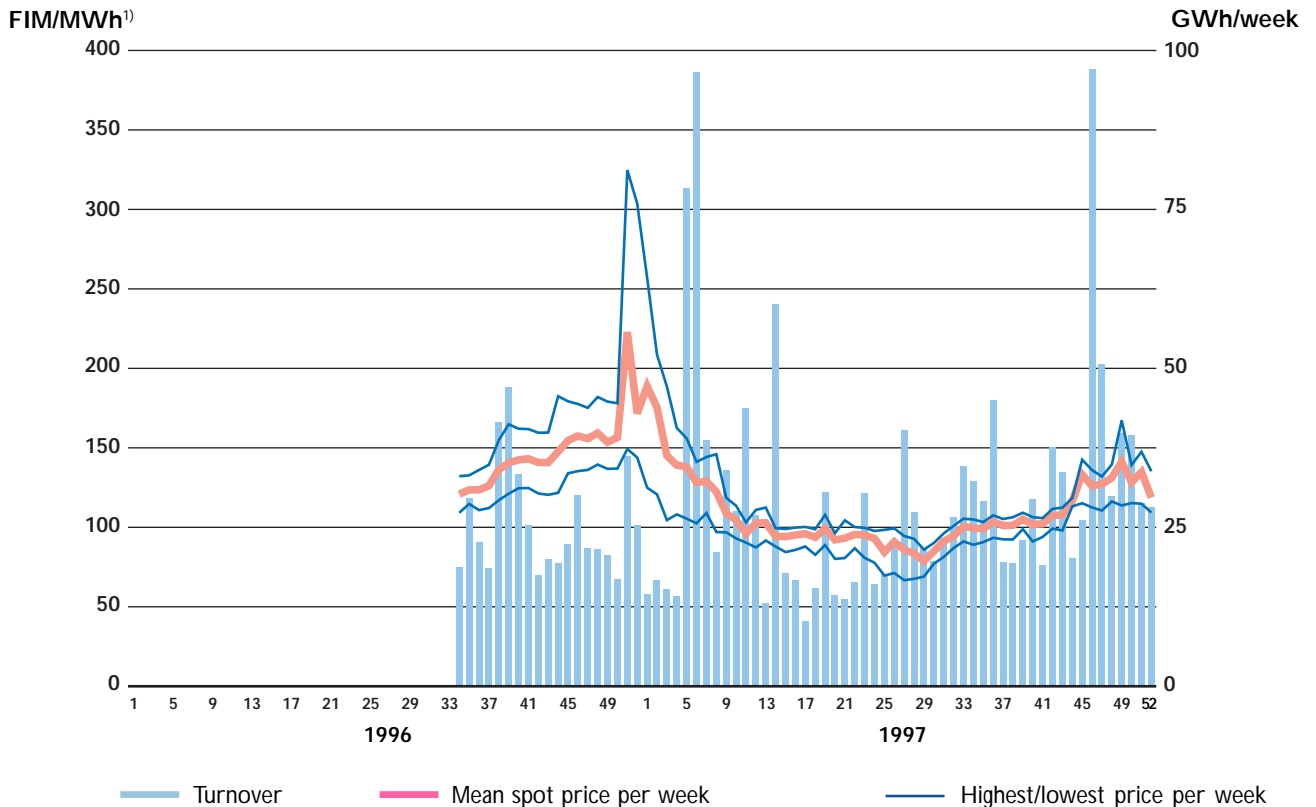
# SPOT PRICES

## S28 SPOT PRICES AND TURNOVER ON THE NORDIC ELECTRICITY EXCHANGES 1996 - 1997

### Nord Pool ASA's spot market: Mean price (system price) and turnover per week



### EL-EX's spot market: Mean price and turnover<sup>2)</sup> per week



<sup>1)</sup> The average NOK/FIM currency exchange rate was 0.7111 in 1996 and 0.7339 in 1997.

<sup>2)</sup> Trading on EL-EX is based on the principle of continuous trading, which means that the turnover may be greater than the physical supply.

## INFORMATION ON THE ENVIRONMENT

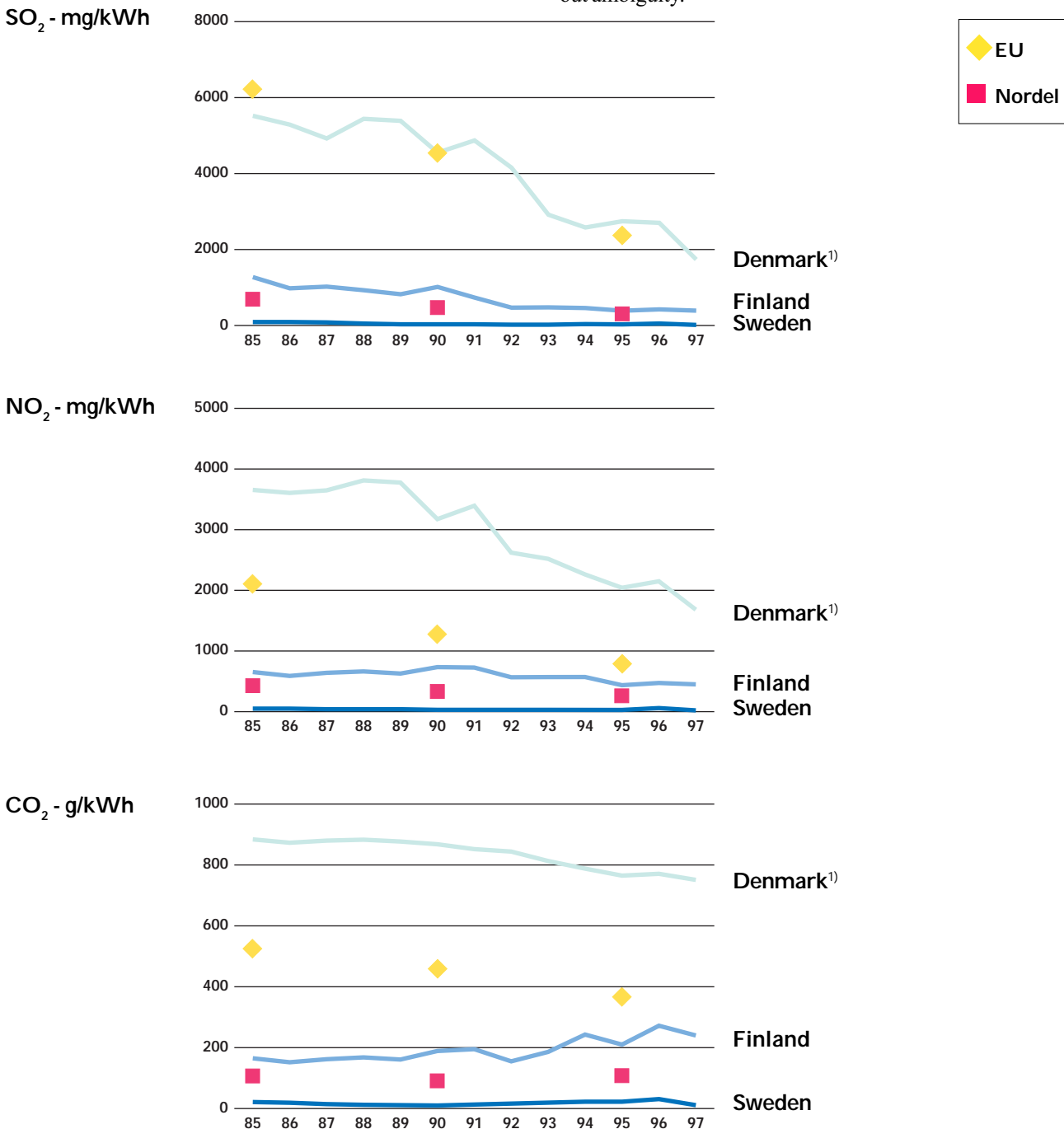
Environmental aspects play a central role in the electricity sector. The Nordic countries have taken long-range measures to reduce emissions from power generation, e.g. by utilising new combustion and purification techniques and by utilising combined heat and power plants of high efficiency. The active trade in power between the Nordel countries has also helped reduce environmental effects by ensuring that effective use has been made of the production resources.

The diagrams below show the emissions of SO<sub>2</sub>, NO<sub>2</sub> and CO<sub>2</sub> in relation to total electricity generation in each country. The high proportion of thermal power in the Danish and Finnish systems increases the emission figures in these countries. The Norwegian and Icelandic emissions are

negligible because virtually all electricity generation is based on hydropower and geothermal power.

As a rule, the emissions show a steady downward trend in the long term. The year 1996 was an exception because the unusually dry year led to a sharp increase in the consumption of fossil fuels. However, the data for 1997 show that the general trend follows the previous pattern.

Average emissions within the EU and within Nordel are given for some reference years. Emissions from the Nordel countries are on a considerably lower level. The diagrams should merely be considered as indicating a trend because, for instance, the exact proportions of emissions from combined heat and power generation cannot be defined without ambiguity.



<sup>1)</sup> For Denmark, the figure shows only power production owned by power utilities, which represents about 90% of the total production.

# ELECTRICITY TAXES

## ELECTRICITY TAXATION IN THE NORDIC COUNTRIES AS OF 1 JANUARY 1998

Taxation of electrical energy in the Nordic countries varies with respect to both structure and level. The taxes have been raised substantially in most countries during the '90s, and considerable structural changes have also been introduced.

Long-range planning in these questions is of great importance in the capital-intensive power industry, for instance, when companies make decisions about investments. If electricity taxes imposed on power generation vary from country to country within the same market area, a serious problem arises because enterprises in the individual countries are denied the opportunity to compete with each other on equal terms. In consequence, Nordel has called attention

to this drawback and has recommended harmonisation of electricity taxes. The need for more uniform electricity taxation has also been stressed in connection with the development of a Nordic electricity exchange.

The table below shows the electricity taxes that have been imposed on power generation and consumption in the Nordic countries as of the beginning of 1998. When compared to 1997, the total tax burden has risen. The only major structural change has been implemented in Sweden, where some of the tax on hydropower generation has been shifted to the consumption sector.

To enable comparison between the countries, the taxes have also been converted to pennies/kWh. Some assumptions have been made, for instance, with respect to currency exchange rates and the characteristics of power plants; therefore the table should only be seen as indicative.

## TAXES ON ELECTRICITY GENERATION & CONSUMPTION IN THE NORDIC COUNTRIES 1998

	Finland	Sweden	Norway	Denmark	Iceland
<b>Generation</b>					
Hydropower (pennies, öre/kWh)	0	0 <sup>1)</sup>	1.2 <sup>4)</sup>	-	0
Nuclear power (pennies, öre/kWh)	0	2.2	-	-	-
Coal (FIM, SEK, NOK, DKK/t)	0	0 <sup>2)</sup>	0	0	0
Gas (penni, öre/m <sup>3</sup> )	0	0 <sup>2)</sup>	0	0	0
Peat (pennies, öre/kWh, fuel)	0	0	-	-	-
Heavy fuel oil (pennies, öre/l, kg)	0	0 <sup>2)</sup>	0	0	0
Biofuel (pennies, öre/kWh)	0	0	-	0	0
<b>Imports</b> (pennies, öre/kWh)	0	0	0	0	-
<b>Consumption</b>					
Industry/Energy	2.02 / 3.3	0 / 12.9 (9.6)	0 / 0	1,2-7,9-57,5 / 1,2-7,9-57,5 <sup>5)</sup>	0 / 0 <sup>3)</sup>
Private elec. heating/Private (pennies, S/N/D öre/kWh)	3.3 / 3.3	15.2 (9.6) / 15.2 (9.6)	5.75 (0) / 5.75 (0)	51 / 57,5	0 / 0

**The taxes on consumption have been divided into the following categories:**

Finland: Industry / Other consumers

Sweden: Industry / Supply of electricity, gas, heat and water / Other consumers (Municipalities in Northern Sweden)

Norway: Industry / Other consumers (Consumers in Finnmark and Northern Tromsø are exempted from taxes)

Denmark: Industry and enterprises / Consumers of electricity from heating / Other consumers

<sup>1)</sup> The tax on hydropower was replaced by a tax on hydropower premises in 1997. In 1997, this tax amounted to 3.42% of the land value, but in 1998 it was lowered to 2.21%, which corresponds to ca. 2.9 öre/kWh.

<sup>2)</sup> Energy and CO<sub>2</sub> taxes are paid for the plant's own use of fuel, i.e. 3-5% of the total volume. For light fuel oil, the tax amounts to a little over 2 öre per kWh produced. In addition, an NO<sub>x</sub> fee and an SO<sub>2</sub> tax are levied in proportion to the emissions.

<sup>3)</sup> The VAT in Iceland is determined so that the tax percentage is 24.5%, except for houses heated by electricity (14%) and power-intensive industry (0%).

<sup>4)</sup> A tax on natural resources, which can be deducted from the State's proportion of the tax on profits (20%).

<sup>5)</sup> Depending on the intended use and energy efficiency agreements, industrial enterprises and other VAT-registered companies may be entitled to a rebate on some of the fees. The figures show the fees after the rebate.

- Not applicable

TAXES ON ELECTRICITY GENERATION AND CONSUMPTION 1.1.1998, CONVERTED TO PENNIES/KWH

	Finland	Sweden	Norway	Denmark	Iceland
<b>Generation</b>					
Hydropower (pennies/kWh)	0	0	0,9	-	0
Nuclear power (pennies/kWh)	0	1,5	-	-	-
Coal (pennies/kWh)	0	1,5 <sup>1)</sup>	0	0	0
Gas (pennies/kWh)	0	0,8 <sup>1)</sup>	0	0	0
Peat (pennies/kWh)	0	0	-	-	-
Heavy fuel oil (pennies/kWh)	0	1,4 <sup>1)</sup>	0	0	0
Biofuel (pennies/kWh)	0	0	-	0	0
<b>Imports</b> (pennies, öre/kWh)	0	0	0	0	-
<b>Consumption</b>					
Industry/Energy	2,095 / 3,375	0 / 8,9 (6,6)	0 / 0	0,9-6,2-45,4 / 0,9-6,2-45,4	0 / 0
Private elec. heating/Private	3,375 / 3,375	10,5 (6,6) / 10,5 (6,6)	4,3 (0) / 4,3 (0)	40,3 / 45,4	0 / 0

**Assumptions:**

Currency exchange rates: 1 SEK = 0,69 FIM, 1 NOK = 0,74 FIM, 1 DKK = 0,79 FIM, 1 ISK = 0,07 FIM

Fuel	Energy	Efficiency	Consumption taxes in Finland include a fee for supply security (0.075 pennies/kWh)
Coal	7,09 kWh/kg	0,38	
Gas	10,00 kWh/m <sup>3</sup>	0,4	
Peat	11,28 kWh/kg	0,38	
Heavy fuel oil	10,77 kWh/l	0,36	

<sup>1)</sup> Excluding the NO<sub>x</sub> fee and the SO<sub>2</sub> tax.