Memo 2012

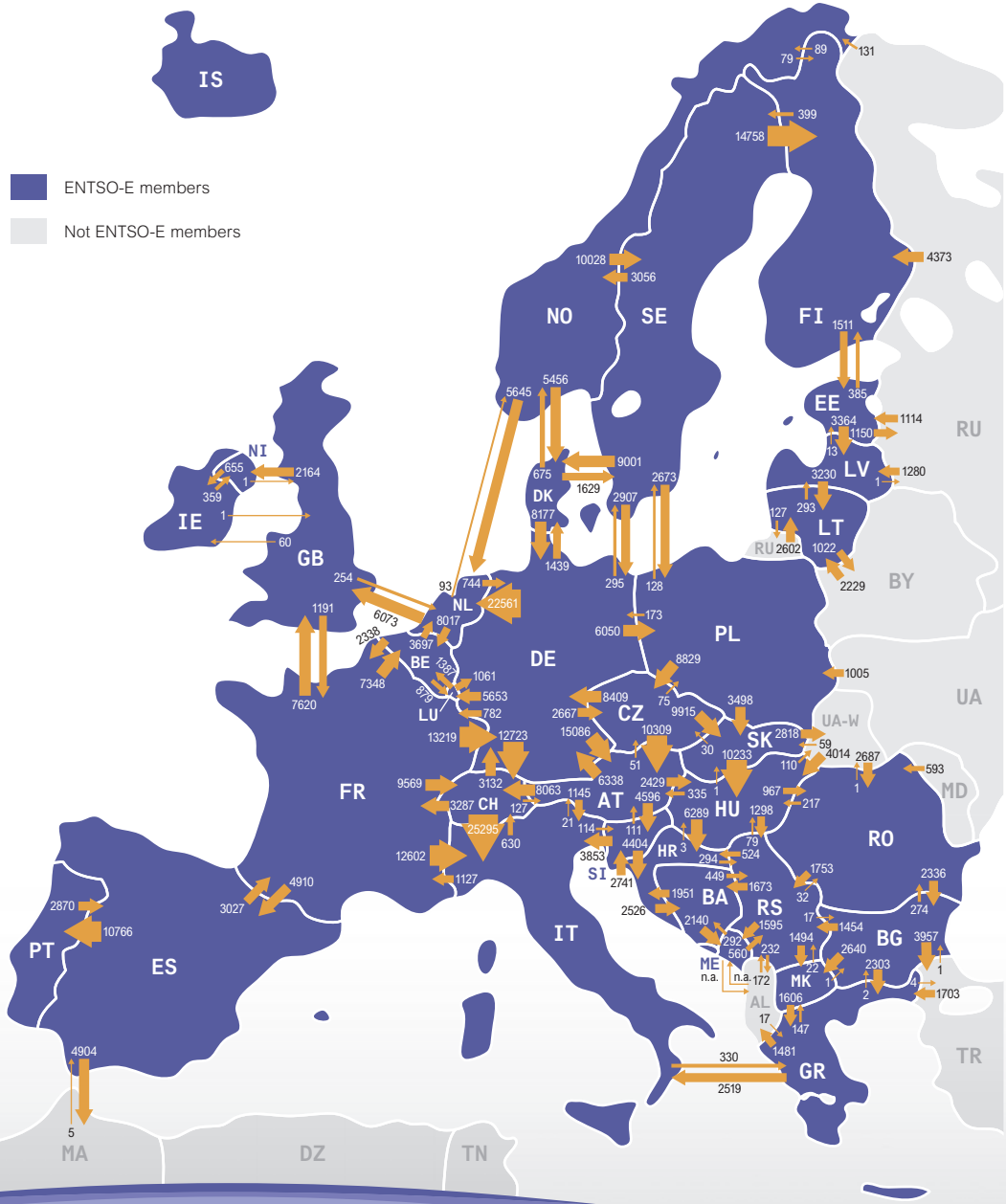
provisional values as of 30 April 2013

European Network of
Transmission System Operators
for Electricity

entsoe

Reliable Sustainable Connected

Physical energy flows



	Sum of in-side flows[1]	Sum of out-side flows[1]	Balance[2]
AT	25989	22622	3367
BA	4491	4540	-49
BE	16752	6914	9838
BG	2357	10628	-8271
CH	30985	31841	-856
CY	—	—	—
CZ	11577	28708	-17131
DE	44160	67256	-23096
DK	15896	10481	5415
EE	2638	4899	-2261
ES	7785	18697	-10912
FI	19595	1999	17596
FR	11752	55268	-43516
GB[3]	13695	3669	10026
GR	5959	4153	1806
HR	13168	5564	7604
HU	16975	9000	7975
IE	715	360	355
IS	—	—	—
IT	45414	2222	43192
LT	8060	1442	6619
LU	6532	2448	4084
LV	4937	3245	1692
ME[4]	3447	852	n. a.
MK	4281	1629	2652
NI[5]	2523	656	1867
NL	32157	14927	17230
NO	4044	21208	-17164
PL	9803	12644	-2841
PT	10766	2870	7896
RO	4553	4307	246
RS	6002	5358	644
SE	12479	32395	-19916
SI	7451	8368	-917
SK	13473	13081	392

Physical flow values in GWh

[1] 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.

[2] Inside flows – Outside flows

[3] All data with the country code GB represents monthly statistical data as sum of England, Scotland and Wales.

[4] The reported exchange data are not complete; exchanges between ME – AL are missing.

[5] All data with the country code NI represents the monthly statistical data of GB Northern Ireland.

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

	Country		AT[3]	BA	BE	BG	CH[3,4]	CY	CZ	DE[3]	DK[3]	EE	ES	FI	FR	GB[5]	GR	HR	HU	IE	IS	IT	LT
Net generation[1]	Nuclear thermal	TWh	0.0	0.0	38.5	14.7	24.3	0.0	28.6	94.6	0.0	0.0	58.5	22.1	404.9	66.1	0.0	0.0	14.8	0.0	0.0	0.0	0.0
	Fossil fuels	TWh	19.7	8.4	28.8	22.1	2.3	4.5	47.0	346.6	16.4	9.1	135.6	17.9	48.0	231.1	41.8	4.7	14.7	20.4	0.0	204.7	3.0
	Hydraulic generation	TWh	42.8	3.8	1.7	3.8	39.9	0.0	3.0	23.4	0.0	0.0	23.4	16.6	63.8	6.9	4.6	4.8	0.2	1.0	12.2	43.3	0.9
	Other renewable generation	TWh	0.0	0.0	7.7	1.3	1.4	0.2	2.6	106.2	12.5	1.3	65.9	10.4	24.7	23.3	4.2	0.4	2.2	4.1	4.9	36.7	0.7
	– of which wind	TWh	0.0	0.0	2.9	1.1	0.1	0.2	0.4	46.0	10.2	0.4	48.5	0.5	14.9	12.6	3.2	0.3	0.7	4.0	0.0	13.1	0.5
	– of which solar	TWh	0.0	0.0	1.6	0.2	0.0	0.0	2.2	27.6	0.0	0.0	12.5	0.0	4.0	0.0	1.2	0.0	0.0	0.0	0.0	18.3	0.0
	– of which biomass	TWh	0.0	0.0	3.2	0.0	0.0	0.0	0.0	30.4	1.9	0.9	4.8	9.9	5.5	0.0	0.2	0.1	1.5	0.0	0.0	n.a.	0.2
	Non-identifiable generation	TWh	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.8	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
	Total generation	**TWh**	**72.0**	**12.2**	**76.6**	**41.9**	**68.0**	**4.7**	**81.1**	**570.8**	**28.9**	**10.5**	**283.7**	**67.7**	**541.4**	**327.4**	**50.5**	**9.9**	**31.9**	**25.6**	**17.1**	**284.7**	**4.7**
Consumption[1]	**Consumption**	**TWh**	**69.3**	**12.1**	**84.9**	**32.5**	**64.8**	**4.7**	**63.0**	**539.9**	**34.3**	**8.1**	**267.4**	**85.1**	**489.5**	**333.4**	**52.1**	**17.3**	**39.9**	**25.7**	**17.1**	**325.3**	**10.6**
	Variation (compared with 2011)	%	1.0	-0.5	-2.5	-2.3	0.5	-4.6	0.0	-0.8	-0.6	4.0	4.9	1.0	2.1	1.3	-1.6	-1.1	-0.6	-1.7	-0.2	-2.8	1.8
	ENTSO-E Transmission network losses percentage consumption	%																					
Net generating capacity as of 31 December 2012[2]	NGC nuclear	MW	0	0	5926	2000	3278	0	3800	12048	0	0	7582	2692	63130	9726	0	0	1892	0	0	0	0
	NGC Fossil fuels	MW	7425	1506	8385	6888	388	1218	10960	66967	7486	2303	48389	9363	27808	58324	9640	1788	6853	6132	52	73824	2691
	NGC Hydro power	MW	12919	1971	1422	3161	13723	0	2216	9209	10	4	19285	3172	25388	3889	3231	2110	52	508	1860	21737	876
	NGC Renewable energy sources	MW	1054	0	5080	1713	508	147	2349	53532	3967	343	29781	2418	12354	5111	2926	165	773	1678	661	23147	337
	– of which wind	MW	1017	0	1348	677	42	147	263	28254	3950	266	22497	287	7449	5111	1457	165	324	1663	0	6959	274
	– of which solar	MW	n.a.	0	2501	1013	111	0	2086	22306	17	n.a.	6390	0	3515	0	1424	0	0	0	0	12918	8
	– of which biomass	MW	n.a.	0	n.a.	23	n.a.	0	0	n.a.	n.a.	n.a.	894	2131	0	0	45	0	449	0	0	2542	54
	NGC Other sources	MW	0	0	0	0	204	0	0	3263	44	n.a.	0	44	0	804	90	0	0	272	0	0	0
	NGC Total	**MW**	**21398**	**3477**	**20813**	**13762**	**18101**	**1365**	**19325**	**145019**	**11507**	**2650**	**105037**	**17689**	**128680**	**77854**	**15887**	**4063**	**9570**	**8590**	**2573**	**118708**	**3904**
	Representativity of the values	%	100	100	100	99	100	100	100	93	100	100	100	100	100	89	100	100	100	100	100	100	100

	Country		LU[3]	LV	ME[6]	MK	NI[7]	NL	NO	PL[8]	PT	RO	RS	SE	SI	SK	ENTSO-E[9]
Net generation[1]	Nuclear thermal	TWh	0.0	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	10.5	0.0	61.2	5.2	14.5	862.3
	Fossil fuels	TWh	2.3	2.0	1.4	4.8	6.0	78.0	3.4	134.2	23.1	28.6	30.0	4.6	4.6	5.8	1555.7
	Hydraulic generation	TWh	1.2	3.7	1.2	1.1	0.0	0.0	142.9	2.4	6.4	12.2	9.9	77.7	3.7	4.3	563.0
	Other renewable generation	TWh	0.2	0.4	0.0	0.0	1.1	17.0	1.6	11.8	13.0	3.0	0.0	17.9	0.0	1.3	377.7
	– of which wind	TWh	0.1	0.1	0.0	0.0	1.0	5.0	1.6	4.4	10.0	2.7	0.0	7.1	0.0	0.0	191.7
	– of which solar	TWh	0.0	0.0	0.0	0.0	0.0	n.a.	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.6	68.6
	– of which biomass	TWh	0.0	0.1	0.0	0.0	0.0	n.a.	0.0	7.4	2.6	0.2	0.0	10.8	0.0	0.0	79.6
	Non-identifiable generation	TWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	11.7
	Total generation	**TWh**	**3.6**	**6.0**	**2.6**	**5.8**	**7.1**	**98.8**	**147.8**	**148.4**	**42.6**	**54.3**	**39.9**	**161.6**	**13.6**	**26.8**	**3370.4**
Consumption[1]	**Consumption**	**TWh**	**6.3**	**7.7**	**4.2**	**8.5**	**7.0**	**115.9**	**127.9**	**144.9**	**49.1**	**54.4**	**39.7**	**142.0**	**12.6**	**26.8**	**3323.0**
	Variation (compared with 2011)	%	-4.4	6.2	n.a.	-5.5	1.3	-1.6	4.8	-0.6	-2.9	-0.9	-1.3	2.0	0.6	0.2	0.3
	Transmission network losses percentage consumption	%															1.62
Net generating capacity as of 31 December 2012[2]	NGC nuclear	MW	0	0	0	0	0	504	0	0	0	1300	0	9363	696	1940	125877
	NGC Fossil fuels	MW	499	757	220	1157	5880	22265	1166	29420	8270	9460	5507	4666	1754	3190	452601
	NGC Hydro power	MW	1134	1556	660	503	12	38	30164	2344	5656	6196	2888	16203	1136	2534	197767
	NGC Renewable energy sources	MW	91	110	0	0	1094	2628	450	3169	4620	1801	0	7151	n.a.	767	169925
	– of which wind	MW	41	81	0	0	1027	2509	450	2562	4194	1753	0	3745	n.a.	3	98515
	– of which solar	MW	40	0	0	0	0	71	0	1	220	21	0	24	n.a.	524	53190
	– of which biomass	MW	n.a.	29	0	0	68	48	0	606	179	27	0	3036	n.a.	168	10299
	NGC Other sources	MW	16	0	0	0	0	987	0	0	0	0	0	0	n.a.	0	5724
	NGC Total	**MW**	**1740**	**2423**	**880**	**1660**	**6986**	**26422**	**31780**	**34933**	**18546**	**18757**	**8395**	**37383**	**3586**	**8431**	**951894**
	Representativity of the values	%	100	100	100	100	100	100	100	100	100	100	100	100	93	100	

[1] All values are calculated to represent 100 % of the national values

[2] All values are identical with the national values and their representativity

[3] NGC values as of 31 December 2011

[4] Calculation based on the ENTSO-E database differs from the official values from the Swiss Federal Office of Energy

[5] All data with the country code GB represents monthly statistical data as sum of England, Scotland and Wales.

[6] Net generation and consumption data as of the year 2011

[7] All data with the country code NI represents the monthly statistical data of GB Northern Ireland.

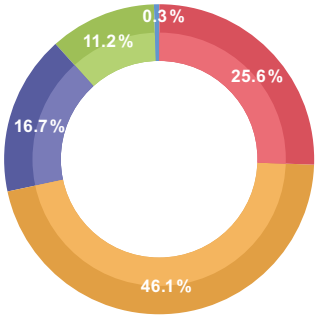
[8] Operational data. Subcategory biomass includes energy from biomass co-firing in conventional thermal unit

[9] Calculated sum of the ENTSO-E member TSOs' countries

Generation

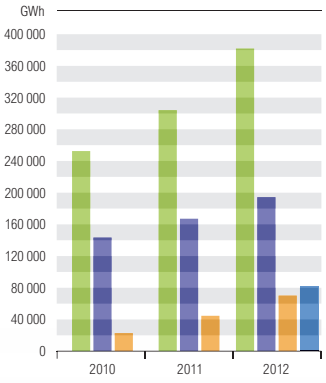
Generation mix in ENTSO-E member TSOs' countries[1]

	GWh
Thermal nuclear	862327
Fossil fuels (lignite and hard coal, gas, oil, mixed fuels, peat)	1555711
Hydraulic generation (storage, run of river, pumped storage)	562977
Other renewable generation (wind, solar, biomass, geothermal, waste)	377731
Non-identifiable generation	11680



ENTSO-E other renewable generation except hydro in GWh[1]

	year	GWh
Total other renewable generation except hydro	2010	249244
	2011	300645
	2012	377731
of which wind	2010	140108
	2011	164647
	2012	191695
of which solar	2010	20900
	2011	42702
	2012	68625
of which biomass[2]	2010	—
	2011	—
	2012	79579



[1] All values are calculated to represent 100 % of the national values

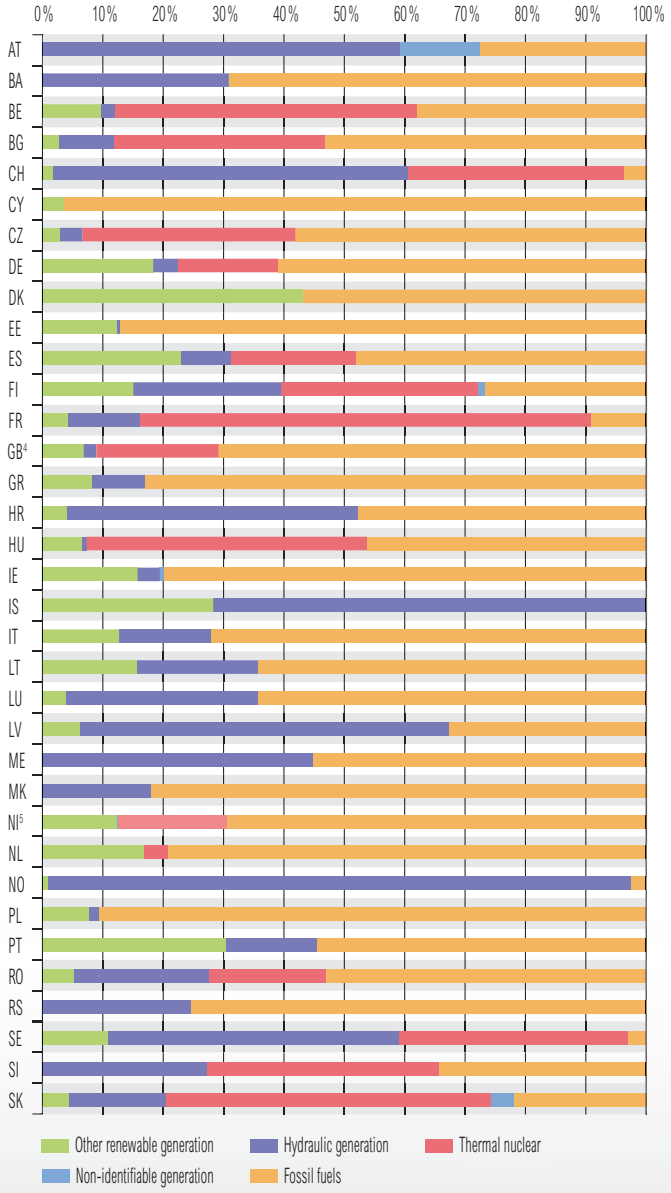
[2] Data collection from year 2012 onwards

[3] 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.

[4] All data with the country code GB represents monthly statistical data as sum of England, Scotland and Wales.

[5] All data with the country code NI represents the monthly statistical data of GB Northern Ireland.

Share of energy produced of each member TSOs' country 2012 in %[3]



Reliable. Sustainable. Connected.

ENTSO-E represents 41 Transmission System Operators (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 by 2014 to support the completion of the European IEM.

As of late April 2013, of the nine network codes planned to date three have received recommendations from Acer to the European Commission to be adopted. Once considered by the European Commission these codes (Capacity Allocation and Congestion Management, Requirements for Generators, and Demand Connection) must go through Comitology before being adopted as regulations. Two other codes have been delivered to Acer and are awaiting their opinion and recommendation whilst four others are still in draft. Visit www.entsoe.eu to see progress on Network codes, TYNDP and other ENTSO-E products and reports as well as ENTSO-E positions on TSO related topics.

Find out more about ENTSO-E data and information, which is available from ENTSO-E's website (www.entsoe.eu). Here we provide updates on our four main areas of activity: system operation, system development, market and research & development. Extensive market related data and information is available on our transparency platform www.entsoe.net with many data updated daily on congestion management, vertical load, balance management, transfer capacities and outages.

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Photo Cover: Landsnet

Grid information

Number of 220 kV and ≥ 330 kV circuits on cross-frontier transmission lines as of 31 December 2012 between ENTSO-E member TSOs' countries

220 kV / ≥ 330 kV

	CH	CZ	DE	DK	EE	FI	FR	GR	HR	HU	IE	IT	LU	LV	ME	MK	NI[2,4]	NO	NL	PL	PT	RO	RS	SE	SI	SK	UA-W	AL	BY	MA	MD	RU[1]	TR	UA
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										–/2	
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						–/1								–/2																			–/3		
ES							2/2														3/5									–/2				
FI[1]		–/1																1/–						1/4								–/3		
FR												3/3																						
GB[3]						2/–					–/1						2/–		–/2															
GR												–/1				–/2												–/1					–/1	
HR										–/4													–/1		2/3									
HU																						–/2	–/1			–/2	2/2							
IE[2]																	2/–																	
IT																									1/2									
LT														–/4															–/5			–/3		
LV																																–/1		
ME																							2/1					1/1						
MK																							2/1											
NO																			–/1					1/4								–/–		
PL																							–/1			–/2			1/–					1/1
RO																							–/1				–/1				–/1			–/1
RS																												1/–						
SK																											–/1							

ENTSO-E Overview circuit length in km

	Length of AC circuits	of which AC cable	Sum of DC cable
220 – 285 kV	142656	3648	
330 kV	4527	0	
380 / 400 kV	150438	1758	
750 kV	471	0	
Sum	**298092 km**	**5406 km**	**5368**

[1] Between FI – RU is no synchronous operation. One 400 kV interconnection operate so that one or several Russian power units are connected to the Finnish system but isolated from the Russian system. Two 400 kV interconnections connect the Finnish and Russian systems asynchronously through a back-to-back HVDC-link.

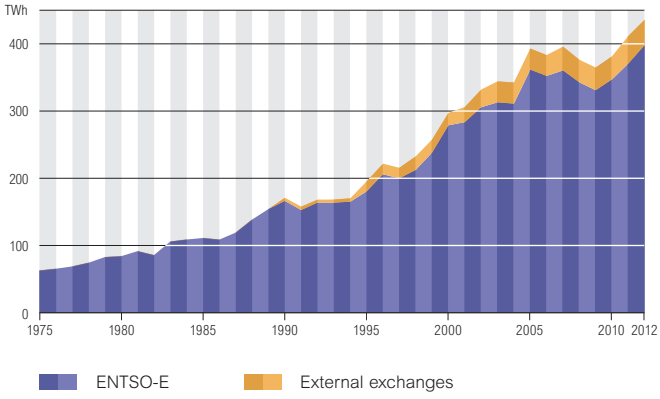
[2] Between IE and NI 275 kV instead 220 kV

[3] All data with the country code GB represents monthly statistical data as sum of England, Scotland and Wales.

[4] All data with the country code NI represents the monthly statistical data GB Northern Ireland.

Development of exchanges

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



– Reliable Baltic data is available since 1995

– There were no exchanges between 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 and 2012 without exchange data between Montenegro and Albania

Overview electricity exchanges for the year 2011 and 2012

	All Exchanges	ENTSO-E	External
2011	411 934 GWh	370 786 GWh	41 148 GWh
2012	436 221 GWh	398 428 GWh	37 793 GWh

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Highest and lowest hourly load value of each country 2012 in MW[1]

	Lowest value date/time	value	Highest value date/time	value
AT	22.07./06:00	3995	07.02./12:00	10040
BA	03.06./06:00	833	10.02./19:00	2143
BE	29.07./07:00	6238	07.02./19:00	14191
BG	02.05./04:00	2579	01.02./20:00	7444
CH[2]	01.08./08:00	2851	10.02./14:00	8305
CY	21.11./04:00	277	18.07./15:00	983
CZ	05.08./05:00	4140	07.02./14:00	10804
DE	26.12./04:00	32089	08.02./19:00	81841
DK	22.07./06:00	2085	06.02./18:00	6209
EE	25.06./04:00	482	06.02./10:00	1564
ES	25.12./05:00	17685	13.02./20:00	42813
FI	24.06./05:00	5463	03.02./18:00	14499
FR	05.08./07:00	30826	08.02./19:00	102000
GB[3]	01.07./07:00	20280	11.12./19:00	58541
GR	15.04./15:00	3015	16.07./14:00	9735
HR	27.05./06:00	1132	06.02./19:00	3193
HU	28.05./06:00	2607	13.12./17:00	5945
IE	05.08./08:00	1648	10.12./19:00	4553
IS	10.01./21:00	1383	17.12./11:00	2168
IT	26.12./05:00	20975	10.07./12:00	54098
LT	27.05./05:00	655	06.02./10:00	1885
LU	25.12./05:00	357	12.12./19:00	1009
LV	03.06./05:00	384	19.12./16:00	1380
ME	14.10./06:00	206	09.02./19:00	708
MK	15.10./05:00	546	09.02./15:00	1619
NI[4]	01.07./07:00	519	12.12./19:00	1706
NL	22.07./07:00	7825	13.12./18:00	17734
NO	27.05./06:00	8845	05.12./09:00	23443
PL	06.05./06:00	10179	06.02./18:00	23728
PT	25.12./09:00	3335	13.02./21:00	8554
RO	04.06./05:00	3969	01.02./18:00	8627
RS	02.05./05:00	2414	08.02./19:00	7565
SE	29.09./06:00	9175	13.12./17:00	26229
SI	02.05./02:00	797	10.02./19:00	2099
SK	29.07./06:00	2243	07.02./18:00	4396
ENTSO-E[5]	**27.05./06:00**	**232125**	**08.02./19:00**	**555194**

[1] All values are calculated to represent 100% of the national values

[2] Lowest and highest physical hourly vertical load value of the Swiss transmission grid.

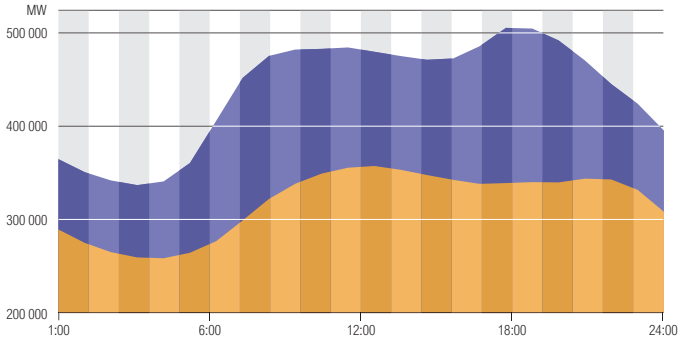
[3] All data with the country code GB represents monthly statistical data as sum of England, Scotland and Wales.

[4] All data with the country code NI represents the monthly statistical data of GB Northern Ireland.

[5] Calculated as sum of the ENTSO-E member TSOs' monthly hourly load values

Consumption on the 3rd Wednesday 2012

ENTSO-E load diagram on the 3rd Wednesday of August and December 2012[1,2]



Load curve on 19 December 2012[2] — with highest load: 505409 MW, with lowest load: 336819 MW

Load curve on 15 August 2012[2] — with highest load: 357322 MW, with lowest load: 258410 MW

Highest and lowest load of each country on 19 December 2012 in MW[2]

	Lowest value	Highest value		Lowest value	Highest value		Lowest value	Highest value
AT	6010	9378	**FR**	57560	77632	**MK**	940	1346
BA	1130	1881	**GB[3]**	31859	56518	**NI[4]**	722	1657
BE	8442	12101	**GR**	4430	8033	**NL**	9523	17038
BG	4174	6504	**HR**	1538	2712	**NO**	16012	20840
CH	7158	9904	**HU**	3644	5541	**PL**	14815	22396
CY	305	649	**IE**	2431	4332	**PT**	4573	7387
CZ	6743	9159	**IS**	1979	2150	**RO**	5819	8387
DE	49209	75826	**IT**	27947	50606	**RS**	4627	6295
DK	3177	5741	**LT**	1050	1775	**SE**	16626	23311
EE	1013	1512	**LU**	488	831	**SI**	1294	1842
ES	22578	36267	**LV**	790	1380	**SK**	2867	3909
FI	11007	13540	**ME**	360	542			

[1] Calculated load values as sum of the ENTSO-E member TSOs' countries

[2] All values are calculated to represent 100% of the national values

[3] All data with the country code GB represents monthly statistical data as sum of England, Scotland and Wales.

[4] All data with the country code NI represents the monthly statistical data of GB Northern Ireland.

Members of ENTSO-E

AT	Austria	APG VUEN	APG-Austrian Power Grid AG Vorarlberger Übertragungsnetz GmbH
BA	Bosnia-Herzegovina	NOS BiH	Nezavisni operator sustava u Bosni i Hercegovini
BE	Belgium	Elia	Elia System Operator SA
BG	Bulgaria	ESO	Electroenergien Sistemen Operator EAD
CH	Switzerland	swissgrid	swissgrid ag
CY	Cyprus	Cyprus TSO	Cyprus Transmission System Operator
CZ	Czech Republic	ČEPS	ČEPS, a.s.
DE	Germany	TransnetBW TenneT GER Amprion 50Hertz	TransnetBW GmbH TenneT TSO GmbH Amprion GmbH 50Hertz Transmission GmbH
DK	Denmark	Energinet.dk IPC	Energinet.dk Independent Public Enterprice
EE	Estonia	Elering AS	Elering AS
ES	Spain	REE	Red Eléctrica de España S.A.
FI	Finland	Fingrid	Fingrid OyJ
FR	France	RTE	Réseau de Transport d´Electricité
GB	United Kingdom	National Grid SONI **(NI)** SHETL SPTransmission	National Grid Electricity Transmission plc System Operator for Northern Ireland Ltd Scottish Hydro Electric Transmission Limited Scottish Power Transmission plc
GR	Greece	IPTO SA	Independent Power Transmission Operator S.A.
HR	Croatia	HEP-OPS	HEP-Operator prijenosnog sustava d.o.o.
HU	Hungary	MAVIR ZRt.	MAVIR Magyar Villamosenergia-ipari Átviteli Rendszerirányító Zártkörűen Működő Részvénytársaság
IE	Ireland	EirGrid	EirGrid plc
IS	Iceland	Landsnet	Landsnet hf
IT	Italy	Terna	Terna – Rete Elettrica Nazionale SpA
LT	Lithuania	LITGRID AB	LITGRID AB
LU	Luxembourg	Creos Luxembourg	Creos Luxembourg S.A.
LV	Latvia	Augstsprieguma tīkls	AS Augstsprieguma tīkls
ME	Montenegro	CGES AD	Crnogorski elektroprenosni sistem AD
MK	FYROM	MEPSO	Macedonian Transmission System Operator AD
NL	The Netherlands	TenneT TSO	TenneT TSO B.V.
NO	Norway	Statnett	Statnett SF
PL	Poland	PSE	PSE S.A. (until January 2013 PSE Operator A.S.)
PT	Portugal	REN	Rede Eléctrica Nacional, S.A.
RO	Romania	Transelectrica	C.N. Transelectrica S.A.
RS	Serbia	EMS	JP Elektromreža Srbije
SE	Sweden	Svenska Kraftnät	Affärsverket Svenska Kraftnät
SI	Slovenia	ELES	Elektro Slovenija d.o.o.
SK	Slovak Republic	SEPS	Slovenska elektrizacna prenosova sustava, a.s.

Structure of ENTSO-E