

# Memo 2011

provisional values as of 30 April 2012

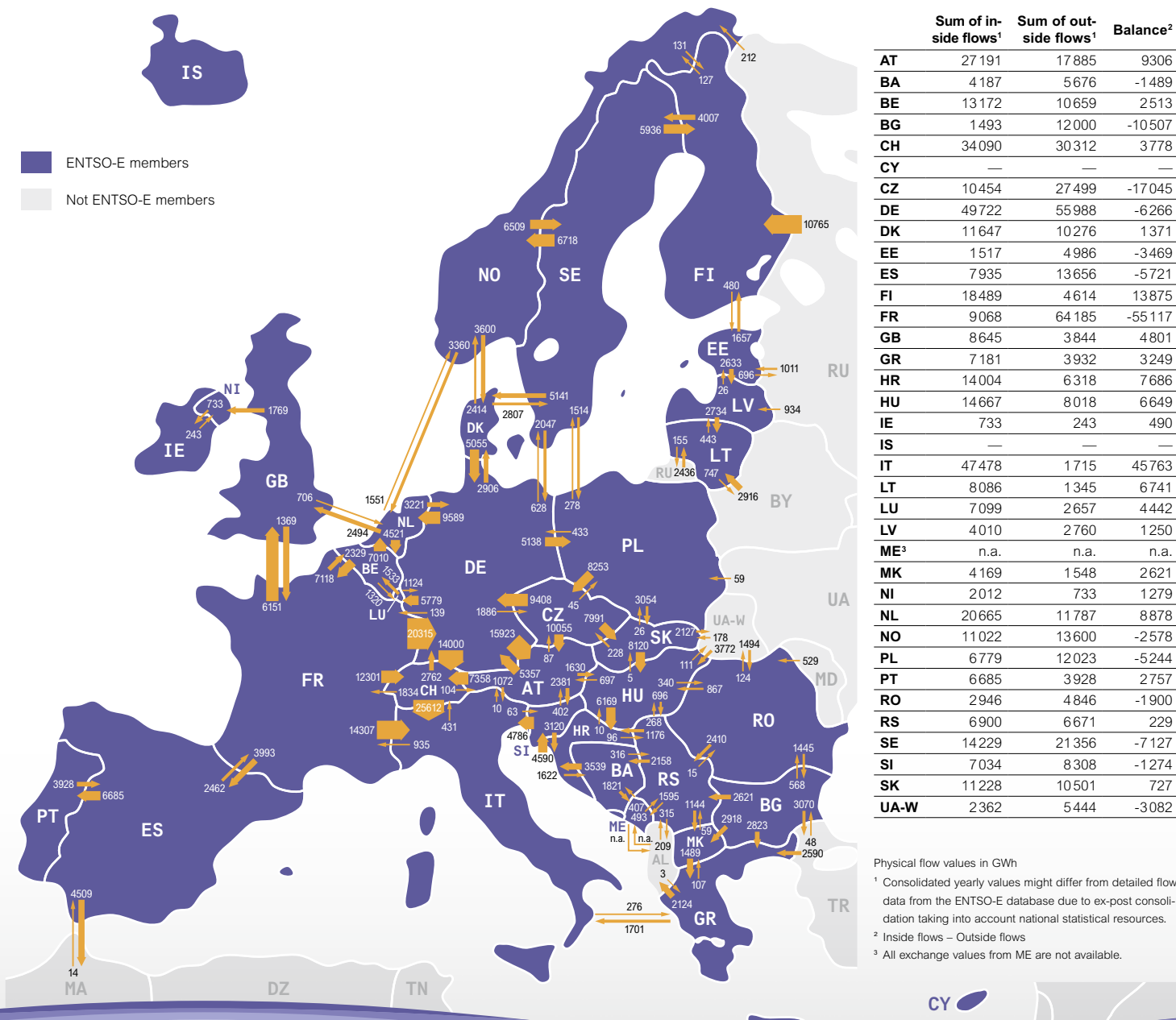
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European Network of  
Transmission System Operators  
for Electricity

entsoe

Reliable Sustainable Connected

# Physical energy flows



	Sum of in-side flows <sup>1</sup>	Sum of out-side flows <sup>1</sup>	Balance <sup>2</sup>
AT	27 191	17 885	9306
BA	4 187	5 676	-1 489
BE	13 172	10 659	2 513
BG	1 493	12 000	-10 507
CH	34 090	30 312	3 778
CY	—	—	—
CZ	10 454	27 499	-17 045
DE	49 722	55 988	-6 266
DK	11 647	10 276	1 371
EE	1 517	4 986	-3 469
ES	7 935	13 656	-5 721
FI	18 489	4 614	13 875
FR	9 068	64 185	-55 117
GB	8 645	3 844	4 801
GR	7 181	3 932	3 249
HR	14 004	6 318	7 686
HU	14 667	8 018	6 649
IE	733	243	490
IS	—	—	—
IT	47 478	1 715	45 763
LT	8 086	1 345	6 741
LU	7 099	2 657	4 442
LV	4 010	2 760	1 250
ME <sup>3</sup>	n.a.	n.a.	n.a.
MK	4 169	1 548	2 621
NI	2 012	733	1 279
NL	20 665	11 787	8 878
NO	11 022	13 600	-2 578
PL	6 779	12 023	-5 244
PT	6 685	3 928	2 757
RO	2 946	4 846	-1 900
RS	6 900	6 671	229
SE	14 229	21 356	-7 127
SI	7 034	8 308	-1 274
SK	11 228	10 501	727
UA-W	2 362	5 444	-3 082

Physical flow values in GWh

<sup>1</sup> Consolidated yearly values might differ from detailed flow data from the ENTSO-E database due to ex-post consolidation taking into account national statistical resources.

<sup>2</sup> Inside flows – Outside flows

<sup>3</sup> All exchange values from ME are not available.

# ENTSO-E in figures – Electricity system data of member TSOs' countries

	Country	AT <sup>1</sup>	BA	BE	BG	CH <sup>4</sup>	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GR	HR	HU	IE	IS	IT	LT	LU <sup>3</sup>	
<b>Net generation<sup>1</sup></b>	Nuclear thermal	TWh	0.0	0.0	45.9	15.2	25.6	0.0	26.7	101.5	0.0	0.0	55.1	22.3	421.1	64.6	0.0	0.0	14.7	0.0	0.0	0.0	0.0	0.0
	Fossil fuels	TWh	23.0	9.4	29.0	25.9	2.1	4.8	49.0	350.5	21.8	10.3	121.3	24.8	51.2	237.2	42.4	5.2	16.8	20.4	0.0	217.2	2.8	2.3
	Hydraulic generation	TWh	33.7	4.3	1.4	3.5	33.8	0.0	2.8	19.9	0.0	0.0	32.2	12.3	50.3	7.5	4.3	4.6	0.2	0.7	12.7	47.7	1.0	1.1
	Other renewable generation	TWh	0.0	0.0	9.3	0.5	1.4	0.1	2.5	86.1	11.3	1.1	55.6	10.5	19.3	19.1	3.4	0.2	1.8	4.4	4.4	24.1	0.6	0.2
	– of which wind	TWh	0.0	0.0	2.3	0.5	0.1	0.1	0.4	44.6	8.9	0.4	41.7	0.5	11.9	9.4	2.6	0.2	0.6	4.4	0.0	9.6	0.5	0.1
	– of which solar	TWh	0.0	0.0	1.5	0.0	0.0	0.0	2.1	18.3	0.0	0.0	9.6	0.0	1.8	0.0	0.4	0.0	0.0	0.0	0.0	9.3	0.0	0.0
	Non-identifiable generation	TWh	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.7	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
	<b>Total generation</b>	<b>TWh</b>	<b>65.4</b>	<b>13.7</b>	<b>85.6</b>	<b>45.1</b>	<b>62.9</b>	<b>4.9</b>	<b>81.0</b>	<b>557.9</b>	<b>33.1</b>	<b>11.4</b>	<b>264.5</b>	<b>70.6</b>	<b>541.9</b>	<b>328.3</b>	<b>50.1</b>	<b>10.0</b>	<b>33.6</b>	<b>25.6</b>	<b>17.2</b>	<b>289.0</b>	<b>4.4</b>	<b>3.7</b>
<b>Consumption<sup>1</sup></b>	<b>Consumption</b>	<b>TWh</b>	<b>68.6</b>	<b>12.2</b>	<b>86.5</b>	<b>33.2</b>	<b>64.4</b>	<b>4.9</b>	<b>63.0</b>	<b>544.3</b>	<b>34.5</b>	<b>7.8</b>	<b>255.0</b>	<b>84.4</b>	<b>478.2</b>	<b>329.1</b>	<b>52.9</b>	<b>17.5</b>	<b>40.2</b>	<b>26.1</b>	<b>17.2</b>	<b>332.3</b>	<b>10.4</b>	<b>6.6</b>
	Variation (compared with 2010)	%	0.4	3.9	-4.3	5.4	-2.0	-5.5	-1.2	-0.7	-3.3	-2.3	-2.2	-3.5	-6.8	-2.0	-1.2	-0.5	3.2	-3.3	2.7	0.6	0.9	-2.0
	ENTSO-E Transmission network losses percentage consumption	%																						
<b>Net generating capacity as of 31 December 2011<sup>2</sup></b>	NGC nuclear	MW	0	0	5926	2080	3220	0	3692	12048	0	0	7525	2676	63130	10397	0	0	1892	0	0	0	0	0
	NGC Fossil fuels	MW	7389	1506	8539	6400	355	973	10938	66967	7156	2283	43659	8978	27789	61984	9614	1787	6860	6132	52	76430	2544	509
	NGC Hydro power	MW	12665	1971	1420	3150	13464	0	2161	9209	9	4	19081	3157	25405	3876	3223	2110	50	508	1860	21594	876	1128
	NGC Renewable energy sources	MW	1031	0	4142	770	328	102	2190	53532	3988	254	26639	2254	10138	3355	1936	118	695	1615	661	20408	252	95
	– of which wind	MW	1002	0	1056	550	12	102	219	28254	3952	184	20729	197	6639	3355	1363	118	325	1615	0	6961	202	43
	– of which solar	MW	0	0	1901	220	34	0	1971	22306	36		4916	0	2228	0	439		0	0	0	12743		27
	NGC Other sources	MW	0	0	0	0	212	0	0	3263	729	0	0	44	0	45	0	0	0	242	0	0	0	0
	<b>NGC Total</b>	<b>MW</b>	<b>21085</b>	<b>3477</b>	<b>20027</b>	<b>12400</b>	<b>17579</b>	<b>1075</b>	<b>18981</b>	<b>145019</b>	<b>11882</b>	<b>2541</b>	<b>96904</b>	<b>17109</b>	<b>126462</b>	<b>79657</b>	<b>14773</b>	<b>4015</b>	<b>9497</b>	<b>8497</b>	<b>2573</b>	<b>118432</b>	<b>3672</b>	<b>1732</b>
Representativity of the values	%	100	100	100	99	100	100	100	93	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

	Country	LV <sup>3</sup>	ME	MK <sup>3</sup>	NI	NL	NO	PL <sup>5,6</sup>	PT	RO	RS	SE <sup>3</sup>	SI	SK	ENTSO-E <sup>7</sup>	UA-W <sup>8</sup>	
<b>Net generation<sup>1</sup></b>	Nuclear thermal	TWh	0.0	0.0	0.0	3.9	0.0	0.0	0.0	10.8	0.0	58.0	5.9	14.4	885.6	0.0	
	Fossil fuels	TWh	2.9	1.4	4.9	6.6	93.0	4.8	140.9	24.8	30.1	32.1	5.4	4.6	6.3	1625.1	7.7
	Hydraulic generation	TWh	2.9	1.2	1.5	0.0	0.0	121.4	2.6	11.8	14.7	9.2	65.8	3.4	4.0	512.3	0.2
	Other renewable generation	TWh	0.2	0.0	0.0	1.1	12.1	1.3	8.1	11.8	1.4	0.0	17.3	0.0	0.9	310.1	0.0
	– of which wind	TWh	0.1	0.0	0.0	1.0	5.1	1.3	2.7	9.0	1.2	0.0	6.1	0.0	0.0	165.1	0.0
	– of which solar	TWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.3	43.6	0.0
	Non-identifiable generation	TWh	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	11.1	0.0
	<b>Total generation</b>	<b>TWh</b>	<b>6.2</b>	<b>2.6</b>	<b>6.3</b>	<b>7.7</b>	<b>109.0</b>	<b>127.4</b>	<b>151.6</b>	<b>48.4</b>	<b>57.0</b>	<b>41.3</b>	<b>146.4</b>	<b>13.9</b>	<b>26.5</b>	<b>3344.2</b>	<b>7.9</b>
<b>Consumption<sup>1</sup></b>	<b>Consumption</b>	<b>TWh</b>	<b>7.3</b>	<b>4.2</b>	<b>9.0</b>	<b>9.0</b>	<b>117.8</b>	<b>122.0</b>	<b>145.7</b>	<b>50.5</b>	<b>54.9</b>	<b>40.2</b>	<b>139.2</b>	<b>12.6</b>	<b>26.8</b>	<b>3308.3</b>	<b>4.7</b>
	Variation (compared with 2010)	%	-0.7	3.4	7.9	-1.9	1.2	-6.0	1.5	-3.3	2.9	1.6	-5.3	2.5	0.6	-2.0	8.7
	Transmission network losses percentage consumption	%														1.6	
<b>Net generating capacity as of 31 December 2011<sup>2</sup></b>	NGC nuclear	MW	0	0	0	504	0	0	0	1300	0	9363	696	1940	126389	0	
	NGC Fossil fuels	MW	848	220	1157	2335	20137	1166	30117	8779	8901	5478	4793	1282	2896	446953	2517
	NGC Hydro power	MW	1555	660	503	4	38	30164	2341	5392	6144	2888	16197	1063	2478	196348	27
	NGC Renewable energy sources	MW	59	0	0	419	2439	450	2209	4855	1030	0	6094	0	753	152811	0
	– of which wind	MW	37	0	0	405	2340	450	2059	4081	1006	0	2899	0	3	90158	0
	– of which solar	MW	0	0	0	0	51	0	1	155	0	0	0	0	507	47535	0
	NGC Other sources	MW	0	0	0	7	1012	0	0	0	0	0	0	0	85	5639	0
	<b>NGC Total</b>	<b>MW</b>	<b>2462</b>	<b>880</b>	<b>1660</b>	<b>2765</b>	<b>24130</b>	<b>31780</b>	<b>34667</b>	<b>19026</b>	<b>17375</b>	<b>8366</b>	<b>36447</b>	<b>3041</b>	<b>8152</b>	<b>928140</b>	<b>2544</b>
Representativity of the values	%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	

<sup>1</sup> All values are calculated to represent 100% of the national values

<sup>2</sup> All values are identical with the national values and their representativity

<sup>3</sup> NGC values as of 31 December 2010

<sup>4</sup> Calculation based on the ENTSO-E database differs from the official values from the Swiss Federal Office of Energy

<sup>5</sup> Operational data

<sup>6</sup> Other renewable includes energy from biomass co-firing in conventional thermal units.

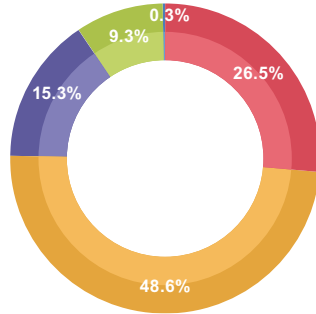
<sup>7</sup> Calculated sum of the ENTSO-E member TSOs' countries

<sup>8</sup> UA-W represents the so-called Burshtyn Island synchronously interconnected with ENTSO-E area.

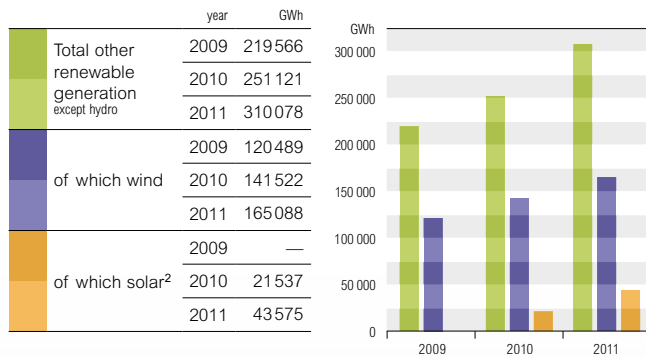
# Generation

Generation mix in ENTSO-E member TSOs' countries<sup>1</sup>

	GWh
Thermal nuclear	885 599
Fossil fuels (lignite and hard coal, gas, oil, mixed fuels, peat)	1 625 142
Hydraulic generation (storage, run of river, pumped storage)	512 261
Other renewable generation (wind, solar, geothermal, waste, bio fuels)	310 078
Non-identifiable generation	11 118



ENTSO-E other renewable generation except hydro in GWh<sup>1</sup>

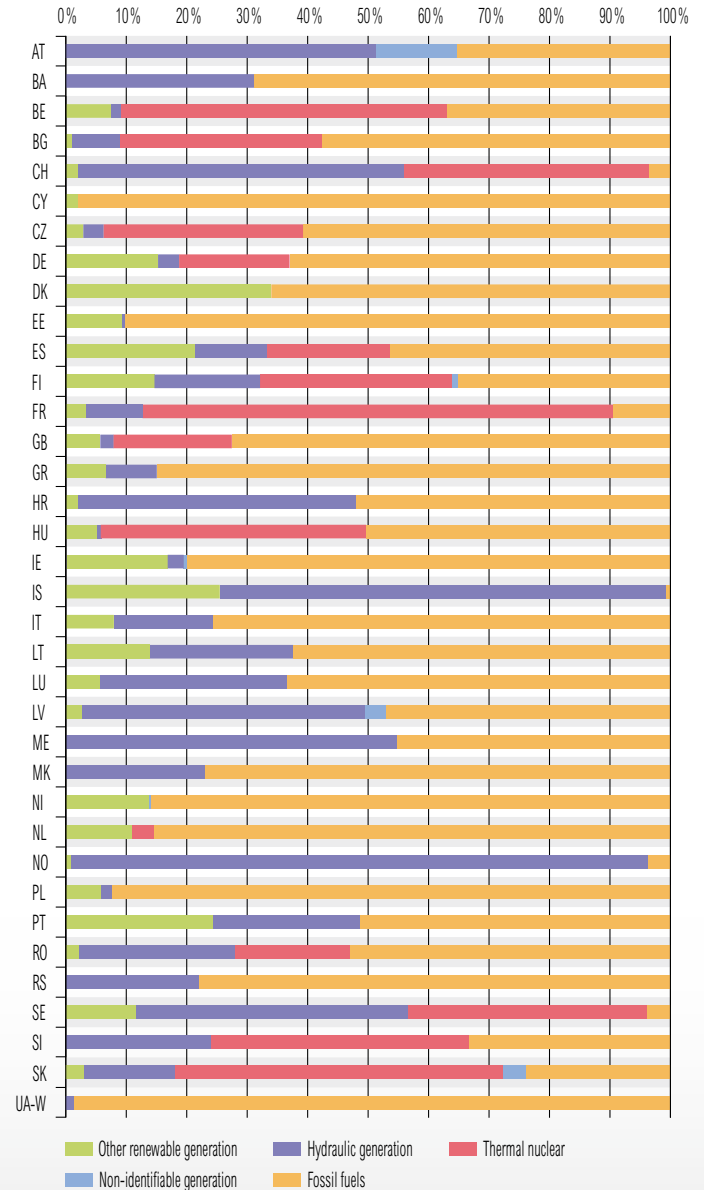


<sup>1</sup> All values are calculated to represent 100% of the national values

<sup>2</sup> Data collection from year 2010 onwards

<sup>3</sup> Share of energy produced based on the net generation of each ENTSO-E member TSOs' country as of the table ENTSO-E in figures on page 4-5.

Share of energy produced of each member TSOs' country 2011 in %<sup>3</sup>



# Reliable. Sustainable. Connected.

ENTSO-E represents 41 TSOs across 34 European countries and fulfils mandates under EC Regulation 714 / 2009 on cross-border electricity exchanges, fully applicable since 3 March 2011. ENTSO-E's overall objective is to promote the reliable operation, optimal management and sound technical evolution of the European electricity transmission system in order to ensure security of supply and to meet the needs of the European Internal Energy Market (IEM). Most notably ENTSO-E is mandated to publish EU-wide Ten-Year Network Development Plans as well as draft network codes - nine until 2014 to support the completion of the European IEM.

ENTSO-E's network code work involves intensive consultation with stakeholders and close cooperation with the European Commission and ACER. The EC sets priorities and submits network codes to Comitology through which codes become binding to system users. The Agency for the Cooperation of Energy Regulators (ACER) writes and approves framework guidelines with which ENTSO-E's draft network codes must be in line.

This Memo represents a short extract from a wide range of data and information, which is available from ENTSO-E's website ([www.entsoe.eu](http://www.entsoe.eu)) on its four main areas of activity: system operation, system development, market and research & development, and of course on the network codes and Ten-Year Network Development Plans. Extensive market related data and information is available on our transparency platform [www.entsoe.net](http://www.entsoe.net) with many data updated daily on congestion management, vertical load, balance management, transfer capacities and outages.

## Contact

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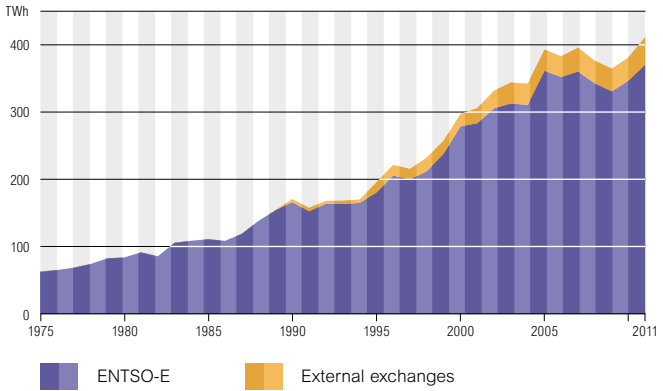
## Grid information

Number of 220 kV and ≥ 330 kV circuits on cross-frontier transmission lines as of 31 December 2011 between ENTSO-E member TSOs' countries

	CH	CZ	DE	DK	EE	FR	GR	HR	HU	IT	LU	LV	ME	MK	NI <sup>1</sup>	NO	NL	PL	PT	RO	RS	SE	SI	SK	UA-W <sup>2</sup>
AT	2/2	2/2	11/3						2/2	1/-													1/2		
BA								7/2					2/1									1/1			
		BE				3/3					2/-						-/4								
		BG					-/1							-/1						-/4	-/1				
		CH	5/7			5/5				5/5															
		CZ	-/4															2/2						2/3	
		DE	2/3			2/4					8/-						-/6	2/2					-/1		
		DK														2/1							2/2		
		EE										-/4													
		ES				2/2													3/5						
		FI		-/1												1/-							1/4		
		FR								3/3															
		GB				2/-									2/-		-/2								
								GR		-/1				-/2											
								HR		-/4												-/1		2/3	
								HU													-/2	-/1		-/2	2/2
					</																				

# Development of exchanges

Development of overall cross-border exchanges of ENTSO-E member TSOs' countries since 1975



- ENTSO-E corresponds the sum of exchanges between ENTSO-E member TSOs' countries
- External exchanges as sum of exchanges in synchronous operation with ENTSO-E member TSOs' countries
- All exchanges represent the sum of ENTSO-E and external exchanges
- Reliable Baltic data is available since 1995
- There were no exchanges between the Republic of Ireland and Northern Ireland before 1995
- External exchanges of the Nordic countries are reliable since 1990
- External exchanges include Albania, Belarus, Moldavia, Morocco, Russia, Turkey, Ukraine and Ukraine-West since 2009
- Sum of all cross-border exchanges 2011 without exchange data between Montenegro and Albania

## Overview electricity exchanges for the year 2010 and 2011

	All Exchanges	ENTSO-E	External
<b>2010</b>	381 594 GWh	347 172 GWh	34 422 GWh
<b>2011</b>	411 934 GWh	370 786 GWh	41 148 GWh

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## Highest and lowest hourly load value of each country 2011 in MW<sup>1</sup>

	Lowest value		Highest value	
	date/time	value	date/time	value
AT	13.06./06:00	3794	19.12./18:00	9701
BA	22.07./04:00	872	31.12./18:00	2150
BE	22.05./06:00	6336	31.01./19:00	14081
BG	25.04./05:00	2660	01.02./20:00	6897
CH <sup>2</sup>	01.08./08:00	2865	01.02./11:00	8083
CY	20.04./04:00	343	16.02./20:00	780
CZ	24.07./05:00	4315	01.02./11:00	10210
DE	13.06./04:00	35597	07.12./18:00	83990
DK	24.07./06:00	2177	05.01./18:00	6231
EE	24.06./04:00	446	23.02./09:00	1510
ES	24.04./07:00	17989	24.01./19:00	43596
FI	26.06./04:00	5226	18.02./09:00	14998
FR	07.08./07:00	31268	04.01./19:00	91720
GB	07.08./07:00	20001	06.01./19:00	57875
GR	01.05./06:00	3356	20.07./13:00	9868
HR	25.04./04:00	1185	25.01./19:00	2970
HU	31.07./06:00	2630	24.11./17:00	5931
IE	08.10./06:00	1586	13.12./19:00	4610
IS	07.10./05:00	1346	30.11./19:00	2138
IT	24.04./07:00	20582	13.07./12:00	53668
LT	26.06./05:00	703	25.02./09:00	1734
LU	28.03./01:00	148	21.12./18:00	1188
LV	17.10./05:00	141	23.02./09:00	1239
ME	23.05./06:00	305	30.10./03:00	746
MK	26.06./06:00	540	31.12./15:00	1642
NI	10.07./07:00	538	10.01./19:00	1744
NL	12.06./07:00	8167	14.12./18:00	18049
NO	24.07./06:00	8665	21.02./09:00	22129
PL	25.04./06:00	9476	22.12./18:00	22755
PT	24.04./08:00	3310	24.01./21:00	9192
RO	24.04./15:00	4086	03.02./19:00	8724
RS	03.07./06:00	2436	02.02./19:00	7341
SE	23.07./07:00	9261	23.02./10:00	26015
SI	02.05./05:00	784	02.03./20:00	1949
SK	31.07./06:00	2213	02.02./18:00	4290
ENTSOE <sup>3</sup>	<b>31.07./07:00</b>	<b>234666</b>	<b>01.02./19:00</b>	<b>532590</b>
UA-W	03.07./04:00	397	05.01./17:00	1142

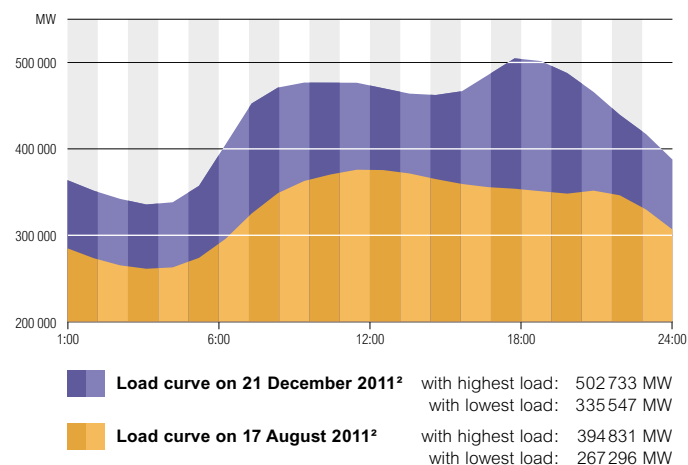
<sup>1</sup> All values are calculated to represent 100% of the national values

<sup>2</sup> Lowest and Highest physical hourly vertical load value of the Swiss transmission grid.

<sup>3</sup> Calculated as sum of the ENTSO-E member TSOs' monthly hourly load values

## Consumption on the 3<sup>rd</sup> Wednesday 2011

ENTSO-E load diagram on the 3<sup>rd</sup> Wednesday of August and December 2011<sup>1,2</sup>



Highest and lowest load of each country on 21 December 2011 in MW<sup>2</sup>

	Lowest value	Highest value		Lowest value	Highest value		Lowest value	Highest value
AT	6227	9442	FR	58900	75461	MK	956	1486
BA	1174	1997	GB	32417	54917	NI	757	1564
BE	8594	12337	GR	4351	7711	NL	9655	17322
BG	3944	6180	HR	1583	2874	NO	15927	20709
CH	7185	10161	HU	3556	5492	PL	15209	22697
CY	360	696	IE	2375	4239	PT	4763	7657
CZ	6878	9109	IS	1864	2101	RO	5653	8012
DE	50763	78477	IT	25299	51745	RS	4597	6689
DK	3117	5628	LT	958	1688	SE	15382	22023
EE	787	1257	LU	638	1188	SI	1150	1875
ES	23414	36994	LV	633	1112	SK	3025	4076
FI	8958	11570	ME	422	648	UA-W	624	1022

<sup>1</sup> Calculated load values as sum of the ENTSO-E member TSOs' countries

<sup>2</sup> Values are calculated to represent 100% of the national values



# Members of ENTSO-E

<b>AT</b>	Austria	APG VUEN	APG-Austrian Power Grid AG Vorarlberger Übertragungsnetz GmbH
<b>BA</b>	Bosnia-Herzegovina	NOS BiH	Nezavisni operator sustava u Bosni i Hercegovini
<b>BE</b>	Belgium	Elia	Elia System Operator SA
<b>BG</b>	Bulgaria	ESO	Electroenergien Sistemem Operator EAD
<b>CH</b>	Switzerland	swissgrid	swissgrid ag
<b>CY</b>	Cyprus	Cyprus TSO	Cyprus Transmission System Operator
<b>CZ</b>	Czech Republic	ČEPS	ČEPS a.s.
<b>DE</b>	Germany	TransnetBW TenneT GER Amprion 50Hertz	TransnetBW GmbH (until February 2012 EnBW Transportnetze AG) TenneT TSO GmbH Amprion GmbH 50Hertz Transmission GmbH
<b>DK</b>	Denmark	Energinet.dk IPC	Energinet.dk Independent Public Enterprise
<b>EE</b>	Estonia	Elering OÜ	Elering OÜ
<b>ES</b>	Spain	REE	Red Eléctrica de España S.A.
<b>FI</b>	Finland	Fingrid	Fingrid Oyj
<b>FR</b>	France	RTE	Réseau de Transport d'Electricité
<b>GB</b>	United Kingdom	National Grid SONI Ltd ( <b>NI</b> ) SHTL SPTransmission	National Grid Electricity Transmission plc System Operator for Northern Ireland Ltd Scottish Hydro Electric Transmission Limited Scottish Power Transmission plc
<b>GR</b>	Greece	IPTO SA	Independent Power Transmission Operator S.A. (until January 2012 Hellenic Transmission System Operator S.A.)
<b>HR</b>	Croatia	HEP-OPS	HEP-Operator prijenosnog sustava d.o.o.
<b>HU</b>	Hungary	MAVIR ZRT.	MAVIR Magyar Villamosenergia-ipari Átviteli Rendszerirányító Zártkörűen Működő Részvénytársaság
<b>IE</b>	Ireland	EirGrid	EirGrid plc
<b>IS</b>	Iceland	Landsnet	Landsnet hf
<b>IT</b>	Italy	Terna	Terna – Rete Elettrica Nazionale SpA
<b>LT</b>	Lithuania	LITGRID AB	LITGRID AB
<b>LU</b>	Luxembourg	Creos Luxembourg	Creos Luxembourg S.A.
<b>LV</b>	Latvia	Augstsprieguma tīkls	AS Augstsprieguma tīkls
<b>ME</b>	Montenegro	CGES AD	Crnogorski elektroprenosni sistem AD
<b>MK</b>	FYROM	MEPSO	Macedonian Transmission System Operator AD
<b>NL</b>	The Netherlands	TenneT NL	TenneT TSO B.V.
<b>NO</b>	Norway	Statnett	Statnett SF
<b>PL</b>	Poland	PSE Operator	PSE Operator S.A.
<b>PT</b>	Portugal	REN	Rede Eléctrica Nacional, S.A.
<b>RO</b>	Romania	Transelectrica	C.N. Transelectrica S.A.
<b>RS</b>	Serbia	EMS	JP Elektromreža Srbije
<b>SE</b>	Sweden	SVENSKA KRAFTNÄT	Affärsverket Svenska Kraftnät
<b>SI</b>	Slovenia	ELES	Elektro Slovenija d.o.o.
<b>SK</b>	Slovak Republic	SEPS	Slovenska elektrizacna prenosova sustava, a.s.

# Structure of ENTSO-E

