YS&AR Report 2012

Yearly Statistics & Adequacy Retrospect 2012

European Network of
Transmission System Operators
for Electricity

entsoe

Data Expert Group and *System Adequacy & Market Modelling* working groups

Contents

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1. General introduction

1.1. Report's background

As of this current report (publication of data concerning year 2012), ENTSO-E is publishing its Statistical Yearbook and the System Adequacy Retrospect in one integrated publication. The Yearly Statistics and Adequacy Retrospect (YS&AR) report includes information from both reports combined, thus reducing redundant information in different timeframes and providing more transparency on the information from the associated TSOs.

This revised report structure will also reduce the total volume of the report, not by excluding any information but instead making more data available via excel downloads instead of printed tables. We hope that this will increase the usability of our product for customers. Merging the two reports will increase the coherence of data with different perspectives, however some exceptions exist and are explained in the next paragraph.

The YS&AR report aims to provide stakeholders in the European electricity market with an overview of the retrospect data and figures regarding the power systems of member Transmission System Operators (TSOs), as well as ENTSO-E as a whole. The report provides information about energy balance, power balance at reference points with a focus on adequacy and information about cross-border exchanges and network components.

The report was prepared under the aegis of the Data Expert Group directly under the supervision of the ENTSO-E Board; however, the Adequacy Retrospect chapter was written by the System Adequacy and Market Modelling Working Group under the supervision of the System Development Committee.

The glossary of terms used this report is based on a web tool entitled ENTSO-E Metadata Repository (EMR), which contains a complete set of definitions collected by ENTSO-E. In addition, EMR includes a build-in engine called "EMR Workflow" that has been designed to improve the quality of the definitions and remove existing inconsistencies. For more information, please visit https://www.entsoe.eu/data/data-portal/glossary/.

1.2. About the data

Statistical and adequacy data is regularly delivered by member TSO Statistical Data Correspondents (STCs). The data is stored in the ENTSO-E statistical database, most of which can be accessed directly through web based queries (except for power balance data) or via reports published on the website www.entsoe.eu (for example, all data used in the YS&AR is available as excel attachments to the report). The data collection process for the YS&AR 2012 took place in July and August 2013 and the final check by the STCs was done in November 2013. It is expected that most of the data used is consolidated and final.

The data in this report is net data (more info about energy and power balance can be found in chapter 3.1 "Methodology").

The data and figures indicated for various countries may differ from some other national statistics published; this is because ENTSO-E statistics only describe the part of the electricity supply system, which concerns interconnected system operation. Consequently, this data may not represent the entire interconnected system in some countries.

Some differences can also be found within this report, especially between statistical data and adequacy data. The incoherency occurs for example between the Net Generation Capacity (NGC) as of 31st December and the NGC for December's reference point in the power balance data in the adequacy chapter (not caused by the 12 day difference between the reference points on 19th December and 31st December). Another example is the difference between sum of monthly energy generation and consumption and yearly energy provided for the adequacy chapter.

These differences arise for two main reasons:

- For some countries (e.g. Spain) national NGC data was provided for the statistical part, but only synchronous interconnected system NGC data was provided for the adequacy part. Another example is Germany, where the Net Generating Capacity as of 31st December concerns data representing 100% of the country, while the representativity of the Net Generating Capacity in adequacy power balance corresponds with the representativity of the load.
- The representativity of the data in some countries (e.g. BG, DE, GB, LU) is not 100%. Following former UCTE / Working Group Data decisions in ENTSO-E statistical publications such as Memo and the previous Statistical Yearbook the energy generation, including all (sub)categories, and the energy consumption have been presented as 100% of a country. This means that for countries with a representativity factor other than 100% their national sums have been shown as 100%, determined according to the formula:

  $X_{100\%} = \frac{X_{\neq 100\%}}{\%_{\neq 100\%}} * 100\%$, where

  $X_{100\%}$ is the value after recalculation,

  $X_{\neq 100\%}$ is the value provided by STCs and

  $\%_{\neq 100\%}$ is the representativity factor provided by STCs.

  This remark concerns the sum of the monthly energy data, available in the "YS&AR 2012 table no.2" excel attachment.

The adequacy section of the YS&AR coming from the previous System Adequacy Retrospect report is managed by the System Adequacy & Market Modelling sub-group (System Adequacy sub-group in UCTE time) and data for this report was gathered by a different data collection mask. The representativity factor for this report has only been collected for information and data was not provided as 100% of a country. Consequently, all comparisons for countries and for the entire ENTSO-E are based on pure, national data. The ENTSO-E Data Expert Group and System Adequacy & Market Modelling Working Group are working on solutions to this problem to improve the quality of the YS&AR and its internal coherency for future editions. To recognize all national exceptions, it's worth reading the comments provided by correspondents.

In parallel activities related to data harmonisation processes, data definitions (e.g. EMR) and IT tools are still being worked on within ENTSO-E working groups, which will lead to the creation of a central database containing all the information.

The adequacy section also includes the area of Ukraine synchronously operated by the ENTSO-E system, referred to as Ukraine West (UA_W), while the statistical section presents ENTSO-E member countries only.

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1.3. About ENTSO-E

ENTSO-E is the European Network of Transmission System Operators for Electricity. The association represents 41 Transmission System Operators (TSOs) across 34 countries. As directed by Regulation (EC) 714/2009, ENTSO-E's role is to enhance cooperation between TSOs across Europe in order to assist in the development of a pan-European electricity transmission network in line with European Union energy goals.

Its specific aims are to:

- Ensure secure reliable operation of the increasingly complex network;
- Facilitate cross-border network development and the integration of new renewable sources of energy;
- Enhance the creation of the Internal Electricity Market (IEM) through standardised market integration and transparency procedures.

ENTSO-E is responsible for creating common tools (network codes), a Ten-Year Network Development plan, recommendations for the coordination of technical cooperation between TSOs within the EU and annual outlooks for summer and winter electricity generation.

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1.4. ENTSO-E members and statistical data correspondents

1.4.1. Member companies

Country		Company	Abbreviation
AT	Austria	Austrian Power Grid AG	APG
		Vorarlberger Übertragungsnetz GmbH	VUEN
BA	Bosnia and Herzegovina	Nezavisni operator sustava u Bosni i Hercegovini	NOS BiH
BE	Belgium	Elia System Operator SA	Elia
BG	Bulgaria	Electroenergien Sistemen Operator EAD	ESO
CH	Switzerland	Swissgrid ag	Swissgrid
CY	Cyprus	Cyprus Transmission System Operator	Cyprus TSO
CZ	Czech Republic	ČEPS a.s.	ČEPS
DE	Germany	TransnetBW GmbH	TransnetBW
		TenneT TSO GmbH	TenneT GER
		Amprion GmbH	Amprion
		50Hertz Transmission GmbH	50Hertz
DK	Denmark	Energinet.dk	Energinet.dk
EE	Estonia	Elering AS	Elering AS
ES	Spain	Red Eléctrica de España: S.A.	REE
FI	Finland	Fingrid OyJ	Fingrid
FR	France	Réseau de Transport d'Electricité	RTE
GB[1]	United Kingdom	National Grid Electricity Transmission plc	National Grid
		System Operator for Northern Ireland Ltd	SONI (NI)[2]
		Scottish Hydro Electric Transmission plc	SHETL
		Scottish Power Transmission plc	SPTransmission
GR	Greece	Independent Power Transmission Operator S.A.	IPTO
HR	Croatia	HOPS d.o.o.	HOPS

[1] The country code GB represents the sum data for England, Scotland and Wales.
[2] The country code NI represents the data for Northern Ireland.

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HU	Hungary	MAVIR Magyar Villamosenergia-ipari Átviteli Rendszerirányító Zártkörűen Működő Részvénytársaság	MAVIR ZRt.
IE	Ireland	EirGrid plc	EirGrid
IS	Iceland	Landsnet hf	Landsnet
IT	Italy	Terna - Rete Elettrica Nazionale SpA	Terna
LT	Lithuania	Litgrid AB	Litgrid
LU	Luxembourg	Creos Luxembourg S.A.	Creos Luxembourg
LV	Latvia	AS Augstsprieguma tĭkls	Augstsprieguma tĭkls
ME	Montenegro	Crnogorski elektroprenosni sistem AD	Crnogorski
MK	FYR of Macedonia	Macedonian Transmission System Operator AD	MEPSO
NL	Netherlands	TenneT TSO B.V.	TenneT NL
NO	Norway	Statnett SF	Statnett
PL	Poland	Polskie Sieci Elektroenergetyczne	PSE
PT	Portugal	Rede Eléctrica Nacional, S.A.	REN
RO	Romania	C.N. Transelectrica S.A.	Transelectrica
RS	Serbia	JP Elektromreža Srbije	EMS
SE	Sweden	Svenska Kraftnät	SVENSKA
SI	Slovenia	ELES, d.o.o.	ELES
SK	Slovak Republic	Slovenska elektrizacna prenosova sustava, a.s.	SEPS

1.4.2. Statistical Data Correspondents

Country	Name	Abbreviation	E-Mail
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BG	Nikolay Chavdarov	ESO	NChavdarov@ndc.bg
CH	Gerhard Geiss	swissgrid	Gerhard.Geiss@swissgrid.ch
CY	George Christofi	Cyprus TSO	gchristofi@dsm.org.cy
CZ	Zdeněk Fučík	CEPS	fucik@ceps.cz
DE	NDC Germany	Tennet GER	NDC-Germany@tennet.eu
DK	Morten Pindstrup	Energinet.dk	mpi@energinet.dk
EE	Karin Ainsaar	Elering AS	karin.ainsaar@elering.ee
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NL	Raymond Kok	TenneT NL	raymond.kok@tennet.eu

NO	Lasse Christiansen	Statnett	lasse.christiansen@statnett.no
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RO	Christian Radoi	Transelectrica	cristian.radoi@transelectrica.ro
RS	Stanko Vujnović	EMS	stanko.vujnovic@ems.rs
SE	Birger Falt	Svenska Kraftnät	birger.falt@svk.se
SI	Dragan Novaković	ELES	dragan.novakovic@eles.si
SK	Stanislav Dudášik	SEPS	stanislav.dudasik@sepsas.sk
UA_W[3]	Ivanna Saluk	NPC Ukrenergo	saluk@wps.com.ua

[3] The country code UA_W (Ukraine West) represents the data for the western part of the Ukrainian system called Burshtyn Island. Non-ENTSO-E member.

2. Executive summary

2.1. ENTSO-E energy and power results

In the year 2012 electricity consumption in the ENTSO-E power system[4] decreased again (by -0.1%). This decrease is greater and amounts to -0.4% when taking into account the fact that year 2012 was a leap year (one day more). This means that consumption levels remain at approximately 0.7% below 2010 values. On the other hand, electricity generation increased by 0.2% compared to 2011. Figure 2.1.1 displays details of the evolution of energy.

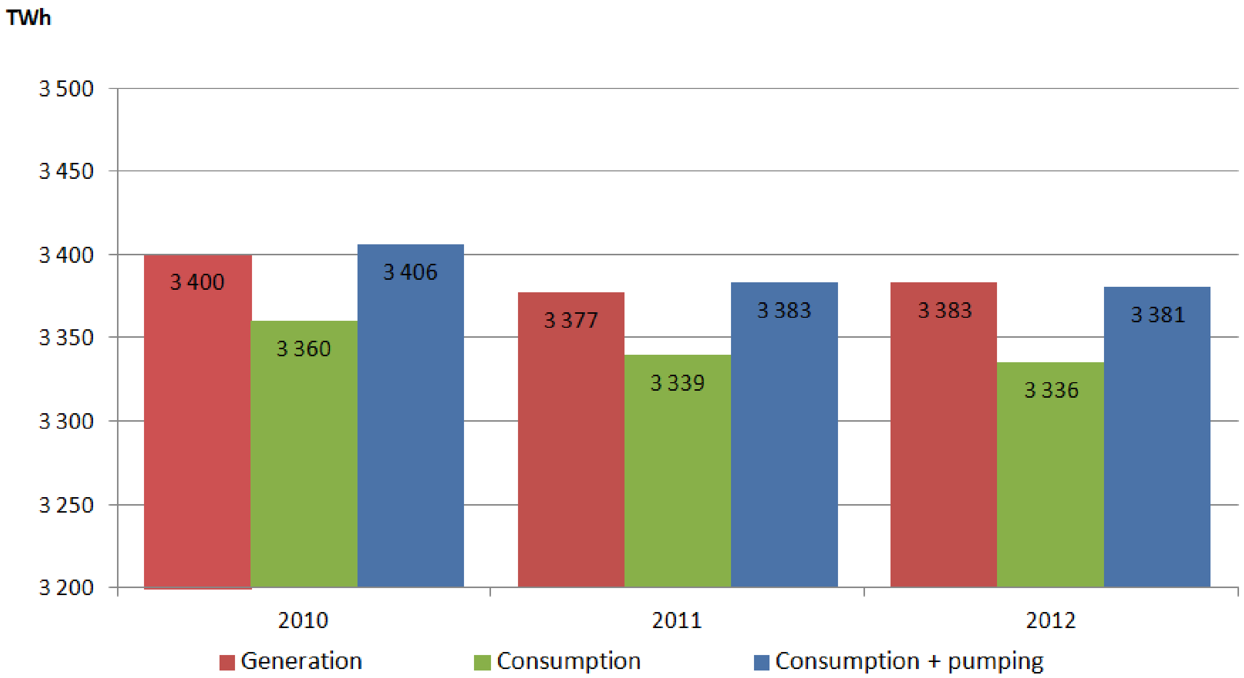

Figure 2.1.1: Energy evolution. Note that the figure does not start from zero.

In 2012 the amount of physical imports and physical exports in the ENTSO-E power system increased significantly compared to the increase in 2011/2010. In 2012, the ENTSO-E power system became a net exporting system for the first time, with electricity exports of 2.5 TWh. For more details see Figures 2.1.2 and 2.1.3.

[4] As mentioned in the "General Introduction" all analysis in the report includes Ukraine West, a non-ENTSO-E system, while for statistical information in the excel attachments Ukraine West is excluded.

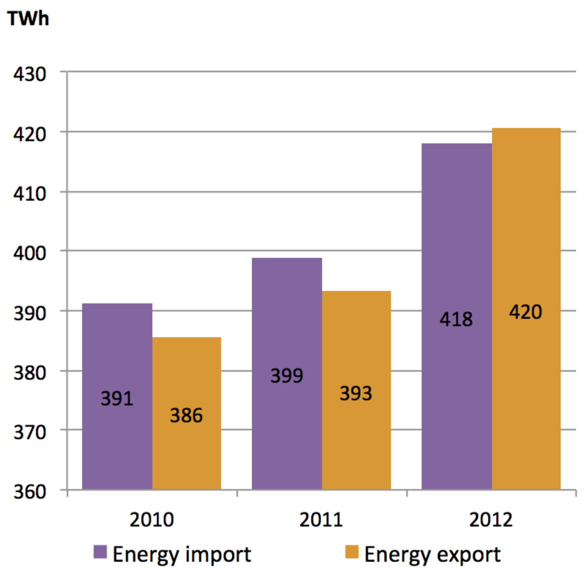

Figure 2.1.2: Import and export evolution

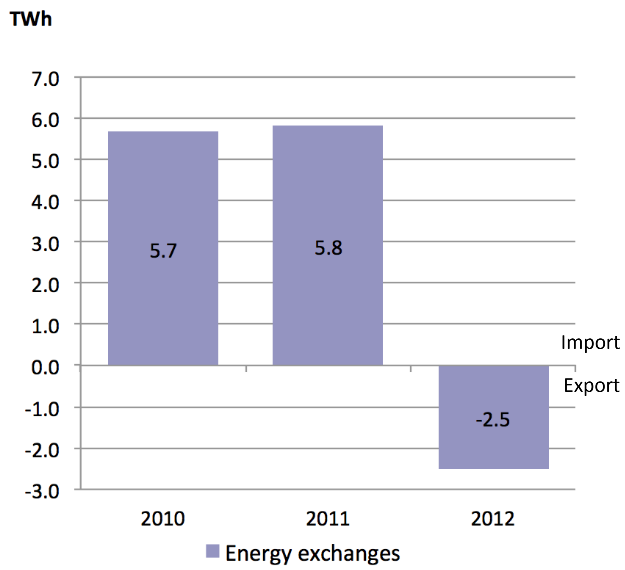

Figure 2.1.3: Exchange balance evolution

The Net Generating Capacity (NGC) increased by 45.5 GW and reached 981 GW in December 2012, which is 4.9% more than in December 2011. On the other hand, the Unavailable Capacity (UC) registered in reference points also had a year on year increase of 41.5 GW on average, (28 GW – 58 GW depending on reference point). In other words, as many as 90% of NGC increases became UC. This is because more and more power comes from Renewable Energy Sources (RES). Both parameters are presented in Figures 2.1.4 and 2.1.5.

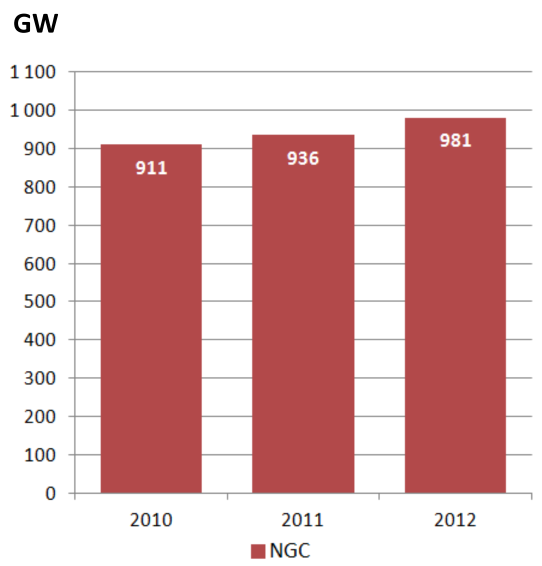

Figure 2.1.4: Net Generating Capacity evolution

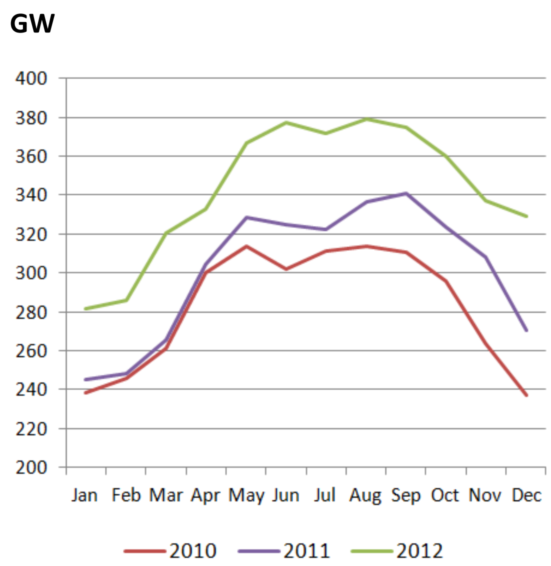

Figure 2.1.5: Unavailable Capacity evolution

2.2. Yearly energy data per country

Pure national data with the representativity factor is presented below. This table is also available in the excel attachment “YS&AR 2012 table no.1”. Please follow country comments provided in the excel attachment as well as in chapters 3.2.2.2, 3.2.3.6 and 3.2.4.2.

Country	Fossil	of which lignite	of which coal	of which gas	of which oil	of which mixed fuels	Renew-able except of hydro	of which wind	of which solar	of which biomass	Hydro	of which renew-able hydro	Non-identi-fiable	Total gene-ration	Exch. balance	Physical import	Physical export	Pump	Con-sumption	Representativity
AT	17 247	0	4 400	9 484	733	n.a.	5 056	2 386	101	2 569	42 909	39 015	6 800	72 012	2 809	23 264	20 455	5 563	69 258	100
BA	8 426	8 426	0	0	0	0	0	0	0	0	3 808	3 742	0	12 234	- 44	4 481	4 525	66	12 124	100
BE	28 807	0	2 307	22 689	8	1 780	7 690	2 879	1 628	3 183	1 667	382	0	76 629	9 838	16 752	6 914	1 709	84 758	100
BG	22 149	n.a.	n.a.	n.a.	n.a.	n.a.	2 021	1 218	800	40	3 974	3 151	n.a.	42 825	-8 271	2 357	10 628	1 089	33 465	100
CH	2 329	n.a.	n.a.	n.a.	n.a.	n.a.	1 439	72	0	n.a.	39 906	37 495	0	68 019	- 856	30 985	31 841	2 411	64 752	100
CY	4 481	n.a.	n.a.	n.a.	4 481	n.a.	184	184	n.a.	n.a.	n.a.	n.a.	n.a.	4 665	0	n.a.	n.a.	n.a.	4 665	100
CZ	43 618	n.a.	n.a.	4 253	n.a.	39 365	5 926	416	2 149	3 361	2 941	2 129	0	81 088	-17 120	11 587	28 707	982	62 986	100
DE	353 065	148 427	106 540	73 368	7 087	17 643	115 887	50 518	26 380	35 040	27 342	21 401	0	590 474	-23 089	44 167	67 256	8 121	559 264	100
DK	16 414	0	10 310	5 952	156	0	12 598	10 270	1	2 327	18	0	0	29 030	5 211	15 920	10 709	0	34 241	100
EE	9 093	n.a.	n.a.	n.a.	n.a.	n.a.	1 327	448	0	879	39	39	0	10 459	-2 261	2 638	4 899	0	8 198	100
ES	135 734	4 824	49 540	69 971	11 398	n.a.	64 822	48 472	11 614	4 736	23 616	19 955	321	283 073	-11 200	7 786	18 986	5 023	266 850	100
FI	17 133	0	7 059	6 354	250	3 470	10 986	493	0	10 493	16 667	16 667	838	67 687	17 561	19 579	2 018	0	85 248	100
FR	48 102	0	17 387	24 035	6 679	0	24 690	14 931	3 885	4 580	63 785	59 089	0	541 457	-45 312	11 886	57 198	6 709	489 436	100
GB	221 834	0	138 359	83 143	97	235	12 581	12 581	0	0	6 146	3 117	0	306 644	10 085	13 694	3 609	3 989	312 740	94
GR	41 770	27 554	0	14 138	78	0	4 868	3 161	1 510	197	4 562	669	0	51 200	1 806	5 959	4 153	268	52 738	100
HR	4 701	0	2 024	2 063	158	450	423	327	0	77	4 779	4 779	1	9 904	7 604	13 168	5 564	230	17 278	100
HU	14 672	4 775	761	8 987	149	0	2 216	742	0	1 474	203	203	0	31 939	7 966	16 969	9 003	0	39 905	100
IE	20 420	2 414	4 893	13 075	38	0	4 101	3 999	n.a.	n.a.	970	761	165	25 656	415	785	370	347	25 724	100
IS	3	0	0	0	3	0	4 885	0	0	0	12 233	12 055	0	17 121	0	n.a.	n.a.	0	17 121	100
IT	207 239	0	46 122	119 690	22 838	18 594	37 224	13 335	18 637	n.a.	43 256	18 976	0	287 719	43 192	45 414	2 222	2 691	328 220	100
LT	3 036	0	0	158	113	2 765	735	537	0	195	935	420	0	4 706	6 619	8 061	1 442	718	10 607	100
LU	2 350	0	0	2 350	0	0	160	77	26	49	1 151	0	0	3 661	4 084	6 532	2 448	1 509	6 236	100
LV	1 676	n.a.	n.a.	1 531	n.a.	145	400	113	10	277	3 681	3 681	n.a.	5 757	1 691	4 935	3 244	n.a.	7 448	100
ME	1 240	1 240	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1 543	n.a.	n.a.	2 783	1 122	3 595	2 473	n.a.	3 905	100
MK	4 752	4 471	0	281	0	0	0	0	0	0	1 061	0	0	5 813	2 652	4 281	1 629	0	8 465	100
NI	5 878	0	2 284	3 593	1	0	1 094	1 027	0	68	11	0	0	6 983	1 875	2 526	651	0	8 858	100
NL	82 220	0	23 980	54 060	80	4 100	12 400	5 000	235	7 165	104	104	0	98 674	17 110	32 155	15 045	0	115 784	100
NO	3 391	n.a.	n.a.	3 391	n.a.	n.a.	1 555	1 555	n.a.	n.a.	142 898	142 898	n.a.	147 844	-18 030	376	18 406	n.a.	129 814	100
PL	134 177	50 170	79 663	4 344	0	0	11 760	4 382	1	7 376	2 432	2 003	0	148 369	-2 841	9 803	12 644	643	144 885	100
PT	23 114	0	12 137	10 210	563	206	12 991	10 011	357	2 624	6 449	5 333	0	42 554	7 896	10 766	2 870	1 387	49 063	100
RO	28 618	17 251	3 130	1 878	0	6 359	2 981	2 744	8	229	12 191	12 191	0	54 328	248	4 548	4 300	141	54 435	100
RS	30 045	29 659	0	386	0	0	0	0	0	0	9 818	9 191	0	39 863	644	6 003	5 359	879	39 628	100
SE	4 648	0	588	1 616	397	2 047	18 028	7 160	22	10 846	78 001	78 001	0	162 069	-19 574	13 120	32 694	29	142 466	100
SI	4 636	3 496	944	191	0	5	n.a.	n.a.	n.a.	n.a.	3 730	3 543	947	14 545	- 910	7 452	8 363	251	13 383	100
SK	5 799	1 831	1 197	2 766	5	0	1 256	6	561	534	4 295	4 042	990	26 789	393	13 472	13 079	345	26 837	100
ENTSO-E	1 552 817	304 538	513 625	543 957	55 312	97 164	382 284	199 044	67 925	98 319	567 121	505 032	10 062	3 374 573	1 313	415 016	413 704	45 100	3 330 785	
UA_W	8 438	n.a.	n.a.	n.a.	n.a.	8 438	0	0	0	0	117	0	0	8 555	-3 824	2 929	6 753	0	4 731	100
SUM	**1 561 255**	**304 538**	**513 625**	**543 957**	**55 312**	**105 602**	**382 284**	**199 044**	**67 925**	**98 319**	**567 238**	**505 032**	**10 062**	**3 383 128**	**-2 511**	**417 945**	**420 457**	**45 100**	**3 335 516**	

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2.3. Net Generating Capacity as of 31st December 2012 per country

Pure national data with the representativity factor is presented below. This NGC data represents statistics and may differ from the NGC provided for the adequacy section (see 1.2 for more information). This table is also available in the excel attachment “YS&AR 2012 table no.1”. Please follow country comments provided in the excel attachment.

MW	Nuclear	Fossil	of which lignite	of which coal	of which gas	of which oil	of which mixed fuels	Renewable (withoul hydro)	of which wind	of which solar	of which biomass	Hydro	of which renewable hydro	Non-identifiable	Total NGC	Representativity
AT	0	7 834	0	1 171	5 119	360	497	1 906	1 307	172	427	13 350	13 350	74	23 164	100
BA	0	1 506	1 506	0	0	0	0	0	0	0	0	1 971	0	0	3 477	100
BE	5 926	8 385	0	533	7 542	310	0	5 080	1 348	2 501	1 231	1 422	114	0	20 813	100
BG	2 000	6 731	4 177	1 760	794	0	0	1 713	677	1 013	23	3 161	2 131	0	13 605	100
CH	3 278	394	n.a.	n.a.	n.a.	n.a.	n.a.	557	45	192	320	13 770	12 386	210	18 209	100
CY	0	949	0	0	0	949	0	144	144	0	0	n.a.	n.a.	n.a.	1 093	100
CZ	3 800	10 960	0	0	1 168	0	9 792	2 349	263	2 086	0	2 216	0	0	19 325	100
DE	12 068	81 945	21 249	25 476	26 965	4 082	4 173	70 900	31 300	33 100	5 700	10 800	4 413	0	175 713	100
DK	0	8 844	n.a.	n.a.	n.a.	n.a.	n.a.	5 148	4 166	407	575	9	0	44	14 045	100
EE	0	2 303	n.a.	n.a.	245	n.a.	n.a.	343	266	n.a.	n.a.	4	0	0	2 650	100
ES	7 573	47 293	1 344	9 908	32 556	3 358	127	29 940	22 522	6 364	1 054	19 290	16 366	63	104 159	100
FI	2 692	9 363	0	3 129	2 525	1 710	1 999	2 418	287	0	2 131	3 172	3 172	44	17 689	100
FR	63 130	27 826	0	7 914	10 527	9 386	0	12 310	7 513	3 405	1 087	25 407	23 679	0	128 673	100
GB	9 726	58 324	0	26 686	28 290	3 348	0	5 915	5 111	0	804	3 889	992	n.a.	77 854	89
GR	0	9 739	4 456	0	4 585	698	0	2 934	1 466	1 424	45	3 231	213	90	15 994	100
HR	0	1 788	0	315	0	320	1 153	184	165	4	15	2 110	2 110	0	4 082	100
HU	1 892	6 673	740	274	5 248	410	0	519	329	0	189	56	56	0	9 140	100
IE	0	6 132	346	855	4 120	811	0	1 678	1 663	0	0	508	n.a.	272	8 590	100
IS	0	52	0	0	0	52	0	661	0	0	0	1 860	1 835	0	2 573	100
IT	0	77 104	0	6 393	35 750	16 920	18 041	25 250	8 102	16 420	n.a.	21 880	n.a.	0	124 234	100
LT	0	2 691	0	0	602	144	1 945	337	275	8	54	877	117	0	3 905	100
LU	0	509	n.a.	n.a.	n.a.	n.a.	n.a.	142	n.a.	n.a.	n.a.	1 128	n.a.	12	1 791	98
LV	0	905	0	0	820	0	85	110	58	0	52	1 553	1 553	0	2 541	100
ME	0	220	n.a.	n.a.	n.a.	n.a.	n.a.	0	0	0	0	660	10	0	880	100
MK	0	1 157	718	0	250	189	0	0	0	0	0	503	n.a.	0	1 660	100
NI	0	5 880	0	2 284	3 695	1	5 879	1 094	1 027	0	68	12	n.a.	0	6 986	100
NL	504	22 265	0	5 035	17 230	0	0	2 628	2 509	71	48	38	n.a.	987	26 422	100
NO	0	1 166	0	0	1 166	0	0	730	730	0	0	30 819	30 819	0	32 715	100
PL	0	29 420	8 814	19 829	777	0	0	3 169	2 562	1	606	2 344	931	0	34 933	100
PT	0	8 269	0	1 756	4 739	1 356	412	4 614	4 194	220	179	5 653	5 653	0	18 536	100
RO	1 300	9 460	3 885	1 179	1 957	0	2 439	1 801	1 753	21	27	6 196	426	0	18 756	100
RS	0	5 507	5 171	0	336	0	0	0	0	0	0	2 888	2 274	0	8 395	100
SE	9 363	4 666	0	225	914	3 387	140	7 151	3 745	24	3 036	16 203	16 203	0	37 383	100
SI	696	1 280	603	223	84	0	370	n.a.	n.a.	n.a.	n.a.	1 098	918	n.a.	3 074	n.a.
SK	1 940	3 190	599	440	1 540	210	401	767	3	524	168	2 534	1 617	0	8 431	100
ENTSO-E	125 888	470 730	53 608	115 385	199 544	48 001	47 453	192 492	103 530	67 957	17 839	200 612	141 338	1 796	991 490	
UA_W	0	2 538	n.a.	n.a.	n.a.	n.a.	2 538	7	n.a.	7	n.a.	28	n.a.	0	2 573	100
SUM	125 888	473 268	53 608	115 385	199 544	48 001	49 991	192 499	103 530	67 964	17 839	200 640	141 338	1 796	994 063	

2.4. Tie lines

Figure 2.2.1 presents a simplified diagram of the cross-frontier transmission lines in the ENTSO-E areas as of 31st December 2012. This diagram is also available in high resolution in the download package.

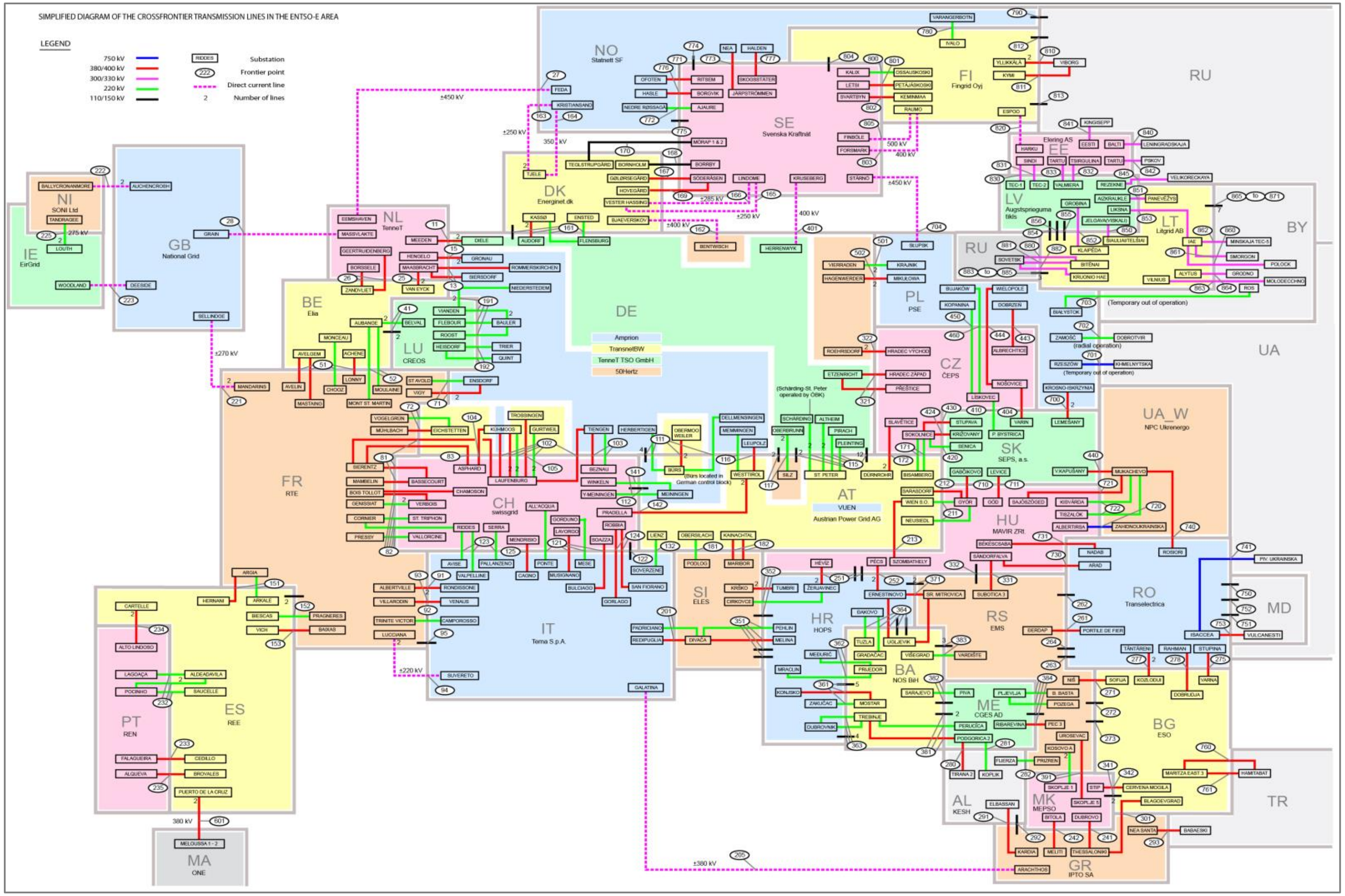


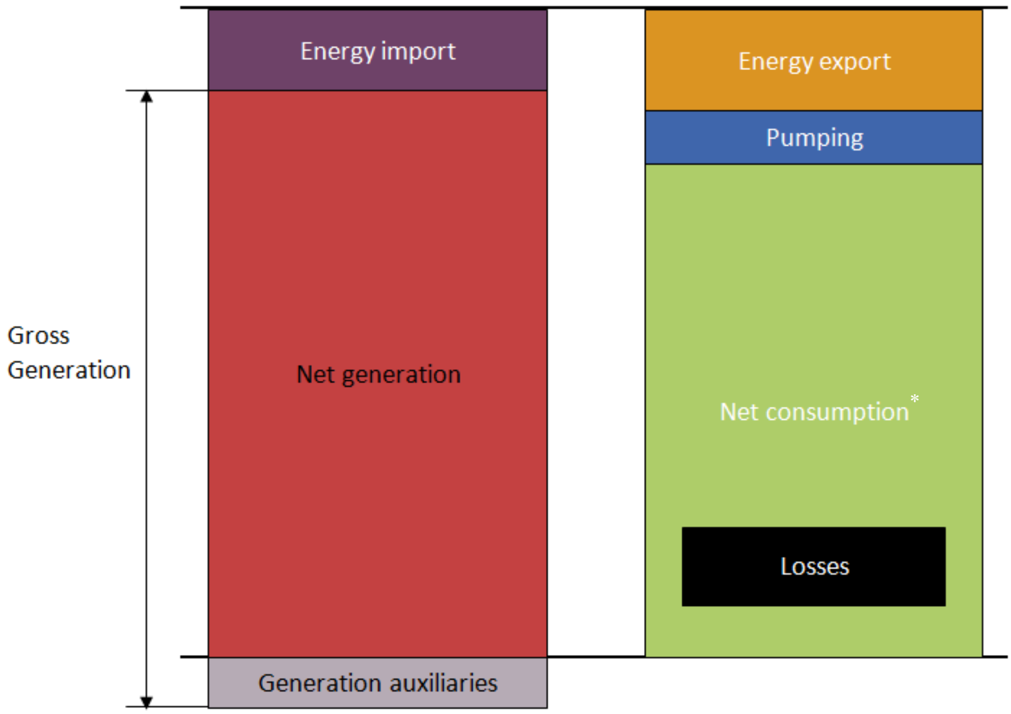
Figure 2.2.1: International lines

3. Adequacy retrospect

3.1. Methodology

3.1.1. Energy balance

The energy balance structure can be found below. This structure is common for both the adequacy section of the report and the statistical information, which is presented in the excel attachments (in the yearly perspective, based on monthly data)[5].



* "Net consumption" in the figure should be named simply "Consumption" according to the definition of term "Consumption", which contents of "Net consumption" and "Network losses".

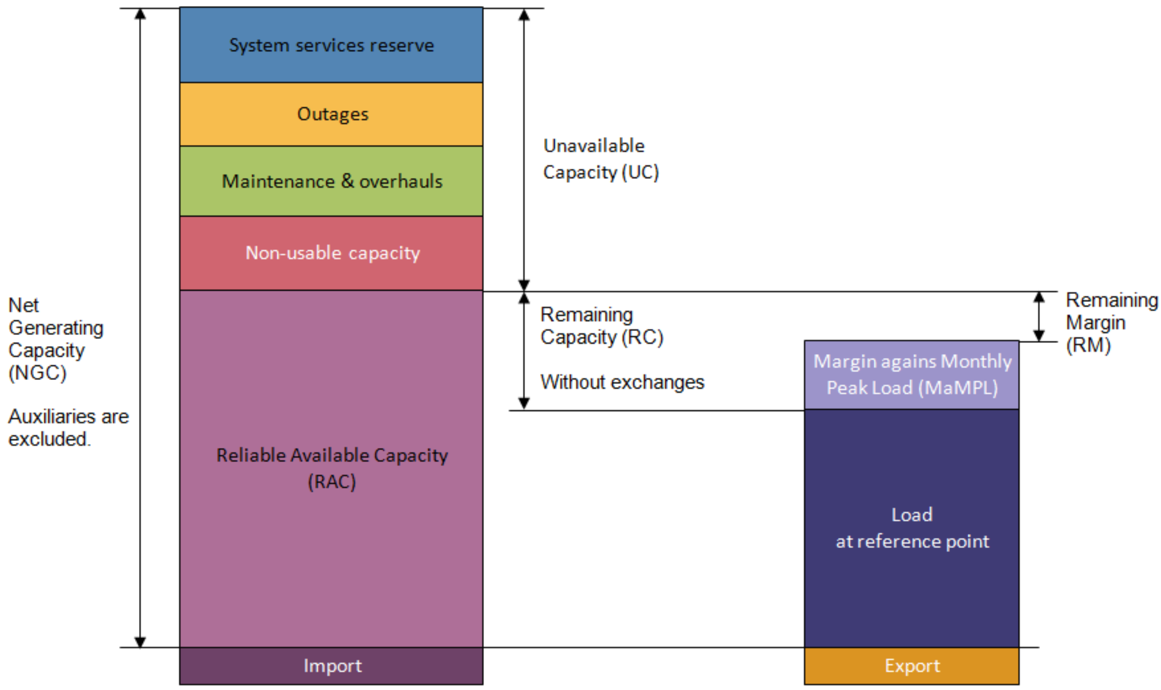
For energy analysis, data for Y-1 was collected. For some countries, data regarding year Y-1 could still have been provisional when collected in year Y. Data regarding year Y-2 sometimes differs from the data published in Y-1 because it has been updated in the meantime. Therefore, correspondents are invited to validate and update (if needed) the energy values for Y-2 when entering the values for Y-1.

3.1.2. Power balance

This subchapter describes the methodology for system adequacy analysis used by ENTSO-E in the adequacy chapter of the Yearly Statistics & Adequacy Retrospect report. The system adequacy of a power system pertains to the ability of a power system to supply the load in all the steady states in which the power system may exist, considering standard conditions. System adequacy is analysed here mainly through generation adequacy, whereby the generation adequacy of a power system is an

[5] All definitions of terms are located in the chapter "Glossary".

assessment of the ability of the generation to match the consumption of the power system. The figure below shows the relationships between the quantities used in power balance analysis[6].



The generation adequacy retrospect in the power system is assessed through the **remaining capacity value**, which is the part of the **Net Generating Capacity** left in the power system after the **Load** at a **Reference Point** has been covered.

When the remaining capacity without exchanges is positive, the power system had enough internal generating capacity left to cover its load; when it is negative, the power system had to cover its load with the help of imports.

Considering the definition of the Remaining Margin (RM), the generation adequacy retrospect assessment is then extended monthly.

When the remaining margin without exchanges is positive, the power system had enough internal generating capacity left to cover its load at any time during the month. When the remaining margin without exchanges is negative, the power system may have had to rely on imports to cover its monthly peak load.

Generation adequacy is assessed for each individual country and for the whole ENTSO-E. In case of negative Remaining Capacity (RC) in individual countries, the power balance is still achieved when the RC of the respective regional block or ENTSO-E is positive and the interconnection capacities are sufficient to cope with the necessary exchanges.

The power data collected for each country is synchronous at each reference point (date and time the power data is collected for) and can therefore be aggregated. In order to compare the evolution of the results, similar reference points are specified for each month and from one report to another.

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6 All definitions of terms are located in the chapter "Glossary".

Times in the studies are expressed in Central European Time (CET=UTC[7]+1) in winter and Central European Summer Time (CEST=UTC+2) in summer. A single monthly reference point is defined in the Adequacy Retrospect section: the 3rd Wednesday of each month at the 11th hour (from 10:00 CEST to 11:00 CEST) in summer and (10:00 CET to 11:00 CET) in winter. Data collected for the hour H is the average value[8] from the hour H-1 to the hour H.

3.2. Energy balance

3.2.1. ENTSO-E Data Summary

As mention in the executive summary, in 2012 energy consumption decreased but energy generation increased. A compilation of these parameters and no significant change in pumping caused ENTSO-E to become a net exporter for the first time. All details can be found in Table 3.2.1.1[9]. It is worth underlining that 2012 was a leap year, meaning that the energy consumption decrease was even greater and the energy generation increase was smaller (February 2012 had 29 days, one day more than February 2011).

TWh	2010	2011	2012	Change 2012 to 2011	
				Absolute value	%
Total Generation	**3 399.8**	**3 377.3**	**3 383.1**	**5.8**	**0.2**
Fossil fuels generation	**1 653.0**	**1 641.1**	**1 561.3**	**-79.8**	**-4.9**
Nuclear generation	**895.4**	**886.6**	**862.3**	**-24.4**	**-2.7**
Non-renewable hydro generation	**140.3**	**65.0**	**62.2**	**-2.8**	**-4.3**
Renewable Energy Sources generation (incl. renewable hydro)	**700.3**	**774.8**	**887.3**	**112.5**	**14.5**
Not clearly identifiable energy sources generation	**10.8**	**9.8**	**10.1**	**0.3**	**3.2%**
Energy exchanges	**5.7**	**5.8**	**-2.5**	**-8.3**	**-143.3**
Energy import	**391.4**	**398.9**	**417.9**	**19.0**	**4.8**
Energy export	**385.7**	**393.1**	**420.5**	**27.3**	**6.9**
Pumping	**45.6**	**43.7**	**45.1**	**1.4**	**3.3**
Consumption	**3 360.3**	**3 339.4**	**3 335.5**	**-3.9**	**-0.1**

Table 3.2.1.1: ENTSO-E energy balance summary

Figure 3.2.1.1 displays the energy balance in 2012 in a visual way, making it easy to see the relationship between all energy balance elements.

[7] UTC is the international designation for Universal Coordinated Time.
[8] When possible, power data used in the retrospect power balance is based on the hourly average values of the actual metering at every reference point.

[9] As mentioned in paragraph 1.2 values of "total" or "sum" represent ENTSO-E, including the Ukraine West system.

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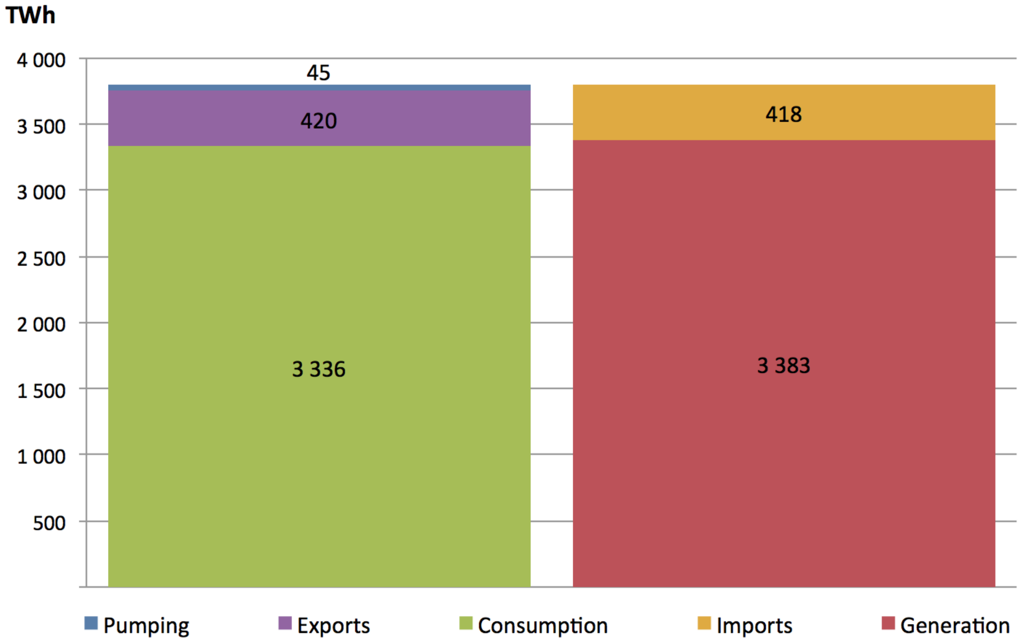


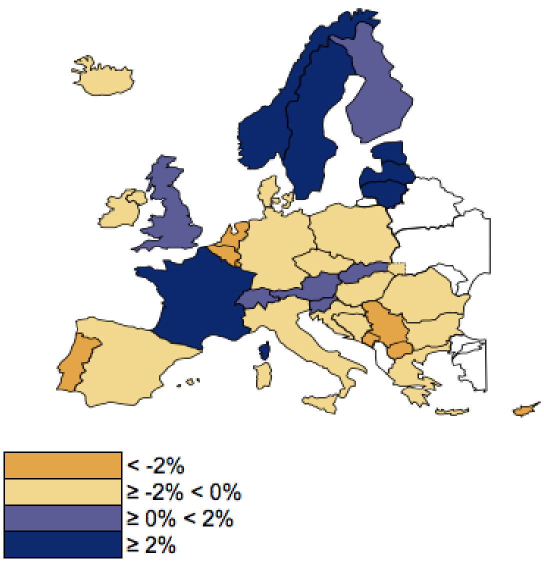
Figure 3.2.1.1: Energy balance in 2012

3.2.2. Energy consumption

3.2.2.1. ENTSO-E overview

The consumption of electricity during the past two years decreased, but for last year (2012 to 2011) the decrease was almost negligible and amounted to -0.1% (-0.4% when taking into account the 2012 leap year). This means that consumption levels remain at approximately 0.7% below 2010 values. On the other hand, electricity generation increased by 0.6% compared to 2011.

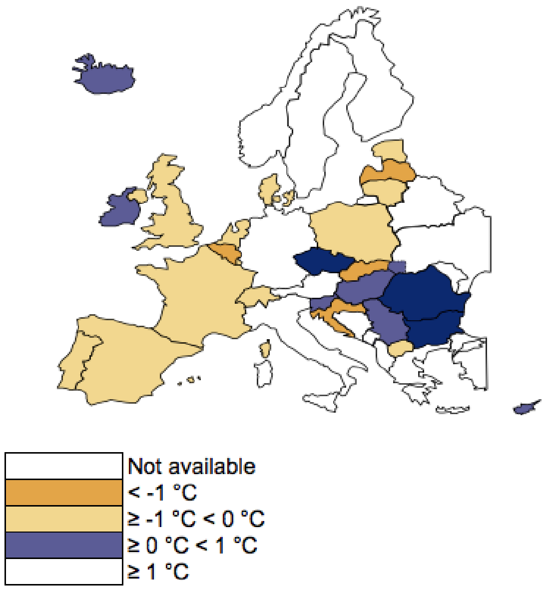
Looking at the country details, the negligible decrease in consumption in ENTSO-E comes out of opposite variations in each country that in some places were quite significant. Figure 3.2.2.1.1 shows the variations of each country for 2012 as compared to 2011.



Map 3.2.2.1.1: Consumption changes per country in 2012

The only country that reported a consumption increase greater than 5% is Norway (5.8%), balancing the reduction reported in 2011 as compared to 2010 (-5.5%). On the other hand, the highest decreases were reported by Cyprus (-6.3%), Luxembourg (-5.4%) and the Former Yugoslavian Republic of Macedonia (-5.4%). In the remaining countries, the total consumption increased or decreased by less than 5%.

The average annual temperatures in most of the ENTSO-E countries in 2012 were lower than in 2011 (see Map 3.2.2.1.2 below), although the average annual temperature at the whole ENTSO-E level was almost steady. The exceptions were Ukraine West, Slovenia, Iceland, Cyprus, the Republic of Ireland, Hungary, the Republic of Serbia, Bulgaria, Romania and the Czech Republic, with higher annual temperatures in 2012 compared to 2011.



Map 3.2.2.1.2: Temperature changes per country in 2012

3.2.2.2. National comments on consumption

PL – Poland
Operational data.

PT – Portugal
Electricity consumption declined 2.9% from the previous year, or 3.6% when corrected for the effects of temperature and number of working days. It decreased 6% from the highest annual consumption, which occurred in 2010.

UA_W – Ukraine West
Including auxiliaries.

3.2.3. Energy generation

3.2.3.1. ENTSO-E overview

Energy generation is very close to energy consumption rate in the ENTSO-E system. This is due to the fact that exchanges with non-ENTSO-E neighbouring countries (Russia, Belarus, Ukraine, the

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Republic of Moldova, Turkey and Morocco) are quite limited when compared to the size of the ENTSO-E system. Therefore, the energy generation in the ENTSO-E system is almost the same as the energy consumption (Figure 2.1.1 in the executive summary).

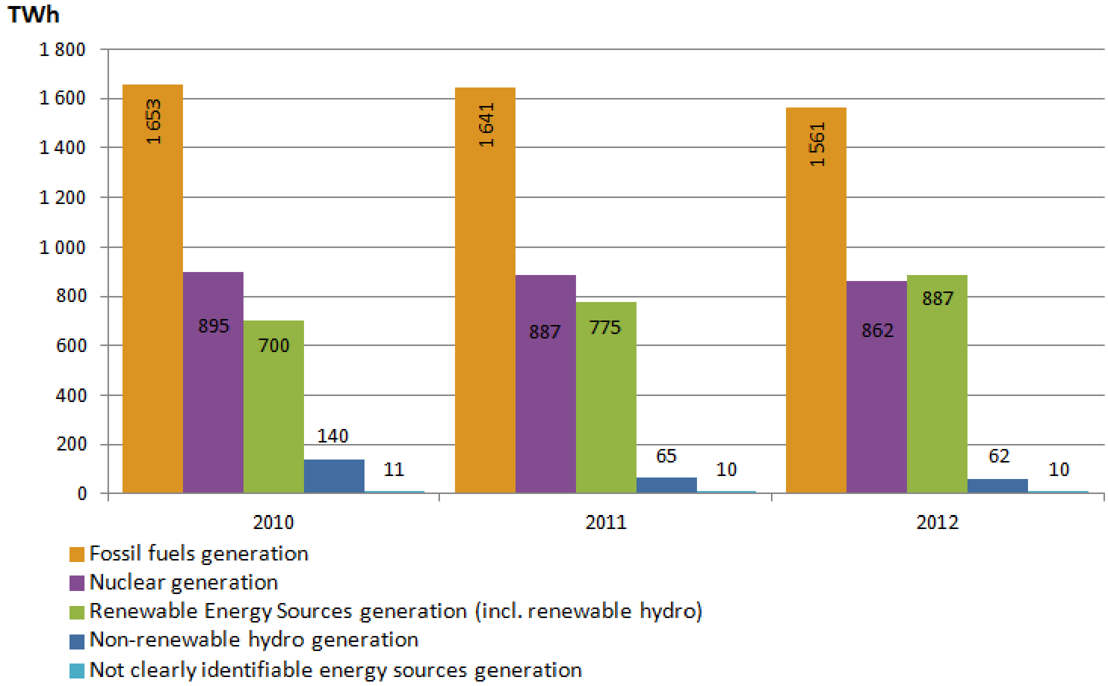


Figure 3.2.3.1.1: Generation category evolution

Figure 3.2.3.1.1 shows how one energy source is altered to the detriment of another, since the general energy production did not vary.

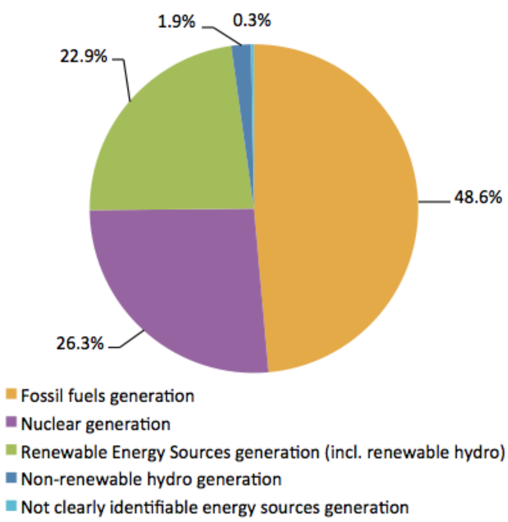


Figure 3.2.3.1.2: Generation mix in 2011

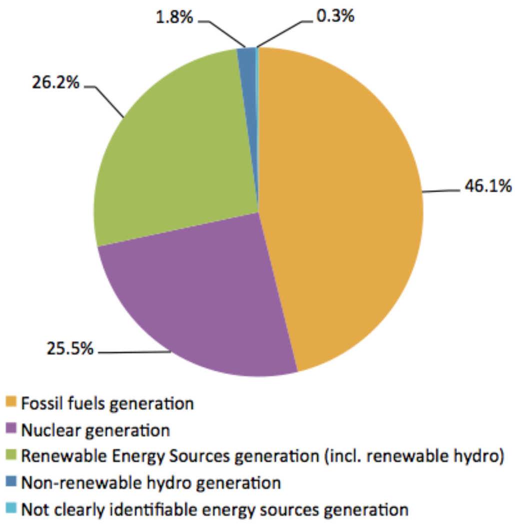
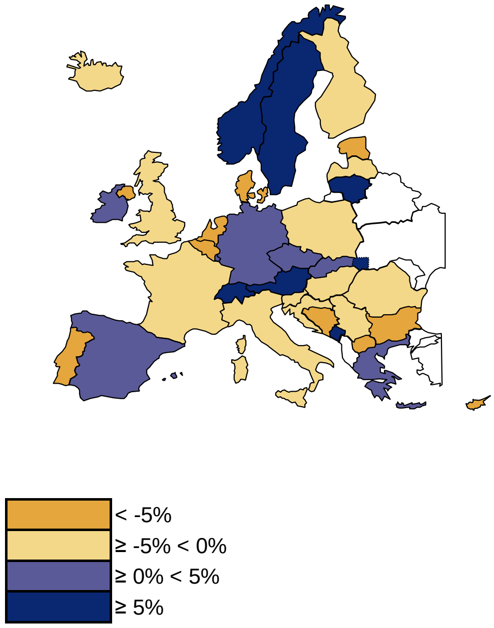
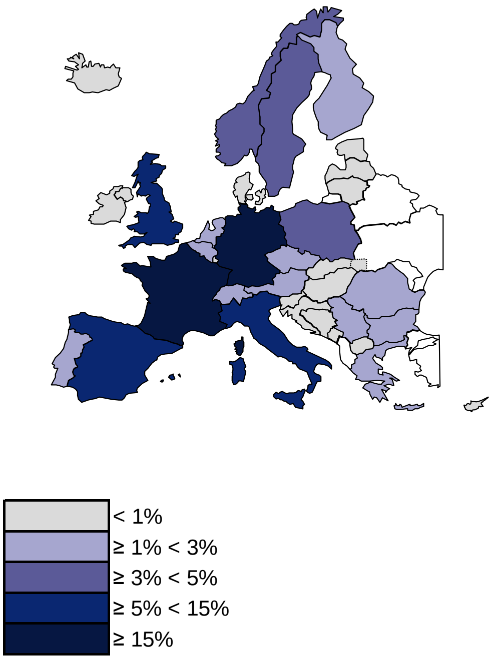


Figure 3.2.3.1.3: Generation mix in 2012

The results for 2011 and 2012 are also shown in Figures 3.2.3.1.2 and 3.2.3.1.3. The quite high increase of renewable generation means that only this category registered growth (by 2.3%). For the first time the renewable share exceeded a quarter. The shares of the other categories decreased except for the not clearly identifiable category, which is stable.



Map 3.2.3.1.1: Generation changes per country in 2012



Map 3.2.3.1.2: Share of each country in the total generation in 2012

Concerning the countries with the highest share of the total ENTSO-E generation in 2012, Germany was slightly higher than France (17.5% and 16.0%, respectively), followed by Great Britain (9.1%), Italy (8.5%) and Spain (8.4%). As illustrated in Map 3.2.3.1.2, the remaining countries had a share of less than 3%, with the exception of Sweden (4.8%), Poland (4.4%) and Norway (4.4%).

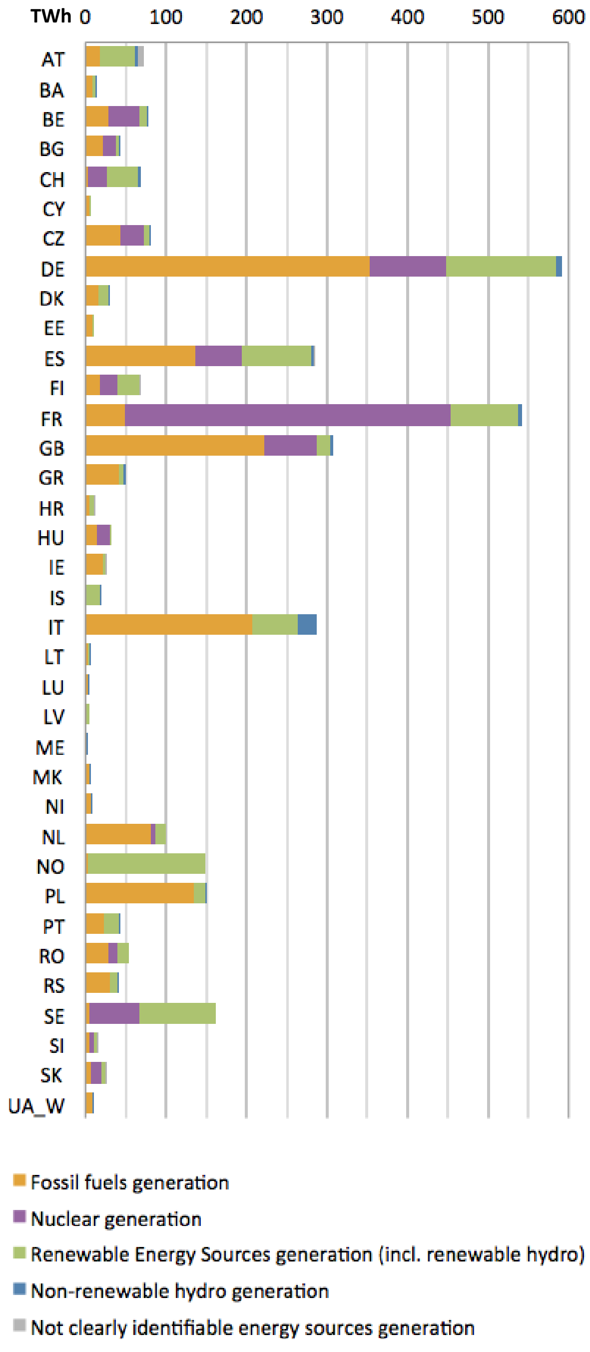


Figure 3.2.3.1.4: Generation mix per country in 2012 (absolute values)

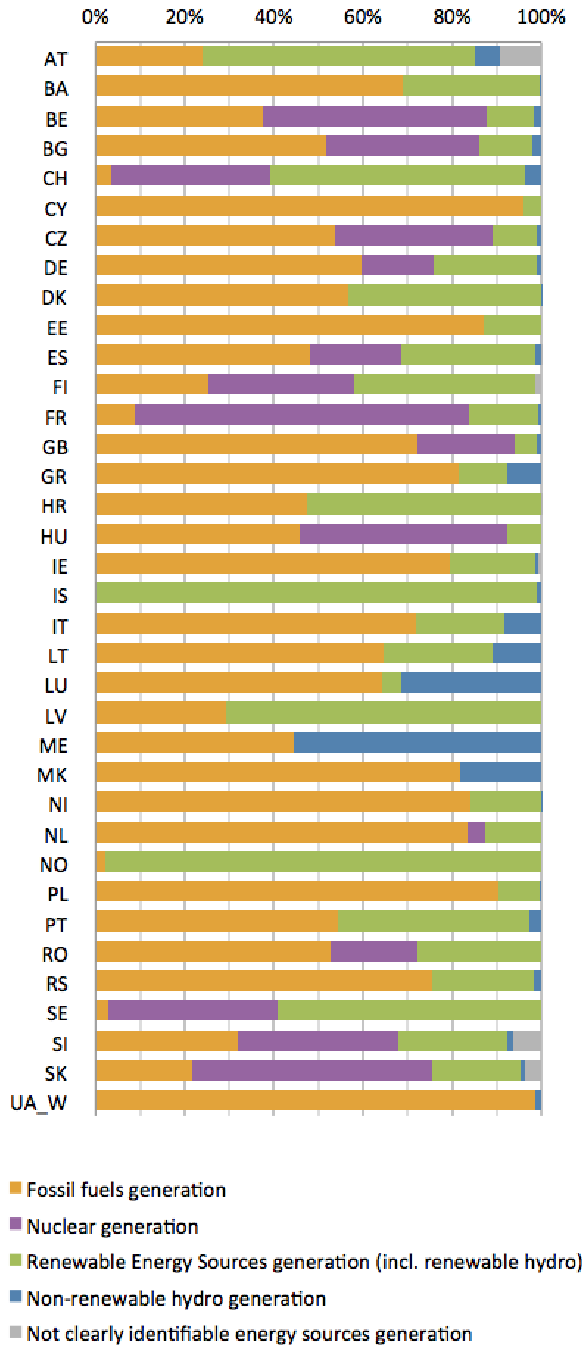


Figure 3.2.3.1.5: Generation mix per country in 2012 (percentage values)

Figures 3.2.3.1.4 and 3.2.3.1.5 show the share of different individual fuel types in the total generation of each country.

3.2.3.2. Fossil fuels generation

As shown in Figure 3.2.3.2.1, the reduction in the share of fossil fuels in 2012 was deeply affected by the collapse of gas generation (a reduction of -111.2 TWh compared to 2011 and -158 TWh compared to 2010). The lignite generation returned to 2010 levels with a reduction of -10.2% (Table 3.2.3.2.1). On the other hand, the share of hard coal increased from 28.4% in 2010 to 32.8% in 2012 (Figure 3.2.3.2.2). This increase was exceeded by the expansion of mixed fuel, which increased by 122.9% from 2011 to 2012 (Table 3.2.3.2.1). The development of mixed fuel could be caused by reinforcements to the existing units from other fossil subcategories to in order to be able to burn different (mixed) fuels, depending on fuel prices and availability or due environmental constrains.

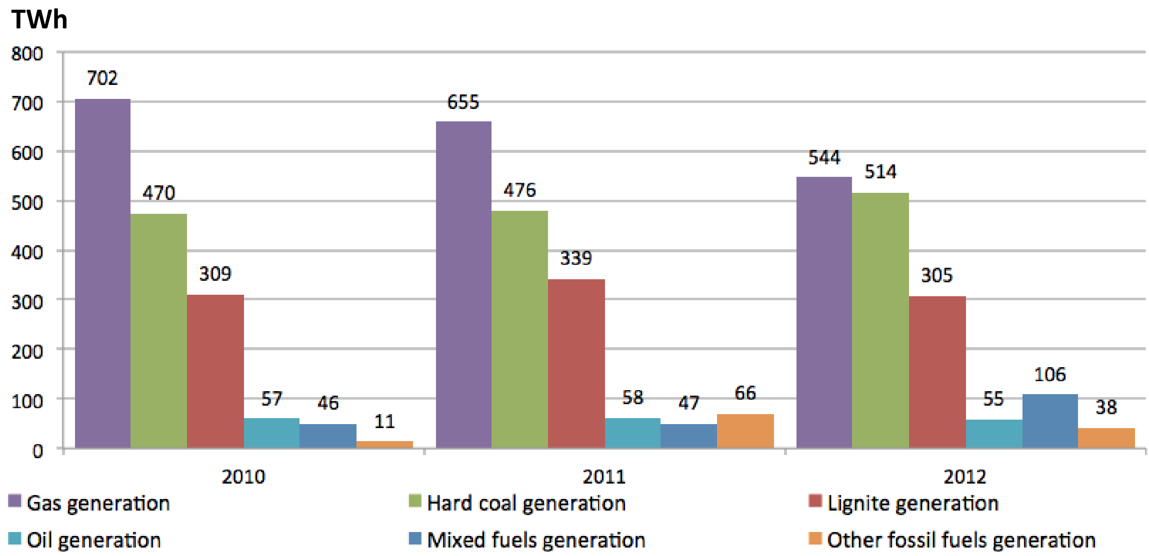


Figure 3.2.3.2.1: Fossil fuels generation evolution per source

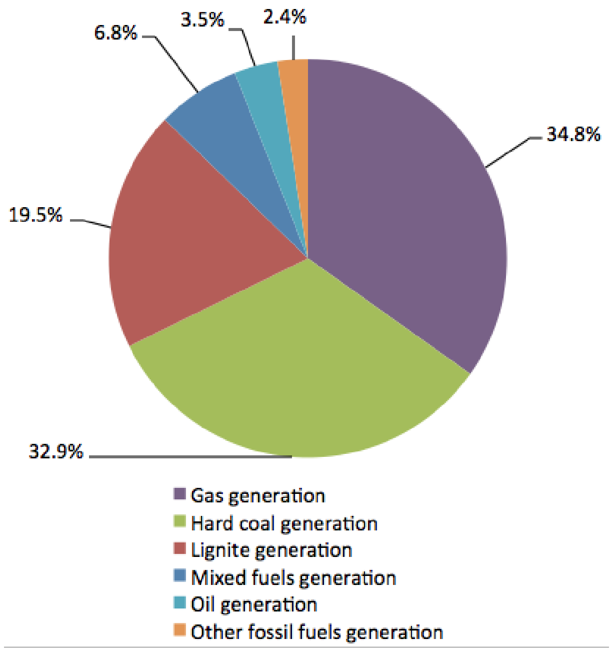
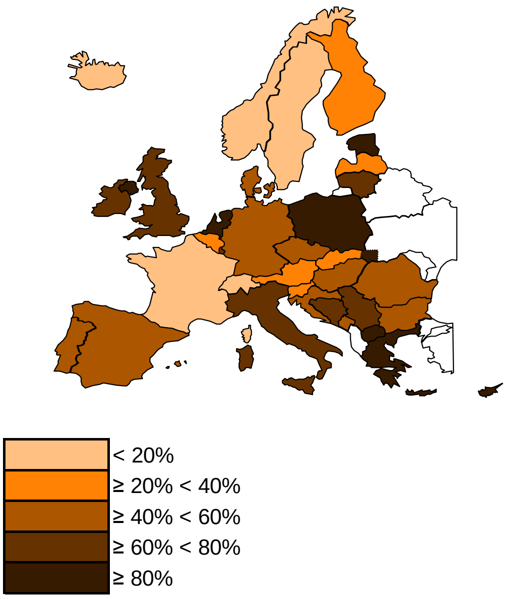


Figure 3.2.3.2.2: Fossil fuels generation mix in 2012

	Total Fossil fuels generation	of which				
		Lignite generation	Hard coal generation	Gas generation	Oil generation	Mixed fuels generation
%	-4.9	-10.2	8.0	-17.0	-3.8	122.9
TWh	-79.8	-34.7	37.9	-111.2	-2.2	58.2

Table 3.2.3.2.1: Fossil fuels generation changes per source

Map 3.2.3.2.1 shows the share of fossil fuels in the total generation for each country in 2012.



Map 3.2.3.2.1: Share of fossil fuels in the total generation of each country in 2012

In absolute values, the main contributors to the overall decrease in fossil fuel generation were the Netherlands (-11.3 TWh), Italy (-11.2 TWh), Great Britain (-8.2 TWh), Finland (-7.0 TWh), Poland (-6.7 TWh), the Czech Republic (-5.4 TWh) and Denmark (-4.7 TWh). Only five countries, Switzerland, Germany, Lithuania, Luxembourg and Ukraine West, reported growth and the biggest took place in Germany (1.4 TWh).

Map 3.2.3.2.2[10] shows the increase / decrease in fossil fuels generation as a part of the total generation per country.

[10] To avoid misunderstanding concerning the maps, which show the percentage increase / decrease of generation (mainly fluctuations in generation in countries where the share of each primary fuel is very small), and avoid underlining only big systems on the map with changes in absolute value, these maps show the increase / decrease of generation as a part of the total generation in each country.

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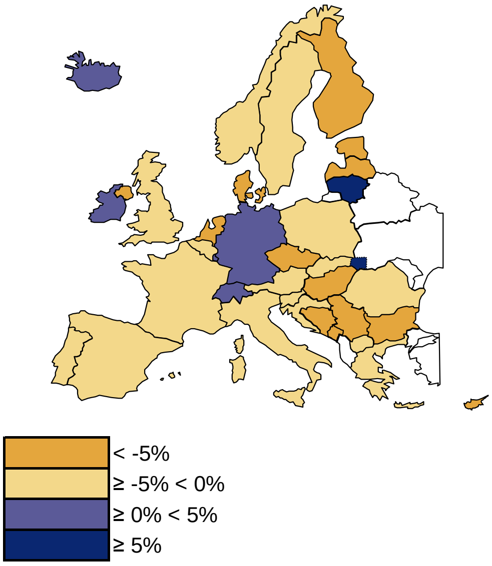

Map 3.2.3.2.2: Fossil fuels generation changes 2011/2012 as part of the total generation in 2012 per country

Considering the changes in fossil fuels referred to the total generation in a country, the biggest decreased occurred in Latvia (-21.0%) and in Denmark (-16.3%). The Netherlands, Estonia, Northern Ireland and Finland registered reductions close to -11.4%. In contrast, Ukraine West had an increase equal to 8.6%.

3.2.3.3. Nuclear generation

ENTSO-E nuclear generation (see Figure 3.2.3.3.1 below) decreased by -2.75% (-24.4 TWh), mainly due to the decrease in France (-16.2 TWh), Germany (-8.0 TWh), Belgium (-7.5 TWh) and Switzerland (-1.2 TWh). In contrast, countries with a significant growth in nuclear generation include Spain (3.4 TWh), Sweden (3.4 TWh), the Czech Republic (1.9 TWh) and Great Britain (1.5 TWh).

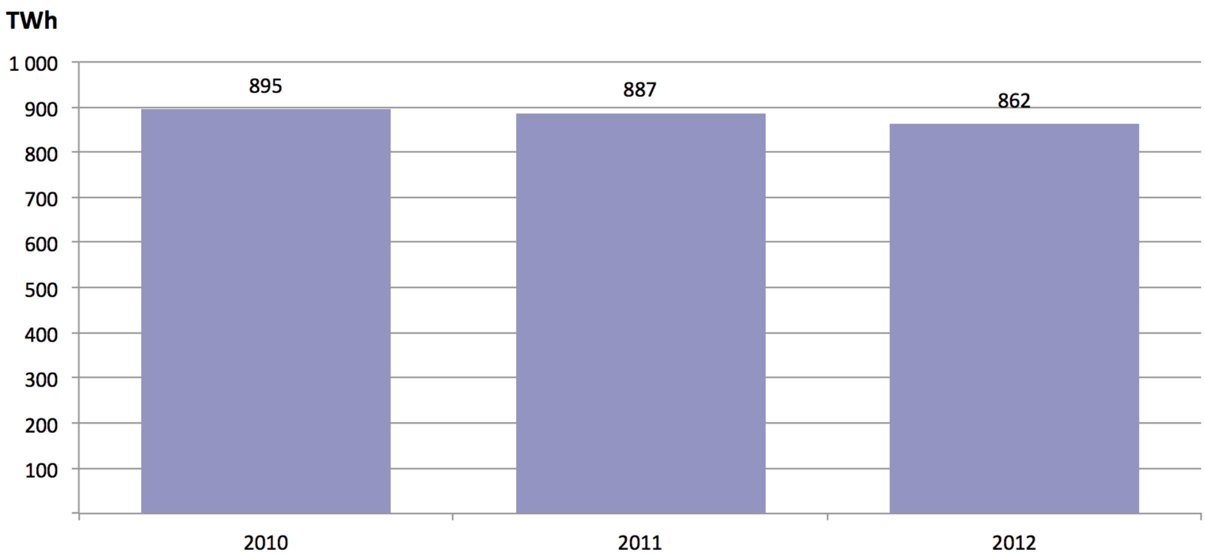

Figure 3.2.3.3.1: Nuclear generation evolution

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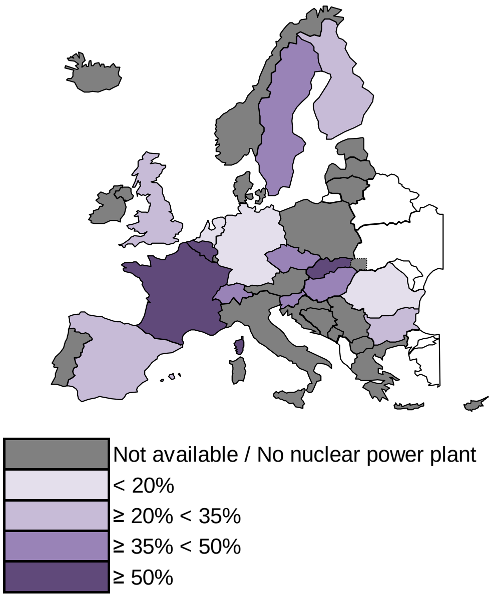
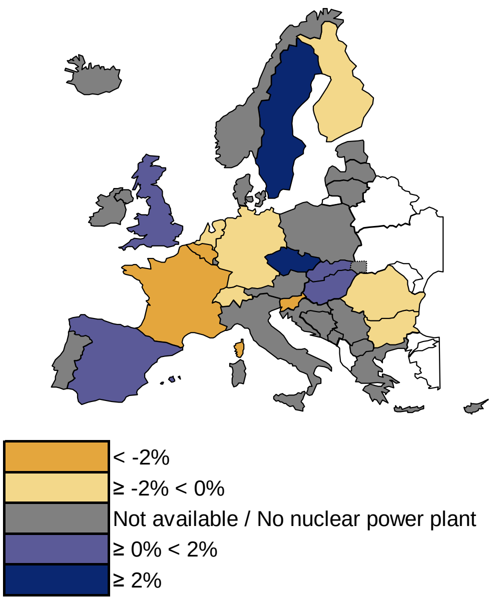
Map 3.2.3.3.1 shows the share of nuclear generation in the total ENTSO-E generation.



Map 3.2.3.3.1: Share of nuclear in the total generation of each country in 2012

The changes in nuclear generation from 2011 to 2012 as part of the total generation per country are shown on Map 3.2.3.3.2.



Map 3.2.3.3.2: Nuclear generation changes 2011/2012 as part of the total generation in 2012 per country

The increase in nuclear generation (as a part of the total national generation) only exceeded 2% in the Czech Republic (2.3%) and Sweden (2.1%). On the other hand, decreases lower than -2% took place in Belgium, Slovenia and France with -9.8%, -4.6% and -3.0% respectively. The other countries are in the middle.

3.2.3.4. Renewable energy sources generation

In this report the following sources are considered as renewable energy sources (RES): wind, solar, biomass (including biogas for some countries), renewable hydro and other renewables (sources not mentioned in the subcategories, e.g. geothermal energy or sources not clearly identified).

For certain countries, renewable energy source (RES) values were not properly identified. They were occasionally included in the non-identifiable energy sources, or the RES share in hydro generation was only partially identified or not identified at all[11].

The evolution of RES subcategories within the space of three years and the share of individual renewable sources in the total ENTSO-E RES generation in 2012 are depicted in Figures 3.2.3.4.1 and 3.2.3.4.2 respectively.

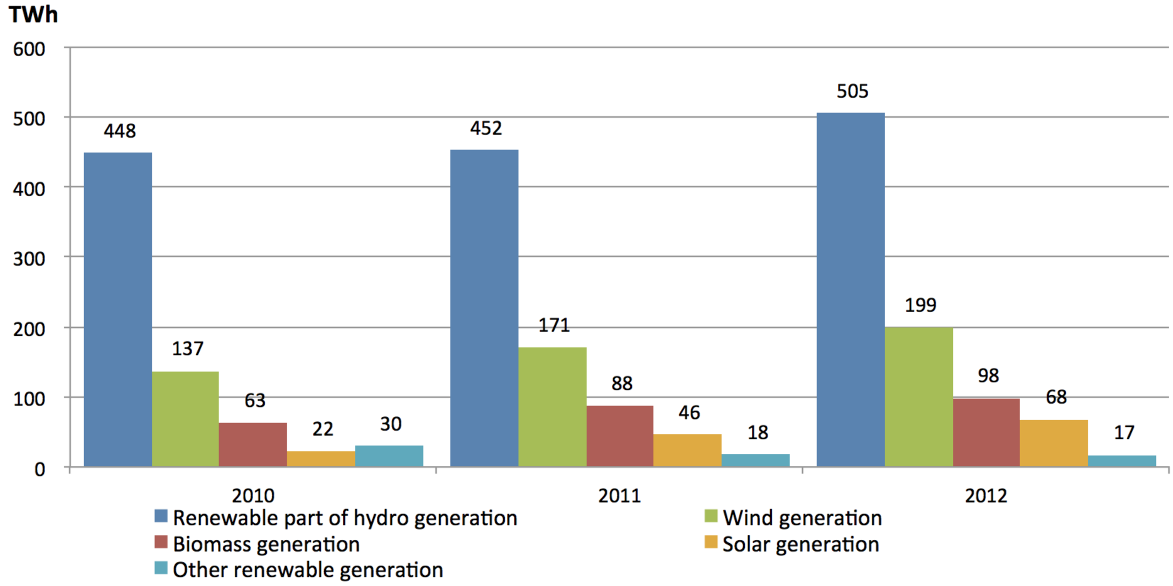


Figure 3.2.3.4.1: Renewable generation evolution

[11] For these countries the RES were considered to be zero.

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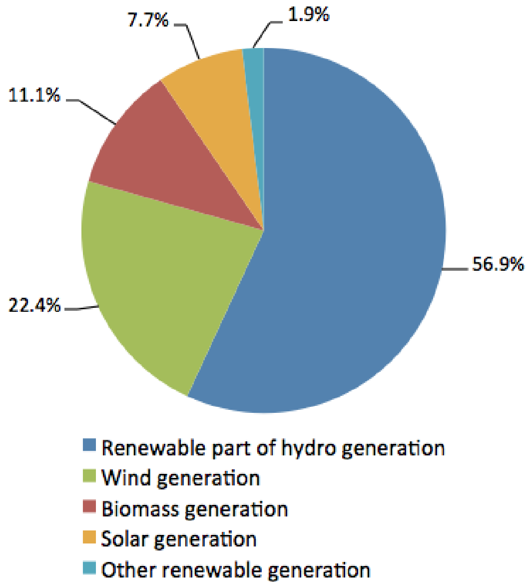

Figure 3.2.3.4.2: Renewable generation mix in 2012

Table 3.2.3.4.1 shows that the generation from renewable energy sources increased by as much 14.5%. All RESs registered growth with the exception of the other RES subcategory. Although major development took place for renewable hydro (52.8 TWh), the year 2012 could be considered as a dry year for some countries such as Spain or Portugal. This means that renewable hydro is becoming more recognizable year by year[12]. In percentage, the highest increase was in the solar subcategory (46.9%).

	Total Renewable Energy Sources generation	of which				
		Wind generation	Solar generation	Biomass generation	Renewable part of hydro generation	Other renewable generation
%	14.5	16.4	46.9	12.2	11.7	-4.4
TWh	112.5	28.0	21.7	10.7	52.8	-0.8

Table 3.2.3.4.1: Renewable generation changes per source

The highest rise in absolute generation values in each category were: Spain for wind (6.4 TWh); Italy for solar (8.0 TWh); Germany for biomass (3.9 TWh); and Norway for renewable hydro (22.4 TWh).

Map 3.2.3.4.1 shows the share of RESs in the total generation of each country in 2011.

[12] The result was supported by the change to the structure of the renewable part of hydro energy in the data collection portal. Since 2012, correspondents are able to provide the strictly renewable part of the total hydro, while for 2011 (and before) in the report the sum of the run-of-river and renewable part of storage and pump storage was used as the renewable part of the total hydro.

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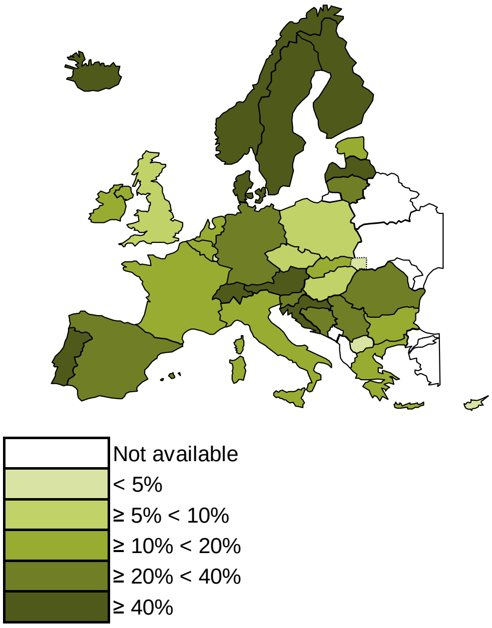
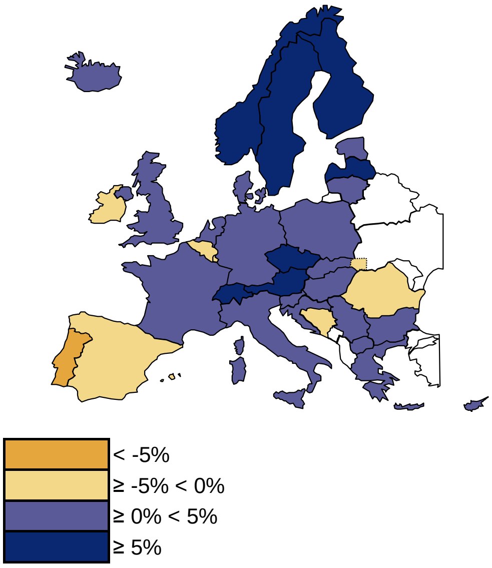


Map 3.2.3.4.1: Share of renewables in the total generation of each country in 2012

In 2012, the highest share of RESs in national generation could be found in Iceland (98.9%) and in Norway (97.7%). Latvia (70.9%), Austria (61.2%), Sweden (59.3%), Switzerland (57.2% and Croatia (52.5%) were next.

The following Map (3.2.3.4.2) demonstrates the increase / decrease of RES generation as a part of total generation per country.



Map 3.2.3.4.2: Renewable generation changes in 2011/2012 as part of the total generation in 2012 per country

The leaders of this growth are Latvia (17.9%), Norway (15.3%) and Austria (13.1%). There were also countries that reported a decrease of renewable generation, such as Portugal (-11.2%), Bosnia and Herzegovina (-4.3%) and Luxembourg (-2.5%)

3.2.3.5. Non-renewable hydro generation

This category only includes hydropower generation that cannot be considered as renewable (i.e. predominantly pure pumped storage hydro power plants or non-identifiable hydro) and it is accounted as the difference between the total hydro generation and the renewable hydro generation as confirmed by correspondents. The renewable element of hydropower generation is included in the RES category (see paragraph 3.2.3.4 above).

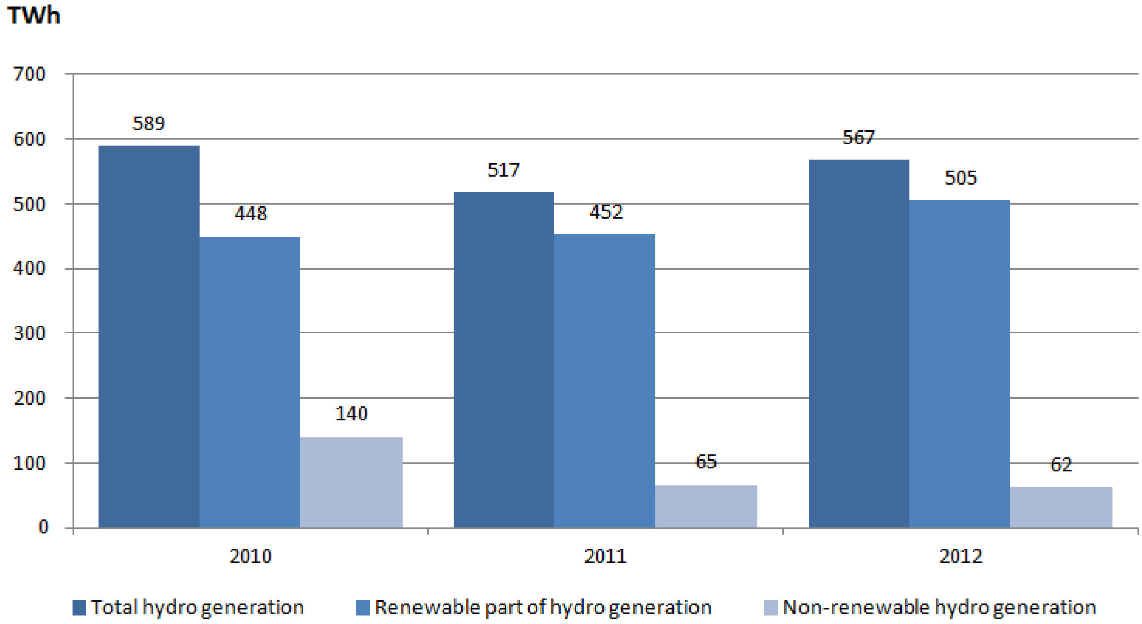


Figure 3.3.3.5.1: Hydro generation evolution

The total generation of hydro power plants increased by 50.1 TWh from 2011 to 2012. This growth was caused by the renewable part element; non-renewable generation is more or less stable.

The main contributors to the total hydro generation increase were Norway (20.8 TWh), France (13.5 TWh), Sweden (12.0 TWh), and Austria (9.2 TWh). Spain and Portugal registered a decrease, -8.6 TWh and 5.4 TWh respectively, mainly as a result of hydro conditions.

3.2.3.6. National comments on generation

AT – Austria
Source of information: E-Control Austria; data about renewables concerned only publicly funded renewables.

BE – Belgium
The decrease in nuclear generation during 2012 in Belgium was due to a temporary unavailability of two major nuclear units. One unit (Doel 3, NGC 1000 MW) was not available from June 2012 till June 2013. Another unit (Tihange 2, NGC 1000 MW) was not available from August 2012 till June 2013.

BG – Bulgaria
The differences occurred mostly because a large part of the RES generation is connected to the distribution network, which is not observed by ESO. Once the year has passed the annual reports by the DSOs provide us with the correct figures.

FI – Finland
Storage hydro includes run-of-river.

NL – Netherlands

Estimation on fuel specs.

PL – Poland
Operational data.
Some fossil fuels units are co-firing biomass. The amount of energy is shared into fossil fuels generation and renewable energy sources generation according to primary fuel share. Some CHPs use oil, but no information is available for the TSO; power and energy is classified in the hard coal subcategory.
Biomass subcategory includes also biogas.

PT – Portugal
Hydrological conditions throughout the year were extremely unfavourable, with a hydro capability factor of only 0.48. Renewable generation supplied 37% of consumption, with wind power reaching its highest ever share (20%).

RS – Serbia
Reason for differences: values on ME border are not harmonized.

SI – Slovenia
Non-identifiable energy sources include all generation (including RES generation) on the distribution level (no breakdown of this generation is available to the TSO). The ownership of Nuclear power plant Krsko is equally divided between Slovenia and Croatia; half of its production is delivered to Croatia in accordance with the international agreement (the figures in the tables consider 100% of its generation).

UA_W – Ukraine West
Including auxiliaries.

3.2.4. Physical Energy flows

3.2.4.1. ENTSO-E overview

Exchanges are the physical import and export flows in every interconnection line of a power system. The exchange balance is the difference between the physical import and export flows. The import/export of the overall ENTSO-E perimeter is the sum of the import/export of each ENTSO-E country member. The physical flows are metered at the exact border or at a virtual metering point estimated from the actual one.

As introduced in the executive summary, in 2012 both exports and imports were higher than previous years: +7.0% and + 4.8%, respectively. Moreover, for the first time ENTSO-E was a net exporting system in 2012 (Figures 2.2 and 2.3).

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Figure 3.2.4.1.1 shows the evolution of exchanges per country during the last three years.

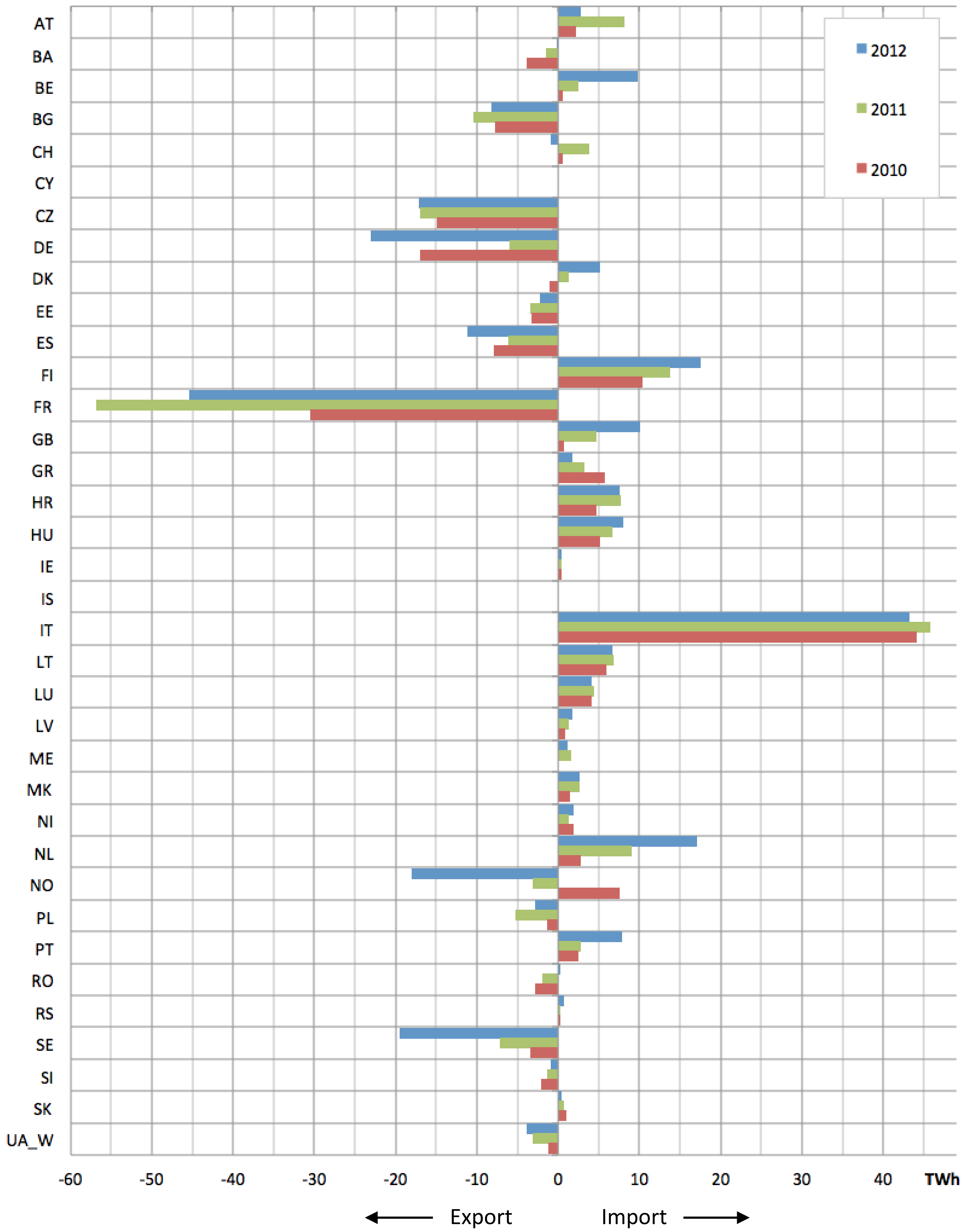
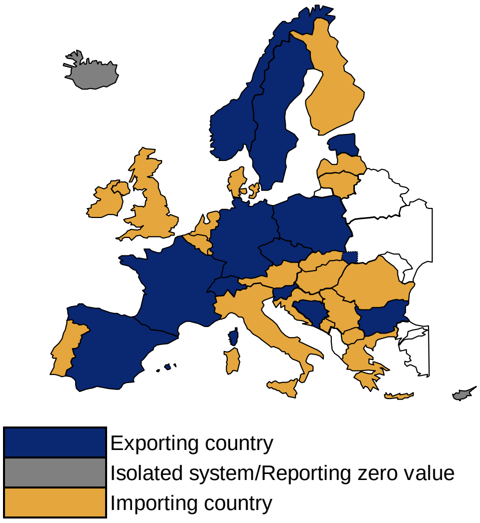


Figure 3.2.4.1.1: Exchanges evolution per country



Map 3.2.4.1.1: Net importing / exporting countries in 2012

In order to avoid any possible bias due to the results of large systems, Figure 3.2.4.1.2 and Figure 3.2.4.1.3 depict the net exchanges per country as part of their consumption.

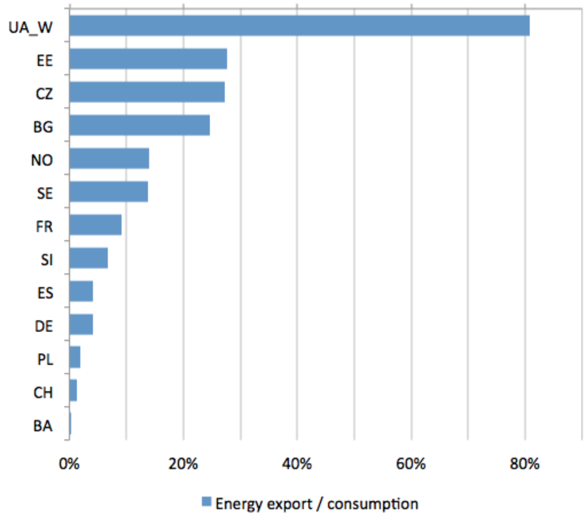


Figure 3.2.4.1.2: Net export as part of the consumption per country

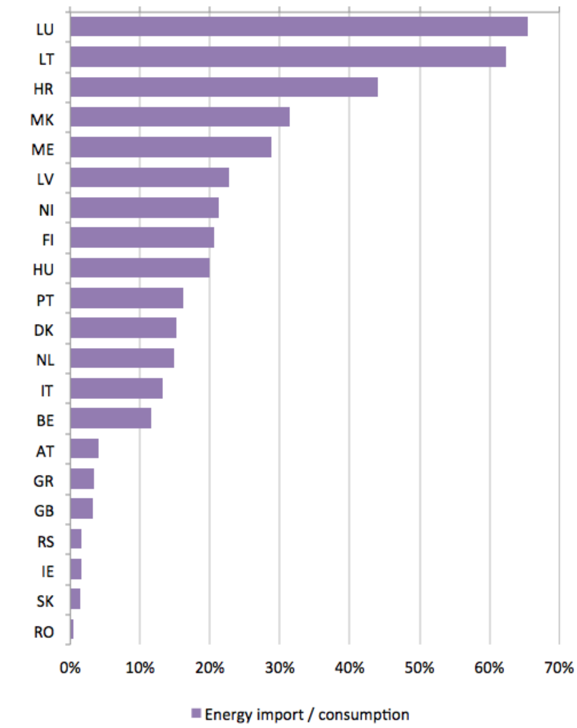


Figure 3.2.4.1.3: Net import as part of the consumption per country

Figure 3.2.4.1.1 above confirms that France was still the biggest net exporter (45.3 TWh). On the other hand Ukraine West only exported about 3.8 TWh, but from a different point of view (Figure 3.2.4.1.2) it was the leading exporter in terms of overall generation (export/consumption), exporting 80.8% of its consumption, followed by Estonia (27.6%), the Czech Republic (27.2%) and Bulgaria (24.7%). At the other end of the spectrum (Figure 3.2.4.1.3), the countries who resorted mainly to imports to supply their consumption in 2012 were Luxembourg (65.5%), Lithuania (62.7) and Croatia (44.0%).

3.2.4.2. National comments on energy flows

ES – Spain

Lines lower than 220 kV have been considered.

PT – Portugal

The import balance supplied 16% of consumption, with an occupancy rate of 59% of the import capacity.

RS – Republic of Serbia

Reason for differences: values on the ME border are not harmonized.

3.3. Power balance

3.3.1. ENTSO-E Data Summary

Unless otherwise stated, all graphs and tables in this chapter refer to the month of December for the respective year.

Table 3.3.1.1 displays power balance results for December's reference point. While Net Generating Capacity (NGC) results are representative of the entire year, Unavailable Capacity (UC), load and exchanges fluctuate over the year and strongly depend on weather/market conditions at the reference point. The table 3.3.1.1 and Figure 3.3.1.1 must be treated as examples of power balance valid for December 2012, not as typical structures of power balance. Details concerning results in all reference points are presented in chapters 3.3.4 and 3.3.5.

GW	2010	2011	2012	Change 2012 to 2011	
				Absolute value (MW)	%
Net Generating Capacity	910.7	935.5	981.1	45.5	4.9
Fossil fuels power	451.3	454.8	463.5	8.7	1.9
Nuclear power	133.9	125.7	125.4	-0.4	-0.3
Renewable Energy Sources power (incl. renewable hydro)	253.4	303.7	354.8	51.2	16.8
Non-renewable hydro power	66.5	46.8	36.5	-10.3	-22.0
Not clearly identifiable energy sources power	5.7	4.5	0.9	-3.6	-80.4
Unavailable capacity	237.1	270.6	329.0	58.4	21.6
Non-usable capacity	155.7	189.4	232.5	43.2	22.8
Maintenance & overhauls	26.3	30.2	36.0	5.9	19.4
Outages	22.9	20.0	27.6	7.6	38.1
System services reserve	32.2	31.1	32.9	1.8	5.8
Reliable Available Capacity	658.5	664.9	652.1	-12.9	-1.9
Load	521.2	473.5	481.3	7.8	1.7
Remaining Capacity	137.3	191.4	170.7	-20.7	-10.8
Exchanges	-0.6	-2.2	-1.1	1.2	-52.2
Imports	40.1	51.2	46.1	-5.1	-10.0
Exports	40.7	53.4	47.2	-6.3	-11.7

Table 3.3.1.1: ENTSO-E power balance summary for December

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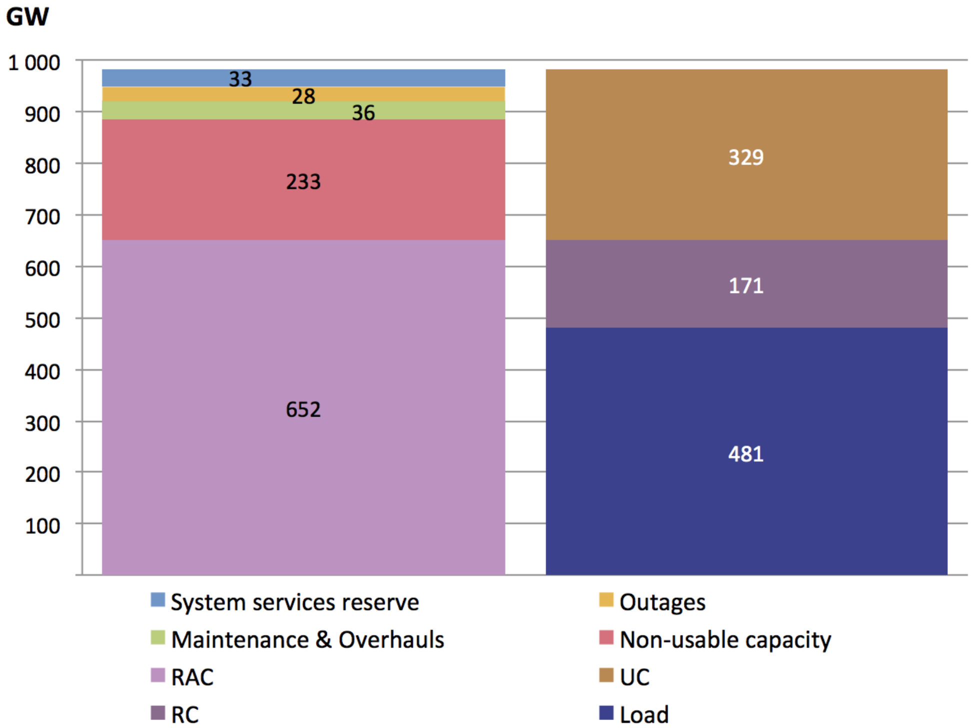


Figure 3.3.1.1: Power balance in December 2012

3.3.2. Load

3.3.2.1. ENTSO-E overview

The total ENTSO-E load is always the lowest in the August reference point. In 2012 it was even lower than in 2010 / 2011 because there was a holiday (15th August) in most countries on the 3rd Wednesday, which is shown in Figure 3.3.2.1.1. The figure also shows that the maximum ENTSO-E peak load took place in February's reference point and amounted to a power output of 508 GW. Precise load data for every reference point can be found in Table 3.3.2.1.1.

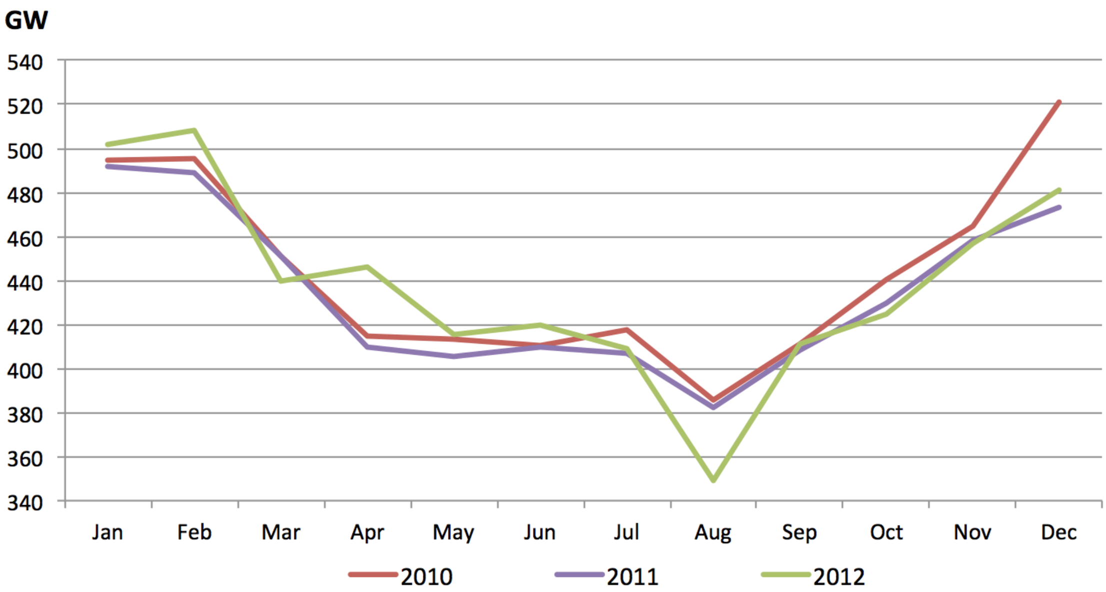


Figure 3.3.2.1.1: Load evolution

GW	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	494	495	451	415	413	410	418	386	411	440	464	521
2011	492	489	451	410	406	409	407	382	409	430	458	473
2012	502	508	440	446	415	419	409	349	411	425	457	481

Table 3.3.2.1.1: Load evolution per reference point

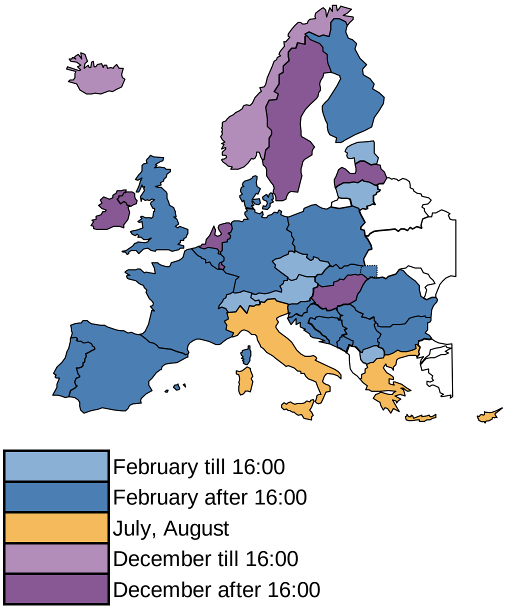
3.3.2.2. National peak load

Table 3.3.2.2.1 presents all information concerning instantaneous peak load per country, including historical peak loads (this figure is also included in excel attachment "YS&AR 2012 table no.1". It is necessary to underline that these values should be – in general – higher (or at least the same) than the values provided for Monthly Statistics, because in the monthly data the average hourly load is collected. Based on data from Monthly Statistics it can be seen that the ENTSO-E peak load took place on Wednesday 8th February at 19:00 and amounted to a power output of 557.3 GW, however only four countries reported their peak load on this date (more details are available in the excel attachment "operational data", sheet "hourly load").

Country	Weekday	Calendar Day	Month	Time	Daily Average (°C)	Deviation from Normal (°C)	Instantaneous Peak Load (MW)	Compared to Last Year's (%)	Day of Historic Peak Load	Year	Instantaneous Historic Peak Load (MW)	Deviation from Normal (°C)
AT	Thursday	2	2	11:30	n.a.	n.a.	**11 617**	**3,8**	n.a.	n.a.	n.a.	n.a.
BA	Friday	10	2	18:00	n.a.	n.a.	**2 143**	**-0,3**	Fri 31 Dec	2010	2 173	n.a.
BE	Tuesday	7	2	18:30	-8,3	-12,1	**14 234**	**0,6**	Wed 1 Dec	2010	14 391	-8,5
BG	Wednesday	1	2	18:30	-12,7	-15,0	**7 697**	**7,9**	Wed 20 Dec	1989	8 396	n.a.
CH	Wednesday	15	2	10:15	1,0	-2,0	**10 688**	**6,1**	Fri 10 Dec	2010	10 749	-8,0
CY	Thursday	19	7	12:15	33,0	-3,0	**997**	**-9,4**	Tue 3 Aug	2010	1 148	-3,0
CZ	Tuesday	7	2	12:00	-11,4	-12,0	**10 725**	**5,9**	Tue 7 Feb	2012	10 725	-12,0
DE	Tuesday	7	2	19:15	n.a.	n.a.	**81 858**	**n.a.**	Tue 7 Feb	2012	81 858	n.a.
DK	Monday	6	2	18:00	-8,1	n.a.	**6 169**	**-0,8**	Tue 24 Jan	2006	6 436	n.a.
EE	Monday	6	2	9:00	-16,0	-11,0	**1 572**	**3,5**	Thu 28 Jan	2010	1 587	-13,0
ES	Monday	13	2	19:15	3,9	2,9	**43 527**	**-1,0**	Mon 17 Dec	2007	45 450	-1,9
FI	Friday	3	2	18:00	n.a.	n.a.	**14 433**	**-3,6**	Fri 18 Feb	2011	14 965	n.a.
FR	Wednesday	8	2	19:00	-1,2	-4,9	**102 098**	**10,4**	Wed 8 Feb	2012	102 098	-4,9
GB	Wednesday	8	2	19:00	-1,9	7,0	**58 985**	**5,0**	Mon 17 Dec	2007	60 700	-2,9
GR	Monday	16	7	14:00	36,0	9,0	**9 894**	**-1,6**	Mon 23 Jul	2007	10 414	5,0
HR	Monday	6	2	19:00	-2,0	n.a.	**3 193**	**7,0**	Mon 6 Feb	2012	3 193	n.a.
HU	Thursday	13	12	16:45	-4,8	-5,2	**6 016**	**0,2**	Thu 29 Nov	2007	6 180	-5,7
IE	Monday	10	12	16:30	3,8	6,1	**4 589**	**55,0**	Tue 21 Dec	2010	5 090	-4,7
IS	Monday	17	12	12:00	-1,6	3,0	**2 168**	**1,4**	Wed 7 Dec	2011	2 138	-1,2
IT	Tuesday	10	7	12:00	29,5	2,5	**54 113**	**-4,2**	Tue 18 Dec	2007	56 882	1,5
LT	Monday	6	2	10:00	-19,1	-14,5	**1 885**	**8,7**	Tue 18 Apr	1989	3 153	n.a.
LU	Wednesday	12	12	19:00	-5,6	-14,7	**1 009**	**-17,7**	Wed 21 Sep	2011	1 188	-9,2
LV	Wednesday	19	12	18:00	-10,9	-2,7	**1 368**	**11,7**	Wed 21 Dec	1988	1 997	n.a.
ME	Friday	10	2	19:00	n.a.	n.a.	**708**	**n.a.**	Sun 23 Jan	2011	735	n.a.
MK	Thursday	9	2	15:00	-7,0	11,0	**1 619**	**1,0**	Sat 31 Dec	2011	1 642	3,0
NI	Wednesday	12	12	18:30	1,3	-8,0	**1 722**	**-2,4**	Wed 22 Dec	2010	1 777	-11,9
NL	Thursday	13	12	18:00	-1,0	4,7	**18 438**	**2,1**	Tue 15 Jan	2008	18 465	1,3
NO	Wednesday	5	12	9:00	n.a.	n.a.	**23 443**	**6,0**	Wed 6 Jan	2010	23 394	n.a.
PL	Tuesday	7	2	17:30	-11,1	-9,0	**23 970**	**4,4**	Tue 7 Feb	2012	23 970	-9,0
PT	Monday	13	2	21:00	7,7	-2,9	**8 554**	**-6,9**	Mon 11 Jan	2010	9 403	-2,5
RO	Wednesday	1	2	18:00	-15,0	-13,6	**8 627**	**-1,1**	Thu 23 Nov	1989	10 248	n.a.
RS	Wednesday	8	2	19:00	-9,4	n.a.	**7 565**	**3,1**	Fri 31 Dec	2010	7 656	n.a.
SE	Thursday	13	12	16:30	-9,1	8,0	**26 200**	**0,7**	Mon 5 Feb	2001	27 000	9,0
SI	Friday	10	2	19:00	-7,1	-8,5	**2 100**	**5,3**	Thu 26 Jan	2006	2 110	1,0
SK	Tuesday	7	2	18:00	-7,7	-7,5	**4 395**	**2,7**	Tue 12 Dec	1989	4 471	n.a.
UA_W	Friday	3	2	18:00	-21,5	-13,0	**1 197**	**4,8**	Fri 3 Feb	2012	1 197	-13,0

Table 3.3.2.2.1: National instantaneous peak load overview 2012

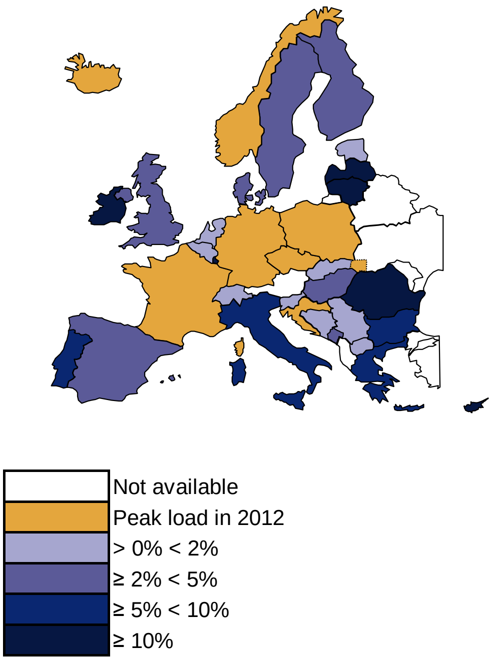
As usual peak loads during the summer took place in Cyprus, Greece and Italy. All had their peak power usage in the morning. On the other hand, most "winter" countries registered their peak loads in February 2012, which was a very cold month. ENTSO-E's highest load at a reference point (3rd Wednesday, 11:00 a.m.) took place in February's reference point (15th February 2012). Usually, "winter" countries had their peak in the evening (after 16:00), however in Austria, Switzerland, the Czech Republic, Iceland, Estonia, Lithuania, the Former Republic of Macedonia and Norway the peak was registered in the morning / early afternoon (till 16:00). Map 3.3.2.2.1 displays all described results.



Map 3.3.2.2.1: Month and time of peak load

The difference between historical peak load and peak load in 2012 is presented in Map 3.3.2.2.2. New historical peak load were registered in Croatia, the Czech Republic, France, Iceland, Poland and the Ukraine West system. Except for Iceland, all peaks took place in February (see Map 3.3.2.2.1).

The peak loads of Latvia and Lithuania were lower than the historical loads by 40.2% and 31.5% respectively, but this is the result of political changes in the late 80s and early 90s – their historical peak loads took place in 1989. Bulgaria and Romania also had their historical peak loads in that year, but the differences were not excessive – 8.3% and 15.8% respectively.



Map 3.3.2.2.2: Difference between peak load in 2012 to historical peak load

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3.3.2.3. National comments on load and peak load

AT – Austria
Monthly peak load are estimated values as they are not available.

PT – Portugal
Peak power remained about 850 MW below the highest ever figure, recorded in 2010.

UA_W – Ukraine West
Including auxiliaries.

3.3.3. Net generating capacity

3.3.3.1. ENTSO-E overview

During the year 2012 NGC increased by 26.7 GW (Table 3.3.3.1.1). Comparison of this result with the increase from December 2011 to December 2012 (45.5 GW) shows that 20 GW was commissioned at the turn of 2011 and 2012.

GW		Change December to January	
January	December	Absolute value	%
954.4	981.1	26.7	2.8

Table 3.3.3.1.1: NGC evolution in 2012 (January – December)

In detail, the main contributors of the power increase in 2012 (in absolute values) were Germany with a 26.6 GW increase, Italy with a 5.8 GW increase and France (2.2 GW increase). In percentages, those with the highest increases from the previous year as a part of NGC were Germany with a 15.5% increase, Bulgaria with a 10.0% increase, Ireland with a 9.0% increase, and Romania and Greece with 7.4% and 7.1% respectively.

Within ENTSO-E countries, only four registered a decrease of NGC: Cyprus, Great Britain, Hungary and Portugal. However, there were no significant drops from ENTSO-E's point of view (lower than 1 GW). A huge decrease in percentage as a part of NGC in 2012 was registered for Cyprus (61.7%), which was caused by the destruction of the Vasilikos Power Station. The other results were lower than 4%.

NGC changes per category over the last three years are also interesting, which is shown in Figure 3.3.3.1.1. Renewable Energy Sources (RES) grew significantly, but the fossil fuels category also slightly increased over the last three years. Other categories registered a decrease.

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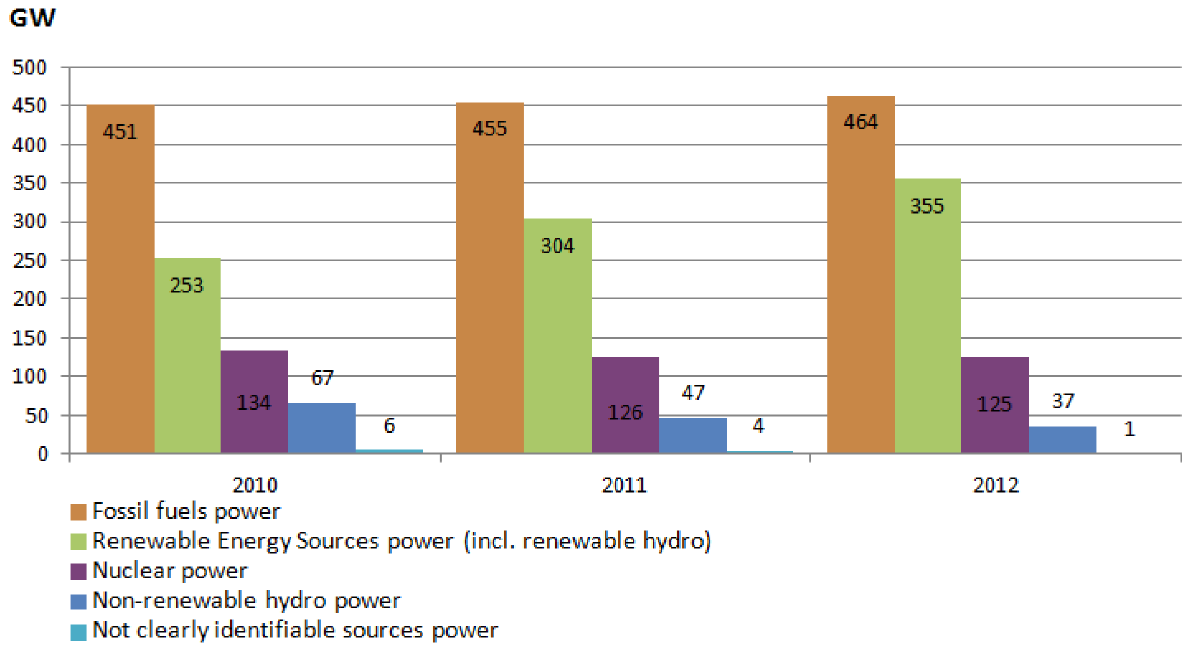

Figure 3.3.3.1.1: NGC category evolution

The significant increase of RESs caused the share of fossil fuels in the total generation of power to decrease (by -1.4%) even though their NGC increased (by 8.7 GW). In fact, the share of all categories except for RESs dropped, which is visible in Figures 3.3.2.1.2 and 3.3.2.1.3.

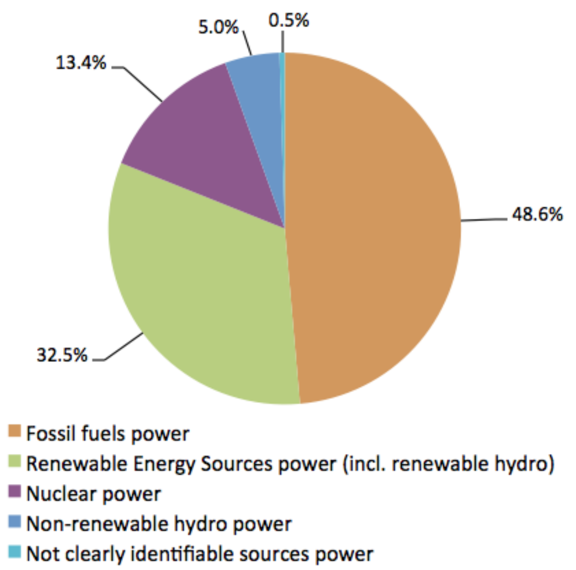

Figure 3.3.3.1.2: NGC mix in 2011

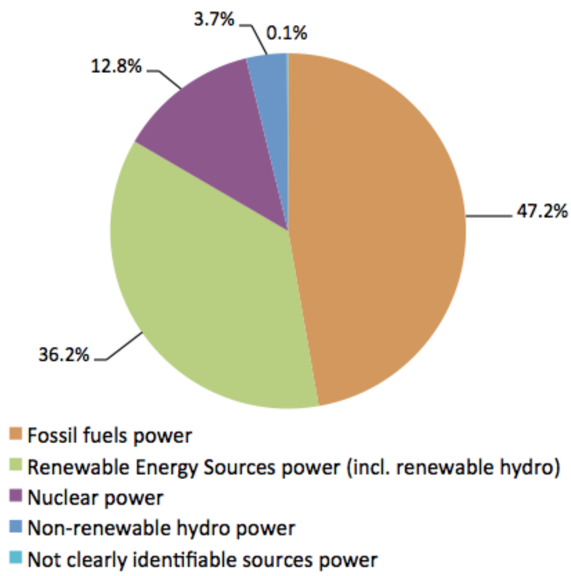

Figure 3.3.3.1.3: NGC mix in 2012

3.3.3.2. Fossil fuels power

The contributors of the previously mentioned increase in fossil fuels are gas and mixed fuel, however taking into account the decrease of hard coal, lignite and oil, the development of mixed fuel could be caused by reinforcements to the existing units from other fossil subcategories in order to burn different (mixed) fuel, depending on fuel prices and availability or due to environmental factors. Figure 3.3.3.2.1 shows the development of fossil fuels within the space of three years, and Table 3.3.3.2.1 shows precise values concerning changes.

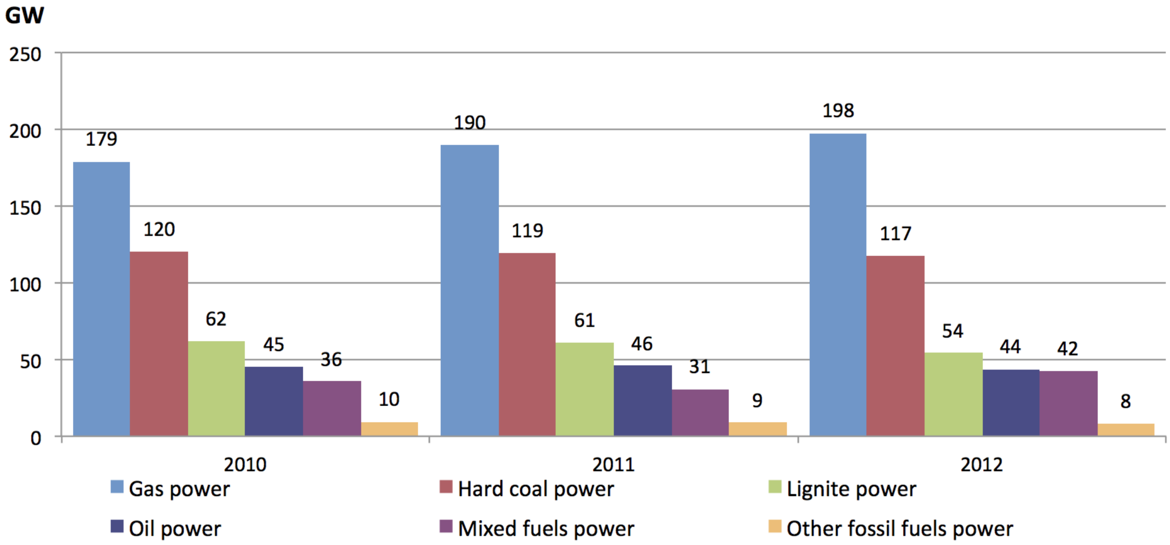

Figure 3.3.3.2.1: Fossil fuels NGC evolution per source

GW	December 2010	December 2011	December 2012	Change 2012 to 2011	
				Absolute value	%
Fossil fuels power	451.3	454.8	463.5	8.7	1.9
Lignite power	61.7	60.8	54.1	-6.7	-11.1
Hard coal power	120.0	119.1	117.3	-1.8	-1.5
Gas power	178.9	189.5	197.5	8.0	4.2
Oil power	45.4	45.8	43.8	-2.0	-4.5
Mixed fuels power	35.7	30.9	42.5	11.6	37.5
Other fossil fuels power	9.5	8.7	8.3	-0.4	-4.4

Table 3.3.3.2.1: Fossil fuels evolution

The highest increases in the NGC of fossil fuels (as a percentage related to NGC in 2012) were registered for Germany (7.1%), Lithuania (3.8%), Slovakia (3.5%) and Romania (3.0%). On the other hand, the decreases were registered for Cyprus (-74.5%) (the destruction of Vasilikos Power Station), Great Britain (-4.5%) and Portugal (-4.4%).

Returning to ENTSO-E data, the present share of each category in total NGC is presented in Figure 3.3.3.2.2. Compared to 2011, the share of gas in the NGC increased by 1.0% and achieved 42.6%. This share is close to the sum share of coal and oil (46.4%).

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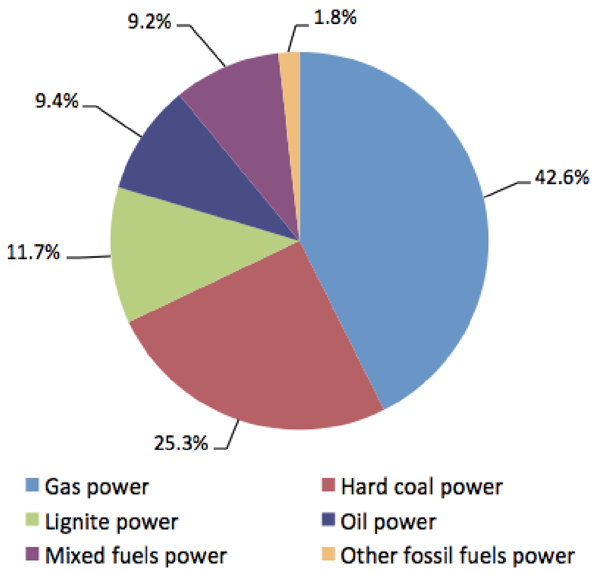

Figure 3.3.3.2.2: Fossil fuels NGC mix in 2012

3.3.3.3. Nuclear power

As mentioned at the beginning of the NGC paragraph, the nuclear power NGC and as its share in the total NGC has decreased during the last two years; however, the most significant decrease took place in 2011 after the Fukushima disaster. The total nuclear power NGC share of large contributors (higher than 5%) remained the same, except for Belgium (where the share fell below 5.0% and amounted to 4.7%). Precise data is displayed in Figure 3.3.3.3.1.

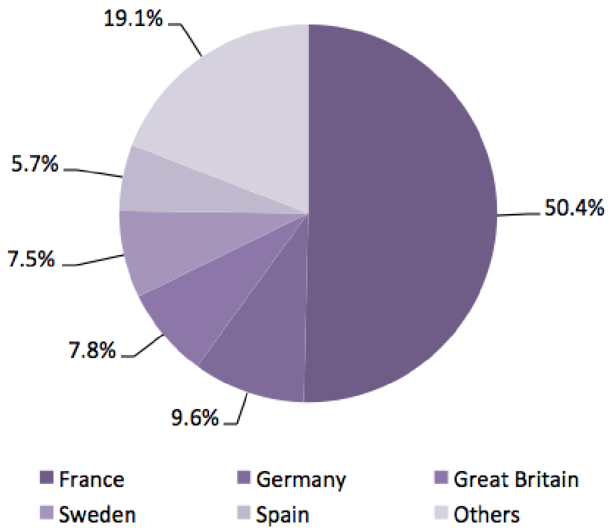

Figure 3.3.3.3.1: The share of nuclear NGC per country as a part of the total nuclear NGC in ENTSO-E

3.3.3.4. Renewable energy sources power

As was expected, the highest increase of NGC within all categories concerned RESs and amounted to 51.2 GW, which corresponds with 16.8%. All renewable subcategories grew except for the subcategory other, which means that TSOs are able to identify their renewable sources more accurately. The leader is the solar subcategory with a power increase of 19.9 GW (41.7%). Second is

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renewable hydro with 13.9 GW (9.3%), and third is wind with 12.2GW (13.6%). Biomass registered the smallest increase in absolute values, by 6GW, but this is the biggest percentage increase (46.0%). While the growth of solar, wind and biomass came from new installations, the growth of renewable hydro could be the result of better recognition of the numbers of “green” hydro stations inside TSOs. This hypothesis could be confirmed by the simultaneous fall of the non-renewable part of hydro, which is described in next paragraph. All details referring to the NGC of renewables can be found in Figure 3.3.3.4.1 and in Table 3.3.3.4.1.

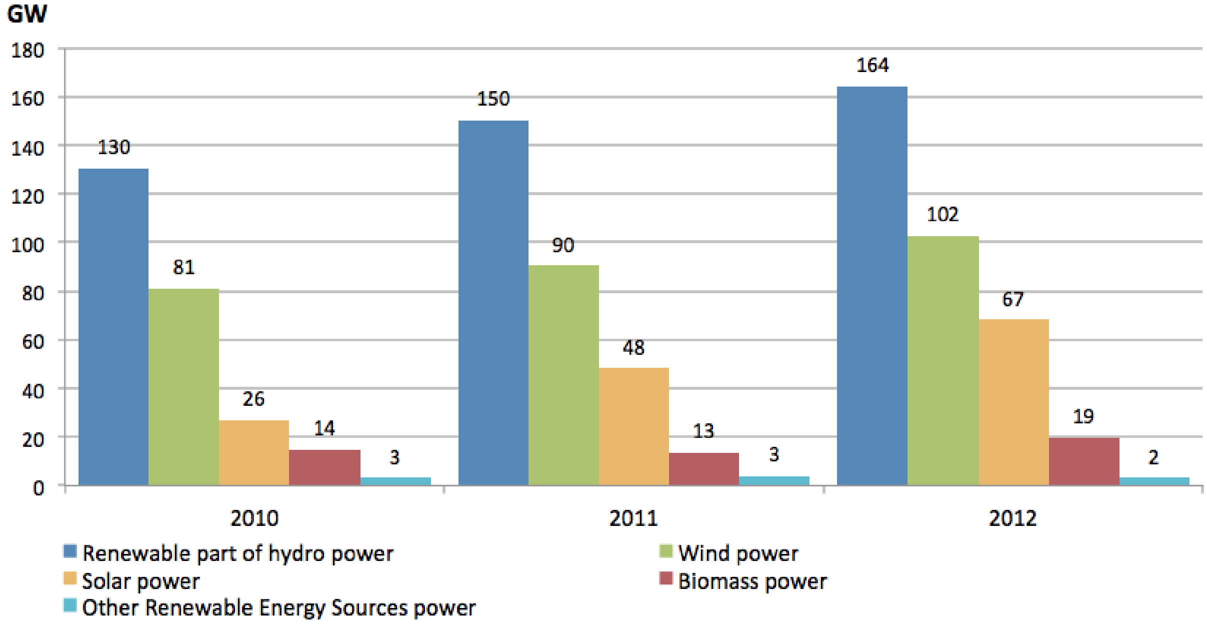

Figure 3.3.3.4.1: Renewable generation NGC evolution per source

GW	December 2010	December 2011	December 2012	Difference 2012 to 2011	
				Absolute value	%
Renewable Energy Sources power	253.4	303.7	354.8	51.2	16.8
Wind power	80.7	89.9	102.1	12.2	13.6
Solar power	26.1	47.6	67.5	19.9	41.7
Biomass power	14.4	13.1	19.1	6.0	46.0
Renewable part of hydro power	129.8	149.8	163.8	13.9	9.3
Other Renewable Energy Sources power	2.5	3.2	2.4	-0.8	-25.5

Table 3.3.3.4.1: Renewable generation evolution

The leading countries in terms of renewable development (increase in 2012 as a part of the total national NGC) are Cyprus (12.8%), Germany (10.1%) and France (9.6). There were also five countries (Croatia, Hungary, Iceland, Slovakia and Ukraine West), which registered a decrease of RESs. The highest drops took place in Croatia (-10.7%) and Slovakia[13] (-5.8%).

[13] The difference of RES NGC in Slovakia can be caused by a different evaluation of RES-Hydro category in data collection process for the years 2011 and 2012.

Looking at the structure of renewables NGC presented in Figures 3.3.3.4.2 and 3.3.3.4.3, only solar and biomass registered a growth of total NGC share, while in absolute values growth also took place for wind and renewable hydro. Almost half of the NGC is made up of renewable hydro. In 2012, 30.6% of this came from Nordic countries: Norway, Sweden and Finland.

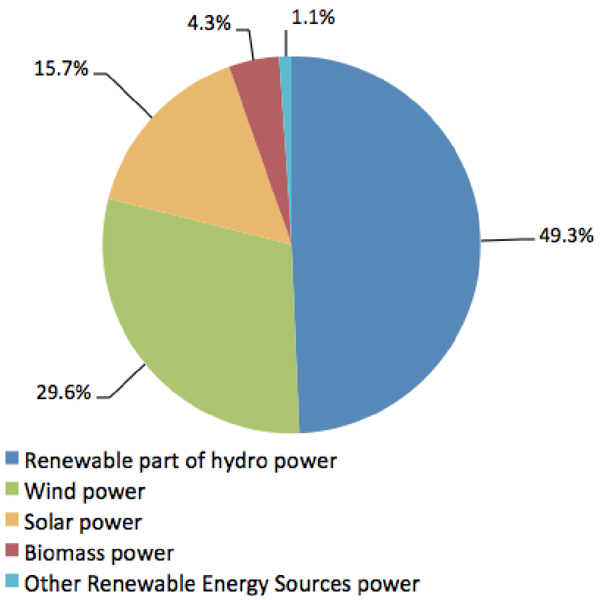

Figure 3.3.3.4.2: Renewable generation NGC mix in 2011

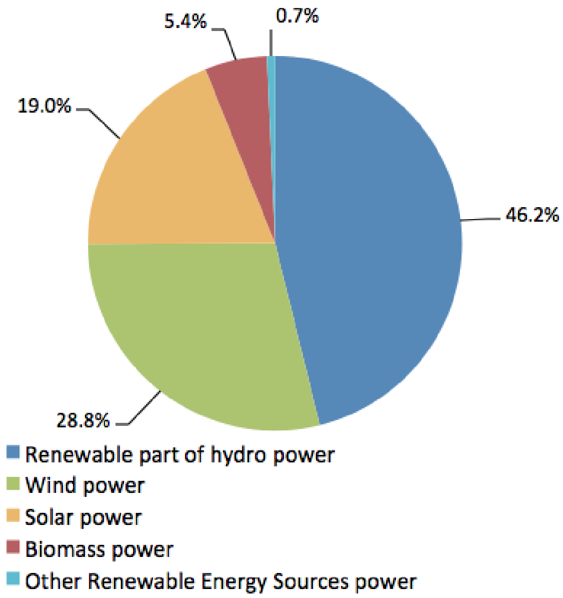

Figure 3.3.3.4.3: Renewable generation NGC mix in 2012

3.3.3.5. Non-renewable hydro power

This category represents the hydro element that could not be confirmed as renewable and is calculated as the total hydro minus the renewable hydro.

Since 2012, the structure of the ENTSO-E database has provided the strictly renewable part of hydro, while for previous years there was the division into run-of-river and renewable part of storage and pump storage. This is one reason why renewable hydro is more recognizable inside TSOs, and in fact the majority of the renewable part of hydro growth came from the non-renewable part because the total NGC hydro power plants is stable in general, as is visible in Table 3.3.3.5.1.

GW	December 2010	December 2011	December 2012	Difference 2012 to 2011	
				Absolute value	%
Total hydro power	196.3	196.7	200.3	3.6	1.8
Renewable part of hydro power	129.8	149.8	163.8	13.9	9.3
Non-renewable hydro power	66.5	46.8	36.5	-10.3	-22.0

Table 3.3.3.5.1: Hydro evolution

3.3.3.6. National comments on NGC

AT – Austria

687 MW of NGC Fossil Fuels are not attributable. All hydro power plants are considered as renewable as pump storage plants have natural inflows.

DE – Germany

Only NGC is included for which the feed-in is known.

EE – Estonia

All other fossil fuels, beside gas and mixed fuel, is from oil shale.

ES – Spain

Spanish Peninsular System Data.

GB – Great Britain

Mixed coal and biomass included in coal. Solar is all embedded and metering not available. Comment for NGC Hydraulic: the rest is pump storage.

IE – Ireland

Renewable figure contains 19 MW of Waste Generation (for months 4 to 8 and 10 to 11). Non-identifiable includes 12 MW from Demand Side Units in months 7, 8 and 10, 41 MW from Demand Side Units in the 11th month and 56 MW from Demand Side Units in the 12th month.

IS – Iceland

Comment for NGC Renewables: Geothermal (for months 1 to 10).

NL – Netherlands

Biomass category interpreted as total waste.

PL – Poland

Operational data.
Some fossil fuels units are co-firing biomass, but full NGC is classified in the category fossil fuel. Some CHPs use an oil, but no information is available for the TSO, power and energy is classified in hard coal subcategory.
Biomass subcategory includes also biogas.

PT – Portugal

During 2012 the fuel-oil fired Carregado power station, with 710 MW, was decommissioned. The new Alqueva II reversible power station, with 254 MW, came into service in 2012.

RO – Romania

Comment for NGC Hydraulic:
January: From 6116.1 MW hydro NGC, an amount of 382.5 MW obtained a green certificate.
February: From 6129.3 MW hydro NGC, an amount of 400.55 MW obtained a green certificate.
March: From 6129.31 MW hydro NGC, an amount of 408.67 MW obtained a green certificate.
April: From 6129.3 MW hydro NGC, an amount of 413.3 MW obtained a green certificate.
May: From 6142.81 MW hydro NGC, an amount of 418.27 MW obtained a green certificate.
June: From 6156.31 MW hydro NGC, an amount of 418.27 MW obtained a green certificate.

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July: From 6156.31 MW hydro NGC, an amount of 420 MW obtained a green certificate.
August: From 6156.31 MW hydro NGC, an amount of 420.24 MW obtained a green certificate.
September: From 6169.5 MW hydro NGC, an amount of 420.24 MW obtained a green certificate.
October: From 6169.5 MW hydro NGC, an amount of 422.06 MW obtained a green certificate.
November: From 6182.69 MW hydro NGC, an amount of 422.06 MW obtained a green certificate.
December: From 6195.88 MW hydro NGC, an amount of 425.64 MW obtained a green certificate.

SI – Slovenia

No changes to NGC in 2012. The ownership of Nuclear power plant Krsko is equally divided between Slovenia and Croatia. Half of its production is delivered to Croatia in accordance with the international agreement (the figures and tables consider 100% of its NGC).

UA_W – Ukraine West
Comment for NGC Fossil Fuels and NGC Hydraulic: including auxiliaries.

3.3.4. Unavailable capacity & Reliable Available capacity

3.3.4.1. ENTSO-E overview

Unavailable Capacity (UC) refers to the part of the NGC that was not available to power plant operators due to limitations of the output of power plants. It consists of non-usable capacity, maintenance and overhauls, outages and system services reserve.

Reliable Available Capacity (RAC) in a power system is the difference between NGC and UC. RAC is the element of NGC, which is actually available to cover the load at a reference point.

GW	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	238.1	216.7	233.0	260.7	276.8	272.8	271.2	284.9	279.3	273.5	256.1	228.5
2011	245.2	248.2	265.8	304.7	328.4	324.6	322.1	336.8	341.1	323.3	307.9	270.6
2012	281.7	285.7	320.5	332.9	366.7	377.3	371.6	379.4	375.1	360.1	337.2	329.0

Table 3.3.4.1.1: UC evolution

Figure 3.3.4.1.1 gives an overview of the structure of UC in 2012. As in past years, most UC was non-usable capacity representing reductions of NGC due to different reasons. Foremost among these reasons are the limited availability of the primary energy source (especially in cases of hydro, wind and solar power plants) and other temporary constraints like mothballing of units, heat extraction for co-generation (CHP) and test operation. In addition to non-usable capacity, a minor part of UC was made up of maintenance and overhauls, system services reserve and outages.

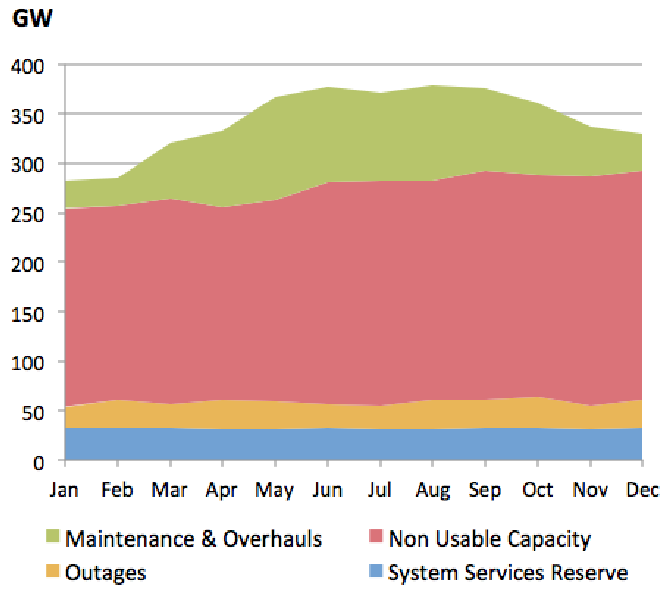

Figure 3.3.4.1.1: UC overview 2012

The last two years were characterised by a heavy increase in the annual average level of UC due to the structure of new capacity additions and temporary decommissioning of power plants. A monthly relative comparison of the last three years' UC and NGC data can be seen in Figure 3.3.4.1.2. In 2012, monthly percentages of UC clearly exceeded the values calculated for 2010 and 2011, peaking in the summer months.

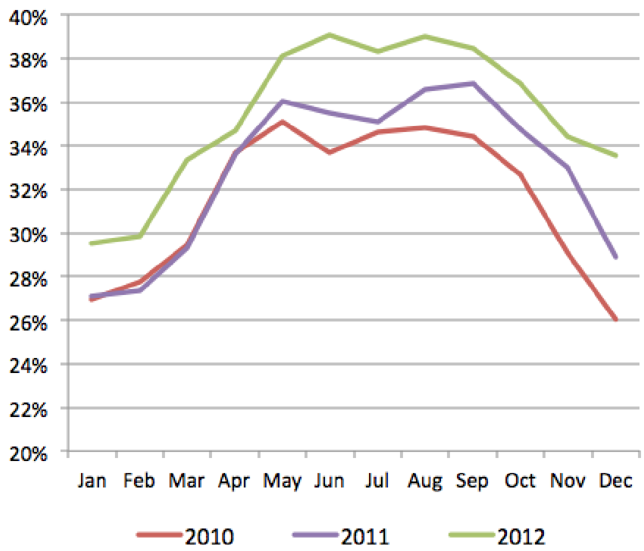

Figure 3.3.4.1.2: UC as a part of NGC evolution

Figure 3.3.4.1.3 presents the RAC as a part of NGC in absolute values for 2012. At ENTSO-E level, the monthly RAC decreased below 600 GW of power from May to September, which is complementary to the maximum UC values reported in summer months. The yearly minimum RAC at 587 GW was in June.

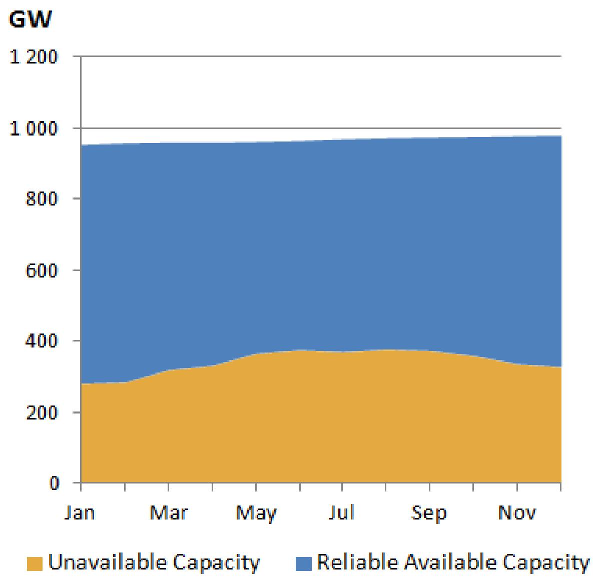

Figure 3.3.4.1.3: RAC vs UC as a part of NGC in 2012

Figure 3.3.4.1.4 shows the share of RAC as a part of NGC in 2010, 2011 and 2012. In parallel with the relative increase of UC experienced in recent years, the monthly share of RAC as a part of NGC was lower in each month in 2012 than in the previous two years, with the exception of April.

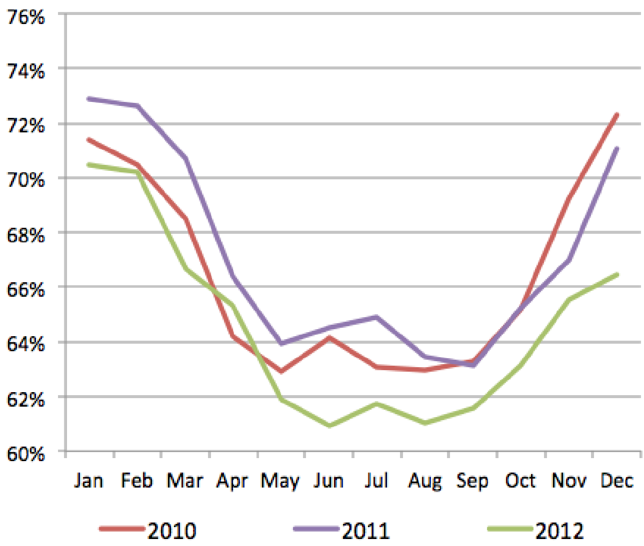

Figure 3.3.4.1.4: RAC as a part of NGC evolution

3.3.4.2. Non-usable capacity

Non-usable capacity represents the aggregated reductions of NGC due to several causes:

- Decisions taken by relevant authorities and power plant operators, e.g. test operation, mothballing of units until a possible re-commissioning or final shutdown.
- Unintentional temporary limitations due to various reasons, e.g. the availability of primary energy sources, fuel management constraints, heat supply or environmental and ambient limitations.

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Figure 3.3.4.2.1 compares the monthly evolution of non-usable capacity as a part of NGC in the past three years. Unlike the previous years, the share of non-usable capacity remained high at the end 2012, resulting in a different shape. As mentioned before, the structure of new capacity additions and withdrawals has a significant influence on the increasing relative share of non-usable capacity. While all monthly values remained under 20% in 2010, the second half of 2012 was characterized by a clearly higher, almost constant level of non-usable capacity, reaching 23% or slightly above.

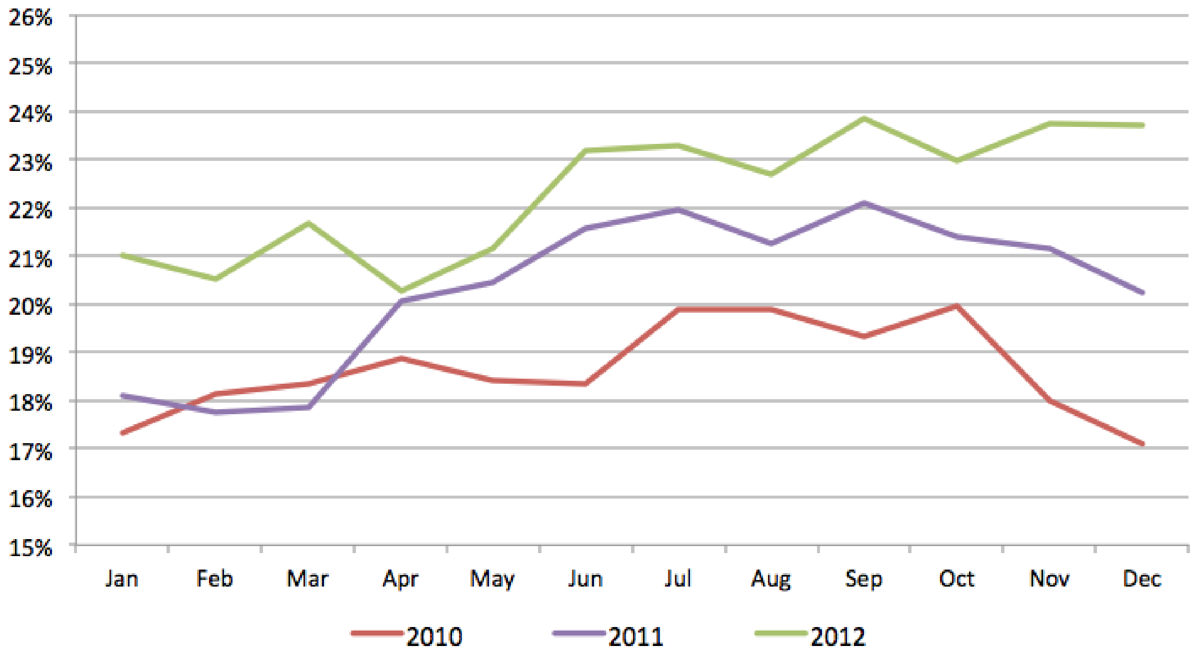

Figure 3.3.4.2.1: Non-usable capacity as a part of NGC evolution

3.3.4.3. System services reserve

System services reserve is required to maintain the security of supply according to the operation rules of each TSO. It is necessary for the compensation of real time imbalances and also for voltage and frequency control. System services reserve consists of the primary control reserve, the secondary control reserve and a part of the tertiary control reserve available for activation within one hour, excluding longer-term tertiary reserves.

Figure 3.4.4.3.1 shows the system services reserve as part of NGC in the past three years. There has been a slight decrease in monthly values since 2010, but no significant difference can be observed between 2011 and 2012.

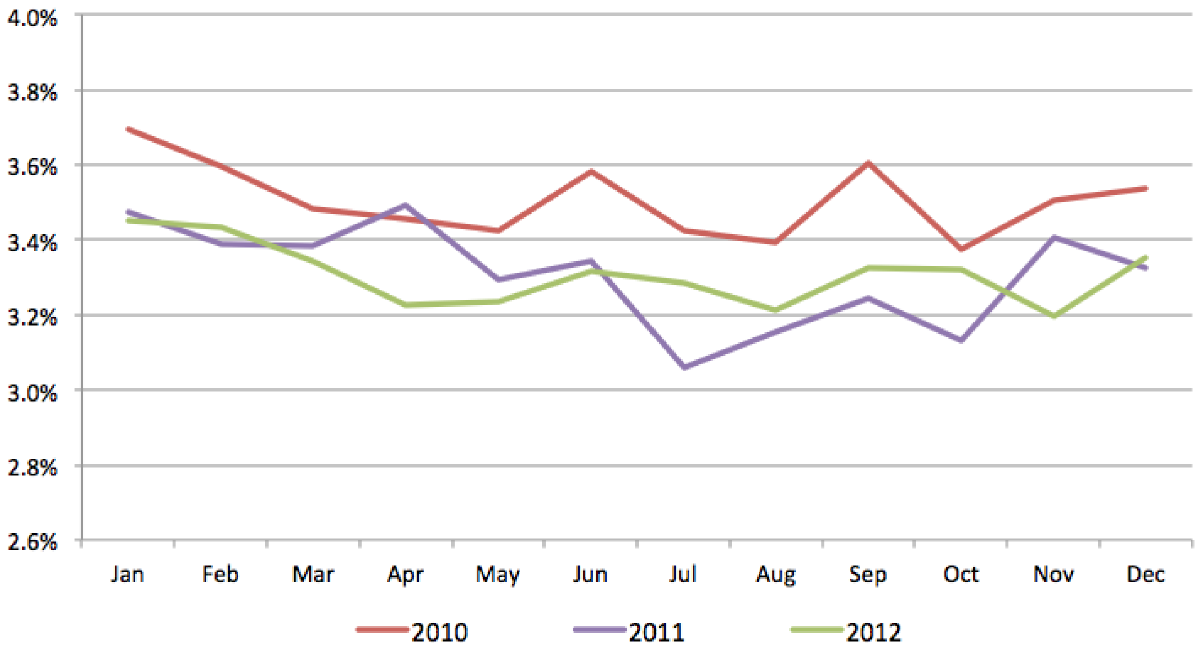

Figure 3.4.4.3.1: System services reserve as a part of NGC evolution

Beyond non-usable capacity and system services reserve, two other subcategories are also included in UC. The maintenance and overhauls subcategory aggregates the scheduled unavailability of net generating capacity for regular inspections and maintenance. In outages, the forced (i.e. not scheduled) unavailability of generating capacity is aggregated. In 2012, UC due to maintenance and overhauls was between 3% and 11% of the NGC (lower share in the winter months, higher share in the summer months), while outages amounted to approximately 3% of NGC, remaining more stable at the reference points.

3.3.4.4. National comments on UC and RAC

PL – Poland

System services reserve contents of primary and secondary reserves as well as interventional reserves in pump storage hydro power.

3.3.5. Remaining capacity & Remaining margin

3.3.5.1. Basic information

The remaining capacity (RC) is the part of the net generation capacity (NGC) left in the system after the load at the reference point has been covered. The RC of a power system is the difference between the Reliably Available Capacity (RAC) and the load.

As reference points for the Adequacy Retrospect are the 3rd Wednesdays of every month, to extend the results from a unique reference point to a whole month the Margin Against Monthly Peak Load (MaMPL) is introduced. It is calculated as the difference in power between the maximum peak load metering over the month and the load at the reference point in this month.

The Remaining Margin (RM) in a power system is the difference between the RC and the MaMPL. It is the part of the NGC that has not been used to cover the monthly peak load. On the other hand, the negative margin shows the situation that could happen if the monthly peak load occurs at a reference point, meaning that the system would not be balanced due to lack of RAC (or an excess of Unavailable Capacity).

3.3.5.2. ENTSO-E overview

A general overview of the structure of NGC, as the sum of RC, UC and load is shown in Figure 3.3.5.2.1. Compared to 2011's reference points, RC in 2012 oscillated between 11% in December and 21% in August (see Table 3.3.5.2.1). When looking at RC as part of NGC (in Figure 3.3.5.2.2), the remaining capacity was only higher than the previous year between August and November. Nevertheless, the minimum monthly RC corresponded to 17.4% of the NGC (in February).

GW	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	136.8	128.8	157.2	157.4	149.5	164.3	149.0	181.5	160.5	149.6	164.1	137.3
2011	168.1	169.7	189.8	191.6	176.8	181.0	188.8	201.8	175.7	176.8	166.4	191.4
2012	170.8	164.5	200.7	181.6	180.2	168.5	189.5	245.0	189.0	192.1	185.1	170.7

Table 3.4.5.1.1 RC evolution

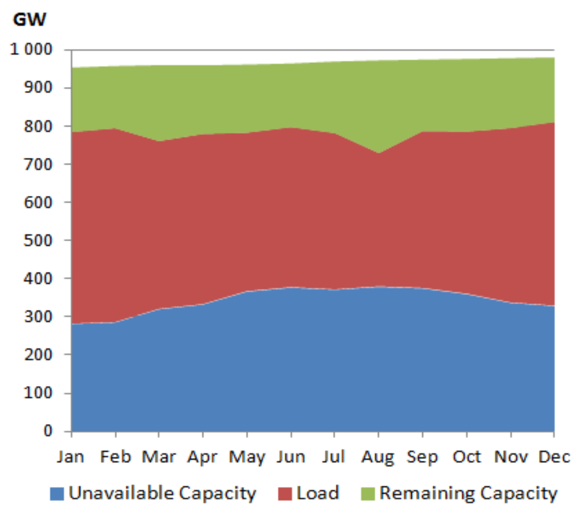

Figure 3.3.5.2.1: RC overview in 2012

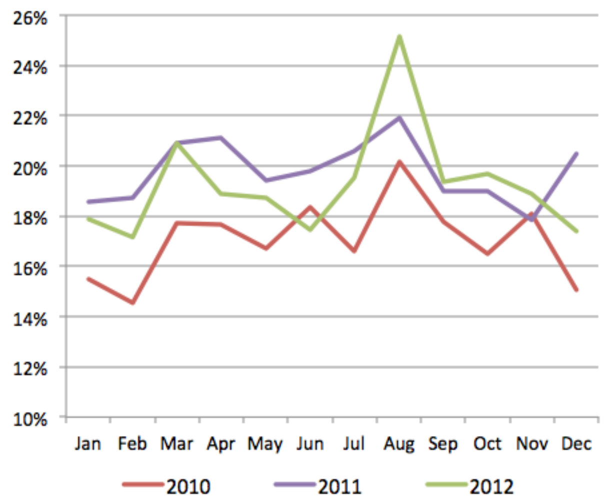

Figure 3.3.5.2.2: RC as a part of NGC evolution

Throughout the year 2012 the total ENTSO-E RM was always positive and higher than 100 GW and 10% of NGC. This means that the ENTSO-E system as such did not rely on imports of electricity from neighbouring countries and had enough generating capacity to cover its demand at any time during the year. These values were generally not very different from what has been observed in recent years (2010 and 2011). In 2011 the lowest monthly RM was higher than 110 GW (12% of NGC). The following table and figures show this based on the aggregated values of the different countries. On the other hand, some countries reported a negative RM. More details are presented in the excel attachment "YS&AR 2012 table no.1", sheet "Power".

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GW	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
RC	170.8	164.5	200.7	181.6	180.2	168.5	189.5	245.0	189.0	192.1	185.1	170.7
MAMPL	41.3	64.0	61.8	29.9	35.9	40.3	49.4	101.6	46.6	61.8	59.1	66.0
RM	129.6	100.4	138.9	151.7	144.3	128.2	140.1	143.4	142.4	130.3	125.9	104.8

Table 3.3.5.2.2: RM overview in 2012

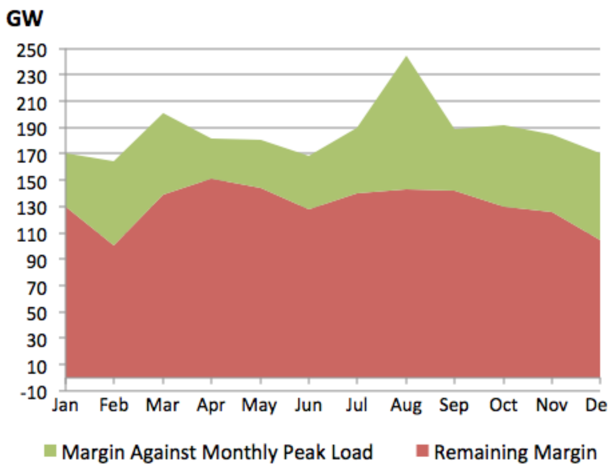

Figure 3.3.5.2.3: RM and MAMPL overview 2012

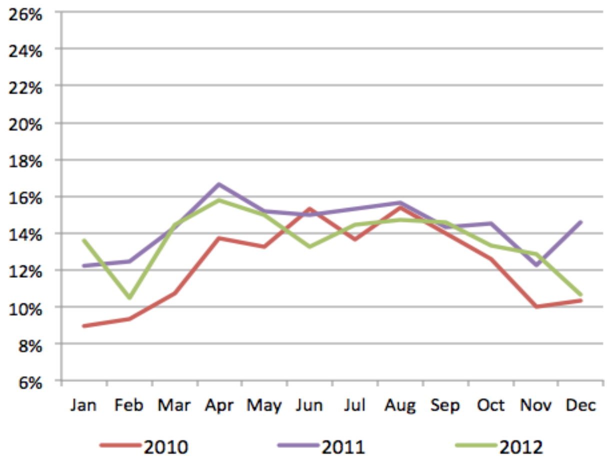

Figure 3.3.5.2.4: RM as a part of NGC evolution

3.3.5.3. National RC

In the majority of ENTSO-E countries the RC was positive during the whole year (without considering the influence of exchanges). Only Finland and Hungary reported negative RC. For Finland, three reference points (July to September) were reported and for Hungary two reference points (May and June) were reported. This situation is shown on Map 3.3.5.3.1, which highlights the countries with a number of reference points and with a negative RC.

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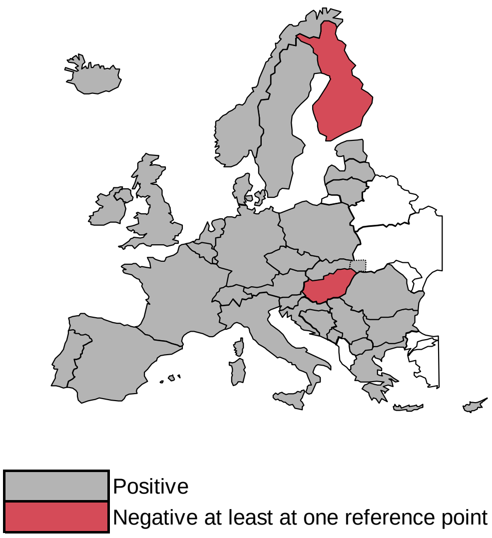
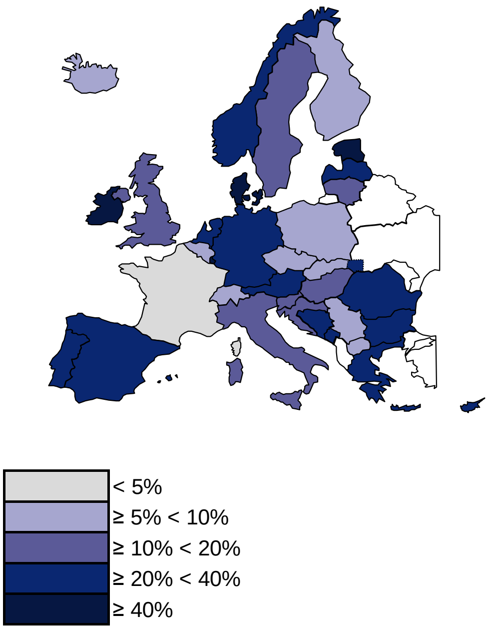


Map 3.3.5.3.1: Reference points with negative RC in 2012 (without exchanges)

When looking at RC with exchanges, all countries were balanced (RC + exchanges was positive), including Finland and Hungary, where import took place for reference points and RC was negative.

Map 3.3.5.3.2 presents RC as a part of NGC per country in February's reference point, since in February 2012 this parameter is the lowest for the whole ENTSO-E. Denmark, Estonia, Ireland and Luxemburg were the countries with the highest declared RC as part of NGC, reporting more than 40%. On the contrary, France was the only country with an RC/NGC ratio lower than 5%. Most countries (86%) presented values between 5% and 40%.



Map 3.3.5.3.2: RC as a part of NGC in February 2012 per country

3.3.5.4. National comments on RC and RM

CY – Cyprus

Comment for remaining margin:

- January: Due to the destruction of the Vasilikos Power Station the systems services reserve is the available capacity of the largest generator plus 30 MW.
- June: Due to the destruction of the Vasilikos Power Station the remaining margin cannot be maintained at positive values.
- October: Due to the destruction of the Vasilikos Power Station the remaining margin cannot be maintained at positive values.

PT – Portugal

The average remaining capacity was 28% of the NGC, with a minimum of about 19% in July.

4. List of appendices

Excel attachment "YS&AR 2012 table no. 1 - operational data 2012"

1. Table of Contents
2. Energy (Yearly Energy balance)
3. Generation (ENTSO-E monthly energy generation based on Monthly Statistics data)
4. Flows (Harmonized flows based on Monthly Statistics data)
5. NGC (Net generating capacity as of 31st December)
6. Power Balance (Power balance on 3rd Wednesday every month)
7. Hourly load (Maximum and minimum yearly hourly load based on Monthly Statistics data)
8. Peak load (Maximum instantaneous peak load)
9. Thermal (Inventory of thermal power units as of 31st December)
10. Hydro (Inventory of hydro power units as of 31st December)
11. Transformers (Inventory of transformers as of 31st December)
12. Lines (Inventory of lines (including DC cables) as of 31st December)
13. Circuits (Number of circuit lines as of 31 December)
14. Tie lines table (Characteristics of the ENTSO-E tie lines as of the 31st December)
15. Tie lines comments (Comments to characteristics of the ENTSO-E tie lines)
16. Cables (Characteristics of the ENTSO-E tie lines as of the 31st December – of which cables)
17. Unavailability (Unavailability of international tie lines based on Monthly Statistics data)
18. Abbreviation (Abbreviation of the companies)

Excel attachment "YS&AR 2012 table no. 2 – country operational data 2012, 2011"

1. General remark
2. Sum of ENTSO-E
3. *Country data*

Excel attachment "YS&AR 2012 table no. 3 – monthly harmonised flows per border 2012, 2011, 2007"

1. General remark
2. Yearly flows - matrix
3. Monthly flows 2012 - graph
4. *Country data*

PDF attachment "Tie lines - simplified diagram of the cross-frontier transmission lines"

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5. Glossary

Auxiliaries	See "Generation Auxiliaries"
Cable	An underground or a submarine set of conductors, insulators and other equipment for conveying electrical energy between two points of a network.
Capacity	Capacity is the rated continuous load-carrying ability of generation, transmission, or other electrical equipment, expressed in megawatts (MW) for active power or megavolt-amperes (MVA) for apparent power.
Circuit Length	The circuit length of an electrical line or cable is the actual length of each of its conductors or the mean of the lengths of the conductors, if there is any appreciable difference in their lengths.
Consumption	See Load and relations to consumption in the following document: https:www.entsoe.eu/fileadmin/user_upload/_library/publications/ce/ Load_and_Consumption_Data.pdf
Consumption of Pumps	The electrical energy absorbed by the motor pumps in raising the water into the upper reservoir for the generation of electrical energy. It should include the electrical energy consumed by the auxiliary equipment and transformer losses during pumping.
Conventional Transmission Capacity	A theoretical value based on parameters standardised within ENTSO-E (continental Europe) for calculation of the thermal load capacity of each Tie Line. These are: ambient temperature of +35ºC, wind velocity of 0.56 m/s at a right angle to the line, as well as the voltage of the line.
Daily Average Temperature	The daily average temperature of the selected date is collected.
Deviation from normal average temperature	The difference between the daily average temperature and the typical average temperature for the calendar day of the selected date of instantaneous peak load or instantaneous historical peak load
Exchange Balance	The difference between the import and export physical flows on each interconnection line of a country.
Generation Adequacy	An assessment of the ability of the generation on the power system to match the Load on the power system (see also Methodology section in Chapter 3).
Generation Auxiliaries	The electrical energy absorbed by generating auxiliaries is the sum of the auxiliary power consumption for all generator sets under consideration during both the on-load and off-loads periods of the generator sets. Thus, it includes the consumption needed to support the operation of the power plant.
Gross Generation	It is the sum of the electrical energy production by all the generating sets concerned, measured at the output terminals of the main generator.

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Historic instantaneous Peak Load	The power value of the highest instantaneous peak load before or for for analysed year
Hydro (Hydraulic)	Electricity derived from the potential and kinetic energy content of water. It can be classified as: Storage Hydro, Run of River, Pure Pumped Storage and Mixed Pumped Storage.
Instantaneous Peak Load	Peak load is the maximum instantaneous power value.
Interconnection	An interconnection is a transmission link (e.g. tie-line or transformer), which connects two Control areas.
Load	Load on a power system is the net consumption corresponding to the hourly average active power absorbed by all installations connected to the transmission grid or to the distribution grid, excluding the pumps of the pumped-storage stations. "Net" means that the consumption of power plants' auxiliaries is excluded from the Load, but network losses are included in the Load.
Maintenance and Overhauls	This category aggregates scheduled unavailability of generating capacity for regular inspection and maintenance.
Margin Against Monthly Peak Load	Margin Against Monthly Peak Load is the difference between load at the reference point and the peak load over the month.
National electrical consumption	National net electrical consumption plus network losses.
Net Generating Capacity	Net Generating Capacity (NGC) of a power station is the maximum electrical net active power it can produce continuously throughout a long period of operation in normal conditions, where: - "net" means the difference between, on the one hand, the gross generating capacity of the alternator(s) and, on the other hand, the auxiliary equipments' load and the losses in the main transformers of the power station; - for thermal plants "normal conditions" means average external conditions (weather, climate...) and full availability of fuels; - for hydro and wind units, "normal conditions" refer to the usual maximum availability of primary energies, i.e. optimum water or wind conditions. Net Generating Capacity of a country is the sum of the individual Net Generating Capacity of all power stations connected to either the transmission grid or to the distribution grid.
Net Generation	It is the Gross Generation loss the electrical energy absorbed by Generating Auxiliaries and the losses in the main generator transformers.
Non-Usable Capacity	Aggregates reductions of the net generating capacities due to the following causes: Temporary limitation due to constraints, like power stations in mothball or test operation, heat extraction for CHP's; Limitation due to fuel constraints management; Limitation reflecting the average availability of the primary energy source; Power stations with output power limitation due to environmental and ambient constraints; Etc.

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Not Clearly Identifiable Sources	Not Clearly Identifiable Sources comprise Power Plants or Power Units, which, according to the primary energy used, cannot be categorised.
Nuclear	Electricity generated by the use of thermal energy released from the fission of nuclear fuel in a reactor.
Other Renewable Energy Sources	In the ENTSO-E statistics, this category comprises all Renewable Energy Sources except total Hydro production.
Outages	This category aggregates forced – i.e. not scheduled – unavailability of generating capacity.
Peak Load	The maximum hourly demand during a period of time: day, month or year.
Physical Energy flows	It represents the real movements of energy between neighbouring countries metered in cross- border Tie Lines in both directions, in the system and out of the system.
Physical imports and exports	Physical imports and exports are metered at the exact border or at a virtual metering point estimated from the actual one(s).
Power unit	Equipment (a machine set) generating electricity, which generally consists of a few technological parts. For purposes of the UCTE, a power unit means: 1) One AC generator in case of a thermal or a nuclear unit; 2) One Head Installation in case of a hydro unit; 3) One wind farm in case of a wind unit. See also: Power Plant.
Pumped Storage	A hydro unit in which water can be raised by means of pumps and stored, to be used later for the generation of electrical energy. It can be classified as: Pure Pumped Storage and Mixed Pumped Storage.
Pumping	See "Consumption of Pumps"
Reference Points	The dates and times for which power data are collected. Reference points are characteristic enough of the entire period studied to limit the data to be collected to the data at the reference points.
Reliably Available Capacity	Reliably Available Capacity on a power system is the difference between Net Generating Capacity and Unavailable Capacity. Reliably Available Capacity is the part of Net Generating Capacity actually available in the power system to cover the load at a respective Reference Point.
Remaining capacity	The RC on a power system is the difference between the Reliably Available Capacity and the Load. The RC is the part of the Net Generation Capacity left on the system to cover any unexpected load variation and unplanned outages at a reference point.
Renewable Energy Sources (Renewables)	It means renewable non-fossil energy sources (wind, solar, geothermal, wave, tidal, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases).
Representativity (National Representativity Index)	This is a specific ENTSO-E term, which generally means that certain values might not cover the whole country. It is expressed as a percentage. There might be differences between the approaches of the ENTSO-E statistics and System Adequacy reports.

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Run-of-river	A hydro unit at which the head installation uses the cumulative flow continuously and normally operates on base load.
Substation	Facility equipment that steps up or steps down the voltage in utility power lines. Voltage is stepped up where power is sent through long distance transmission lines, and stepped down where the power is to enter local distribution lines. They can be classified as normal outside substation, armoured substation and underground substation.
Tie-line	A transmission line connecting two countries.
Transmission capacity	The transmission capacity, also called TTC (Total Transfer Capacity), is the maximum transmission of active power in accordance with the system security criteria, which is permitted in transmission cross-sections between the subsystems/areas or individual installations.
Transmission Losses	The difference between the fed-in (generation) and the delivery energy to distributors. Own needs for the operation of the grid are included.
Transmission System Operator (TSO)	A company that is responsible for operating, maintaining and developing the transmission system for a control area and its interconnections.
Unavailable Capacity	The sum of: - System Services Reserve - Maintenance and Overhauls - Outages - Non-usable Capacity

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