entsoe

European Network of
Transmission System Operators
for Electricity

SYSTEM ADEQUACY RETROSPECT 2011

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1. GENERAL INTRODUCTION

I. ABOUT ENTSO-E

ENTSO-E is a pan-European association with 41 members – 41 Transmission System Operators (TSOs) from 34 countries. It is an association which follows six predecessors and which continues to successfully help coordinate the work of TSOs[1]. Within ENTSO-E, the different committees, working groups and task forces have transferred their work into the new ENTSO-E structure where the well-established work will continue but will also be enhanced through the new pan-European perspective of ENTSO-E.

The main purpose of ENTSO-E is:

- to pursue the cooperation of the European TSOs both on the pan-European and the regional level
- to promote the TSOs' interests
- to play an active and important role in the European rule-setting process in compliance with EU legislation.

The main objective of ENTSO-E is to promote the reliable operation, optimal management and sound technical evolution of the European electricity transmission system in order to ensure security of supply and to meet the needs of the internal energy market. ENTSO-E activities include:

- Coordinating the development of an economic, secure and environmentally sustainable transmission system. The emphasis lies with the coordination of cross-border investments and meeting the European security and quality of supply requirements, while the implementation of investments lies with the TSOs
- Developing technical codes for the interoperability and coordination of system operation in order to maintain the reliability of the power system and to use the existing resources efficiently
- Developing network-related market codes in order to ensure non-discriminatory access to the grid and to facilitate consistent European electricity market integration
- Monitoring and, where applicable, enforcing compliance with the implementation of the codes
- Monitoring network development, promoting research and development (R&D) activities relevant to the TSO industry, and promoting public acceptance of the transmission infrastructure
- Taking positions on issues which can have an impact on the development and operation of the transmission system or market facilitation
- Enhancing communication and consultation with stakeholders as well as the transparency of TSO operations.

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[1] ATSOI (Association of the Transmission System Operators of Ireland); BALTSO (Baltic Transmission System Operators); ETSO (European Transmission System Operators); NORDEL (Association of TSOs from Norway, Finland, Denmark and Sweden); UCTE (Union for the Coordination of the Transmission of Electricity); UKTSOA (UK Transmission System Operators Association)

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II.ABOUT THE SYSTEM ADEQUACY RETROSPECT REPORT

This ENTSO-E System Adequacy Retrospect 2011 report aims to provide stakeholders in the European electrical market with an overview of generation and demand, and their adequacy in the ENTSO-E Power System in 2011 with a focus on the power balance, margins and generation mix.

This System Adequacy Retrospect 2011 analysis can serve as a tool with which to monitor processes performed by ENTSO-E members as an input into the forecast analysis of system adequacy[2].

III. BRIEF DETAILS ABOUT THE REPORT'S BACKGROUND

This year´s System Adequacy Retrospect (herein referred to only as 'SAR 2011') report has been prepared based on data collected from each ENTSO-E country. Compared to the previous year, when data sets had been provided in full by every national data correspondent, in SAR 2011 data for some ENTSO-E countries were missing, either due to late response by the respective national data correspondents, or due to no data submission at all. In such cases, SAR 2010 data have been used, e.g. all data for Montenegro, power data for Croatia, peak load data for Ukraine West. Taking into account that the missing data correspond to a few countries with small contribution to the total quantities in the ENTSO-E level, it is estimated that the assessment of the aggregated figures and charts is not affected and that the general impression and conclusions coincide with the actual situation. The reader should bear this fact in mind whilst reading the report.

Although this report focuses on 2011, it is also very interesting to compare the outcomes for 2011 with the results from previous years (the two previous years at least). While processing this SAR 2011, the aim was also to provide readers with this kind of comparative assessment. The incomplete databases of 2008 and 2009, which had influenced the evaluation and the assessment process for SAR 2010, have a minor effect on the comparisons described in SAR 2011. Therefore, the reader should also bear this fact in mind whilst reading the report.

[2] The ENTSO-E System Adequacy Forecast 2011–2025 is available on the ENTSO-E website: https://www.entsoe.eu/system-development/soaf-2011-2025/

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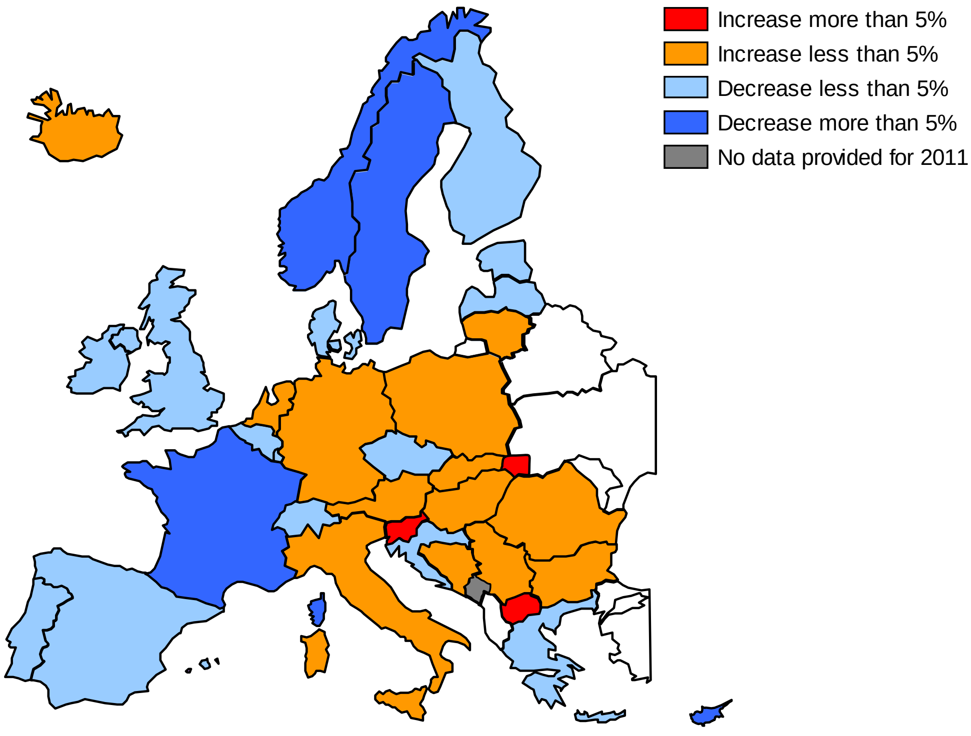
2. EXECUTIVE SUMMARY

ENERGY BALANCE

TWh	2010	2011	Difference between 2011 and 2010	
			Absolute value	%
Total Generation	**3 399,8**	**3 358,5**	**-41,4**	**-1,2**
Fossil Fuels	1 653,0	1 628,4	-24,7	-1,5
Nuclear Power	895,4	886,3	-9,1	-1,0
Total Non-renewable Hydro Power	140,3	82,3	-58,0	-41,3%
Renewable Energy (incl. renewable Hydro)	700,3	750,7	50,4	7,2%
Not identifiable energy sources	10,8	10,8	0,0	-0,1
Imports	391,4	400,2	8,8	2,2
Exports	385,7	395,1	9,4	2,4
Exchanges Balance	**5,7**	**5,0**	**-0,6**	**-11,1**
Pumping	45,6	43,8	-1,8	-3,9
Consumption	**3 360,3**	**3 319,7**	**-40,6**	**-1,2%**

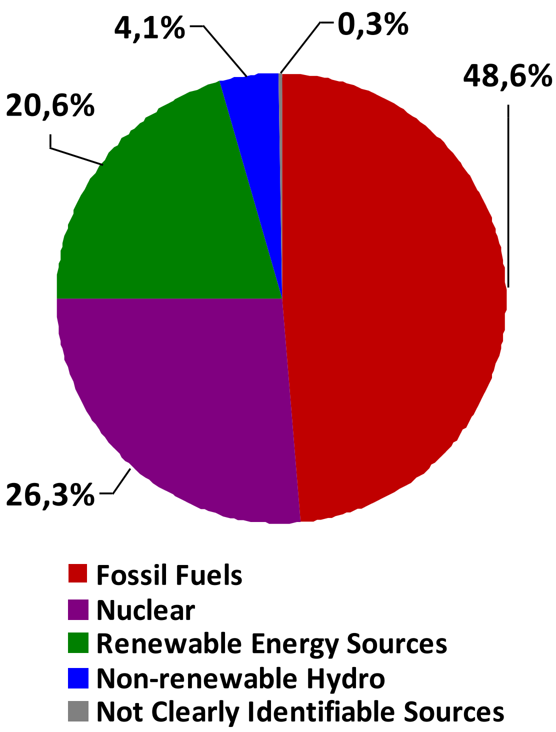
ENTSO-E Energy Summary

Contrary to the consumption increase from 2009 to 2010, the milder winter periods at the beginning and end of 2011 led to a decrease of the consumption reported by almost every country.

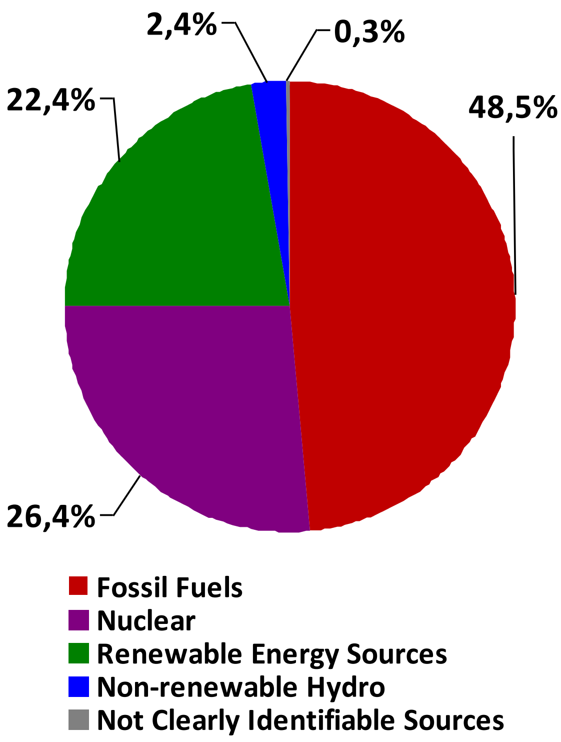


Consumption growth per country in 2011

The total ENTSO-E consumption in 2011 was over 40 TWh lower (1,2% decrease) than in 2010. The same also held for the total ENTSO-E generation, which was approximately 41 TWh lower in 2011 than in 2010 (1.2% decrease). All fuel generation categories diminished their production, with the exception of renewable energy sources (RES). Generally speaking, the share of energy sources in total ENTSO-E generation remained at the same level, which meant that the influence of German nuclear shut down in 2011 on generation structure was negligible.

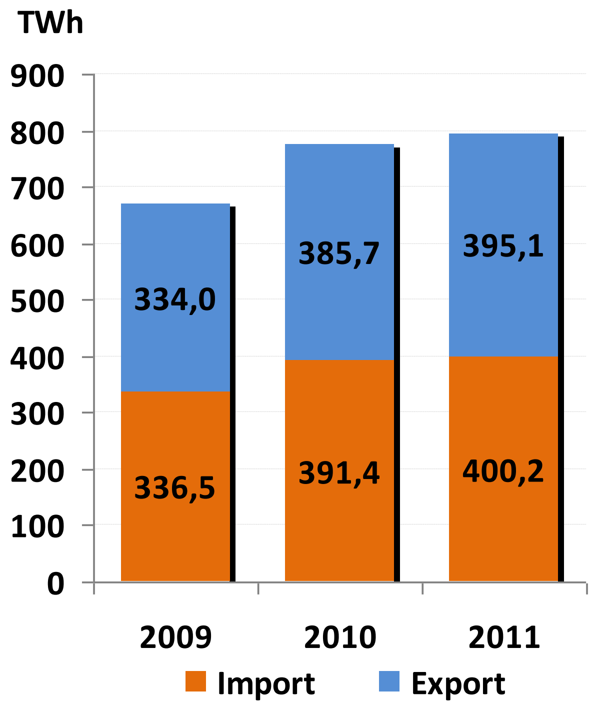


ENTSO-E generation mix in 2010

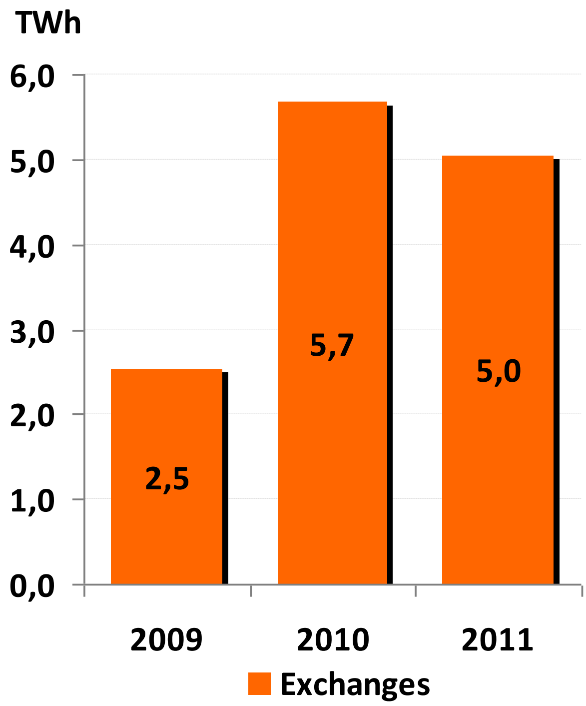


ENTSO-E generation mix in 2011

Most of the energy (48.5%) was produced by fossil fuel power plants (coal, oil, etc.). The second most used fuel was nuclear (26.4%), followed by renewable energy sources (22.4%). Non-renewable hydro power generation covered 2.4% of the total generation, with the rest being provided by a category covering energy sources which are not clearly identifiable (0.3%).



ENTSO-E Imports/Exports Summary



ENTSO-E Exchanges Balance Summary

ENTSO-E was a net[3] importing system in 2011. The net energy physical flows (imports minus exports) of the whole ENTSO-E system were beyond 5 TWh. The main net exporting countries were France (57.1 TWh), the Czech Republic (17 TWh) and Bulgaria (10.5 TWh); the main net importers were once more Italy (45.8 TWh) and Finland (13.9 TWh).

POWER BALANCE

GW	2010	2011	Difference between 2010 and 2011	
			Absolute value	%
Net Generating Capacity	**910,7**	**932,6**	**21,9**	**2,4%**
Fossil Fuels	451,3	452,7	1,4	0,3%
Nuclear Power	133,9	125,7	-8,1	-6,1%
Total Non-renewable Hydro Power	66,5	65,4	-1,1	-1,7%
Renewable Energy (incl. renewable Hydro)	253,4	284,4	31,0	12,2%
Not identifiable energy sources	5,7	4,4	-1,3	-22,4%
Reliable Available Capacity	**658,5**	**661,5**	**3,0**	**0,5%**
Imports	40,1	50,7	10,7	26,7%
Exports	40,7	53,2	12,5	30,7%
Load	**521,2**	**473,8**	**-47,5**	**-9,1%**

ENTSO-E Power Balance Summary[4]

[3] „net export"/„net import" means that the difference between imports and exports was in favour of export or import respectively.
[4] The summation of certain subcategories for the whole ENTSO-E area does not necessarily have to be equal to the ENTSO-E summary value of the main category. See section 3.4

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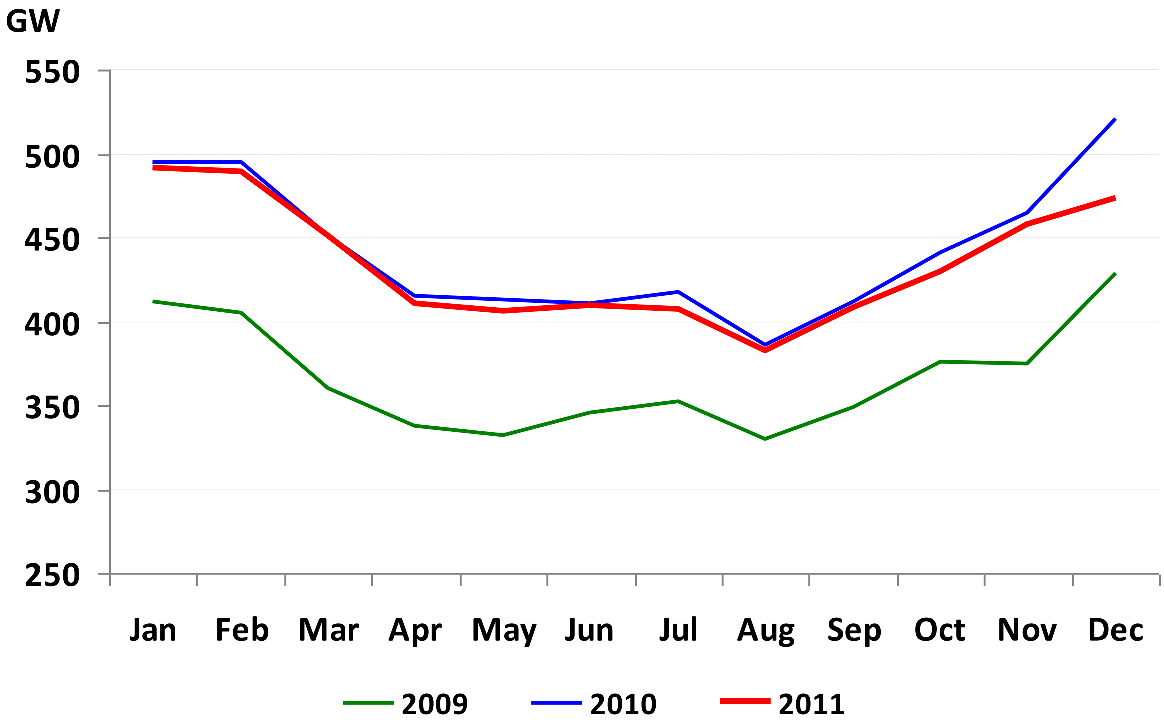
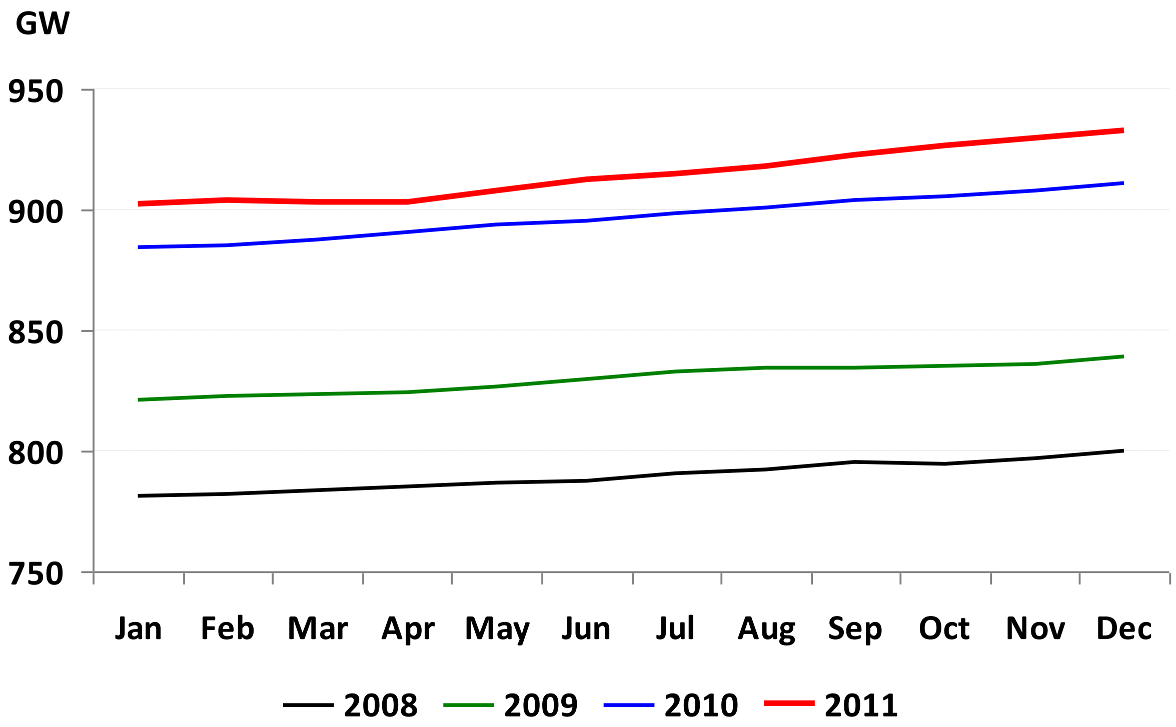
All of the comparisons and assessments made for power balance were conducted for the month of December 2011 (unless otherwise stated). The load of 2011 followed more or less the curves of 2010. December 2010 was a very cold month, with a much higher load than in December 2011.



ENTSO-E Load

Three countries recorded a new absolute historical peak load value in 2011.

In 2011 the net generating capacity (NGC) growth was not as consistent as in the previous year. A more significant decrease is noticeable in March 2011. By the end of the year, an increase in NGC is visible. Crucial for the ENTSO-E generating capacity mix in 2011 were the fossil fuels with 49%, followed by renewable energy sources with 25% (including renewable hydro power plants), nuclear power (almost 14%) and the hydro power plants considered as a non-renewable energy source (approximately 12%).



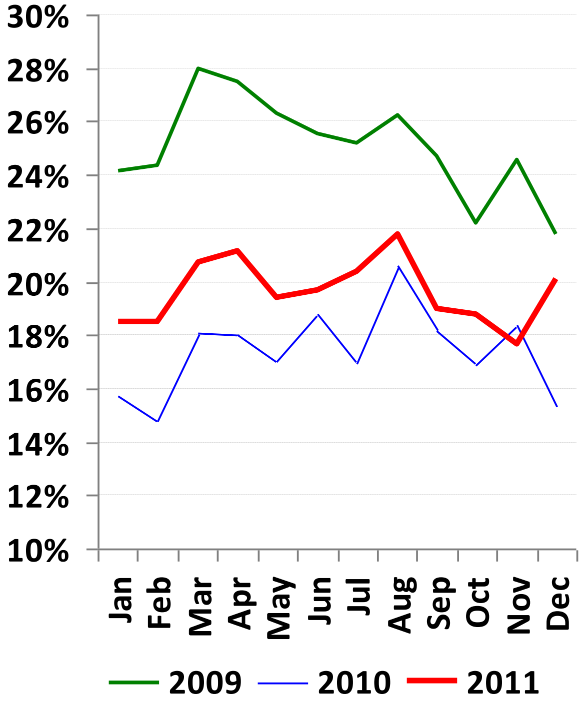
ENTSO-E Net Generating Capacity

The minimum values of reliably available capacity (RAC) in 2011 were reported during the summer period (May, August and September), when unavailable capacity was at the highest level. With regards to absolute values, the RAC in each month of 2011 was slightly higher than in previous years when its share of the NGC was lower (with a few exceptions).

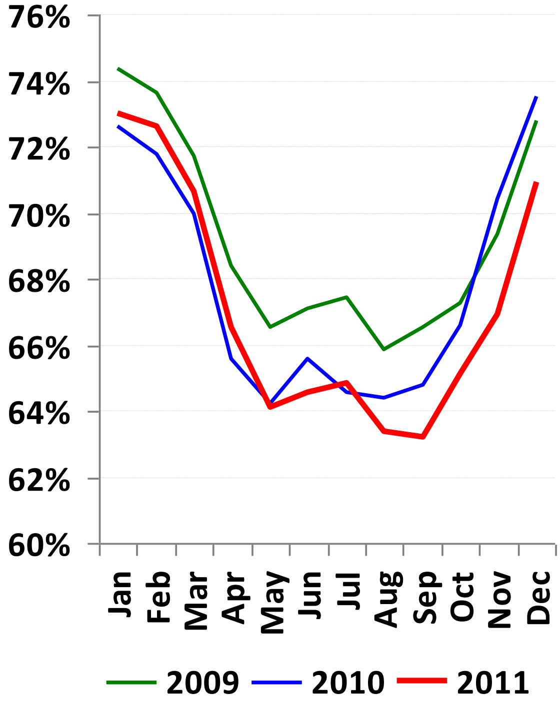
GENERATION ADEQUACY

GW	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	198,3	200,1	230,2	226,7	217,5	212,0	210,1	219,0	206,0	185,5	205,3	182,7
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	167,0	167,5	187,3	190,9	176,3	179,4	186,5	199,8	175,1	173,8	164,0	187,7

ENTSO-E Remaining Capacity Overview

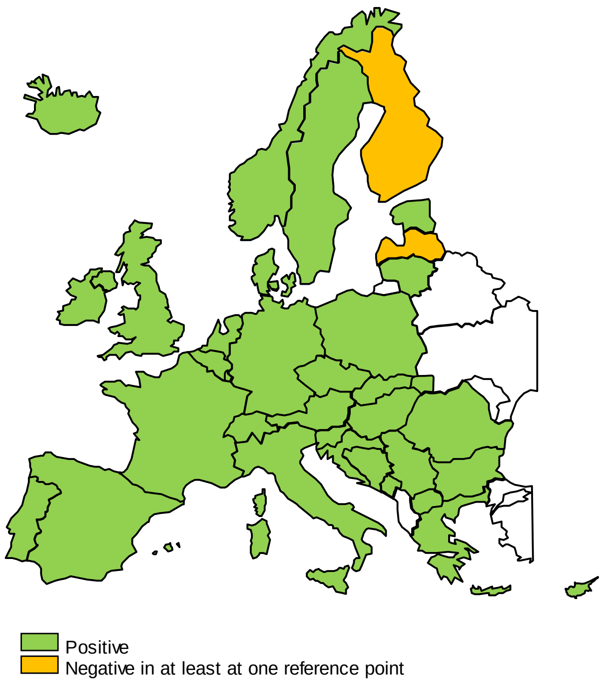


ENTSO-E Remaining Capacity as a part of NGC



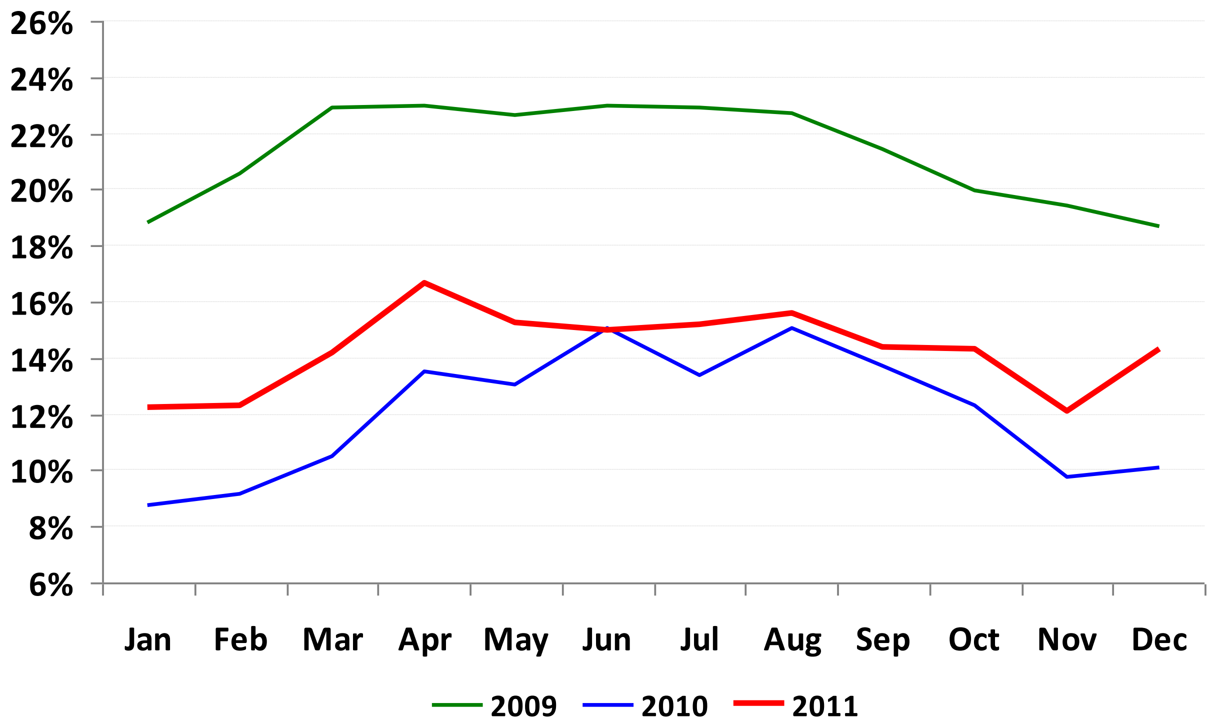
ENTSO-E Reliable Available Capacity as a part of NGC

Compared to 2010, remaining capacity was higher in 2011 with the exception of November. The reasons for this may well be twofold. Since both the unavailable capacities and load were on average lower in 2011 than 2010, the calculated remaining capacity ended up being higher.



Number of reference points with negative RC (without exchanges)

During the whole year of 2011 the remaining margin parameter was positive and higher than 10% of the NGC, that is, the ENTSO-E system did not rely on imports of electricity from neighbouring countries and had enough generating capacity to cover its demand at the reference points.



ENTSO-E Remaining Margin as a part of NGC

3. METHODOLOGY

3.1. SUMMARY

The ENTSO-E SAR report is published at the middle of every year (Y) with a retrospect of the year before the publishing date (Y-1).

The data and the methodology for system adequacy analysis in this System Adequacy Retrospect report are described in more detail in the separate document ***ENTSO-E Methodology for System Adequacy Retrospect*** downloadable on the ENTSO-E website[5].

In this 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 analyzed here mainly through generation adequacy, whereby the generation adequacy of a power system is an assessment of the ability of the generation to match the consumption of the power system. The analyses in this report are made particularly at two levels:

- for the ENTSO-E system as a whole
- for individual countries.

Power data collected for each country are synchronous at each reference point (date and time the power data are collected for) and can thus 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.

Data collected for the hour H are the average value from the hour H-1 to the hour H. A single monthly reference point is defined in the retrospect reports. It is the 3rd Wednesday of each month in the 11th hour (from 10:00 CEST to 11:00 CEST) in summer and (10:00 CET to 11:00 CET) in winter[6].

When possible, power data used in the retrospect power balance are based on hourly average values of the actual metering at every reference point.

[5] https://www.entsoe.eu/dataportal/statistics/docs/ENTSOE_SAR_Data_Collection_Guidelines.pdf
[6] CET**/**CEST – Central European Time**/** Central European Summer Time

3.2. MAIN DEFINITIONS

Load

The load on a power system is the net consumption (i.e. excluding the consumption of power plants´ auxiliaries, but including the network losses) corresponding to the hourly average active power absorbed by all installations connected to the transmission or distribution grid, excluding the pumps of the pumped-storage stations.

Net Generating Capacity (NGC)

The 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. The NGC of a country is the sum of the individual NGC of all power stations connected to either the transmission grid or the distribution grid.

Unavailable Capacity

This is the part of the NGC which is not reliably available to power plant operators due to limitations on the output power of power plants. It consists of the Non-Usable Capacity, Maintenance and Overhauls, Outages and System Services Reserve.

Reliably Available Capacity (RAC)

The RAC on a power system is the difference between the NGC and the Unavailable Capacity. The RAC is the part of the NGC that is actually available to cover the load at a reference point.

Remaining Capacity (RC)

The RC on a power system is the difference between the RAC and the Load. The RC is the part of the NGC left on the system to cover any unexpected load variation and unplanned outages at a reference point.

Margin Against Peak Load

The margin against peak load is the parameter defined as the difference between the load at the reference point and the Peak Load over the period the reference point is representative of.

As reference points in the System Adequacy Retrospect are monthly, the related margin against peak load must also be monthly and is thus called the margin against monthly peak load (MaMPL). It is calculated as the difference between the actual monthly peak load metering and the load at the reference point.

Remaining Margin (RM)

The RM on a power system is the difference between the RC and the MaPL. In SAR reports, the RM is calculated with the MaMPL and with/without Exchanges.

All of the previously mentioned definitions are illustrated in Figure 3.1.

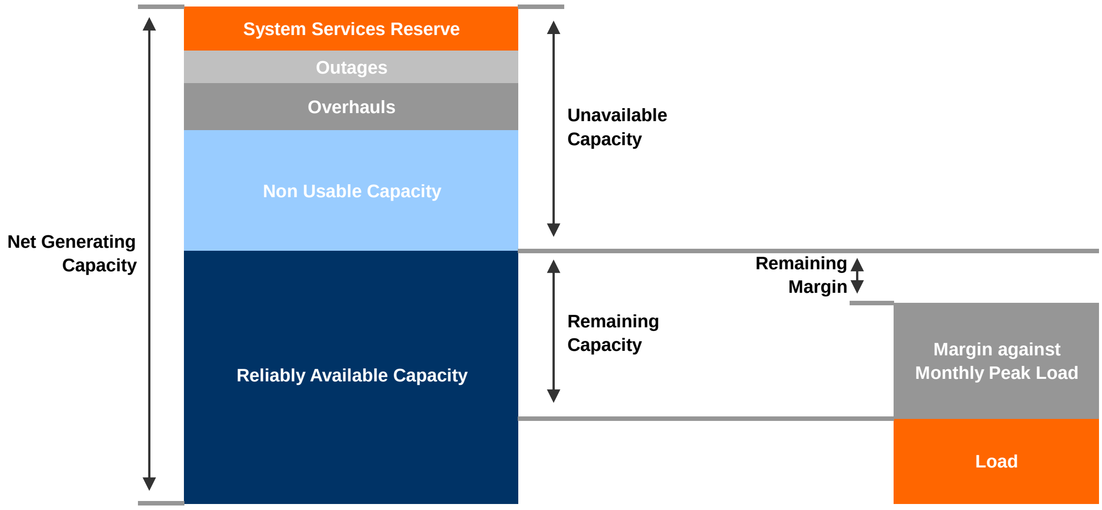


Figure 3.1: Generation adequacy analysis

3.3. ADEQUACY ASSESSMENT

The generation adequacy retrospect in the power system is assessed at the reference points through the remaining capacity value.

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

The comparison of the remaining capacity to an indicative level of 5% of the NGC is a good indicator of the evolution of generation adequacy. Considering the definition of Remaining Margin introduced in Chapter 3.2, the generation adequacy retrospect assessment is then extended monthly.

When the remaining margin without exchanges is positive, it means that 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, it means that the power system may have had to rely on imports to cover its monthly peak load.

3.4. SYSTEM ADEQUACY RETROSPECT DATA

As stated in the general introduction, for this SAR 2011 report, data for some ENTSO-E countries were missing. In such cases, 2010 data have been used, so that there is no gap in the data provided from the point of view of country representativeness.

A separate issue, however, pertains to the availability of some data to the correspondents. If some data were not available to the correspondent (either energy or power data), a new possibility was introduced in the SAR data collection forms; that is, if no data were available for a particular category for the TSO, the option “n.a.” (not available) should have been chosen. Many correspondents used this option for certain categories/subcategories; as a consequence of this, the summation of certain subcategories for the whole ENTSO-E area does not necessarily have to be equal to the ENTSO-E summary value of the main category.

4. ENERGY BALANCE

4.1. ENTSO-E ENERGY DATA SUMMARY

TWh	2010	2011	Difference between 2011 and 2010	
			Absolute value	**%**
Total Generation	**3 399,8**	**3 358,5**	**-41,4**	**-1,2**
Fossil Fuels	1 653,0	1 628,4	-24,7	-1,5
Nuclear Power	895,4	886,3	-9,1	-1,0
Total Non-renewable Hydro Power	140,3	82,3	-58,0	-41,3%
Renewable Energy (incl. renewable Hydro)	700,3	750,7	50,4	7,2%
Not identifiable energy sources	10,8	10,8	0,0	-0,1
Imports	391,4	400,2	8,8	2,2
Exports	385,7	395,1	9,4	2,4
Exchanges Balance	**5,7**	**5,0**	**-0,6**	**-11,1**
Pumping	45,6	43,8	-1,8	-3,9
Consumption	**3 360,3**	**3 319,7**	**-40,6**	**-1,2%**

Table 4.1: ENTSO-E Energy Summary

4.2. ENERGY CONSUMPTION

4.2.1. ENTSO-E OVERVIEW

In previous reports the consumption of electricity was clearly affected by the financial and economic crisis which began at the end of 2008. Its consequences were first visible in 2008, although it affected the 2009 even more. In 2010, the consumption recovered its path of growth not only in many of the ENTSO-E countries, but also on the whole ENTSO-E level. Consumption in 2011 was a little lower than in the year 2010, but still higher than in years 2008 and 2009 (Figure 4.1).

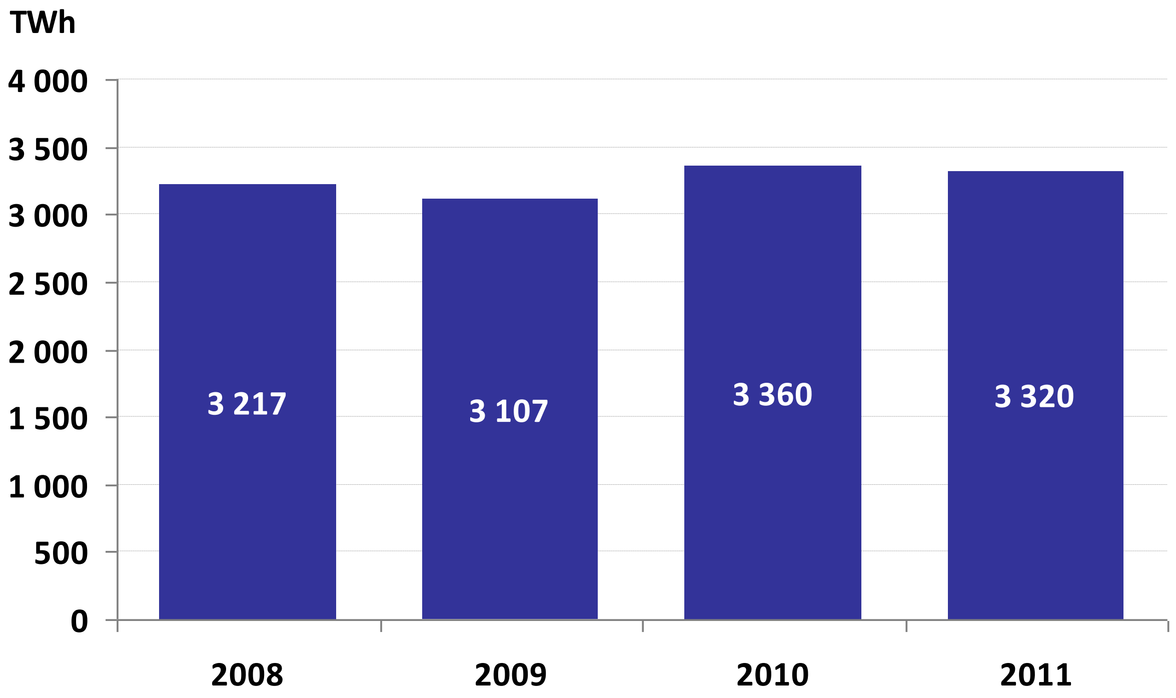


Figure 4.1: ENTSO-E Consumption from 2008 to 2011

The total consumption in ENTSO-E decreased from approximately 3 360 TWh in 2010 to 3 320 TWh in 2011, which corresponds to a reduction of approximately 1.2% (approx. -40.6 TWh) compared to 2010. The surplus in 2010 was around 8%.

The only countries with decreasing consumption of more than 5% were France (-6.8%), Cyprus (-5.6%), Norway (-5.5%) and Sweden (-5.1%). On the other hand, the highest increases were reported by the Former Yugoslavian Republic of Macedonia (11.7%), Slovenia (5.3%), and Ukraine-West (8.7%). In the remaining countries the total consumption increased or decreased by less than 5%.

The situation for the total consumption in 2011 compared to the consumption in 2010 for all of the countries is shown on Map 4.1.

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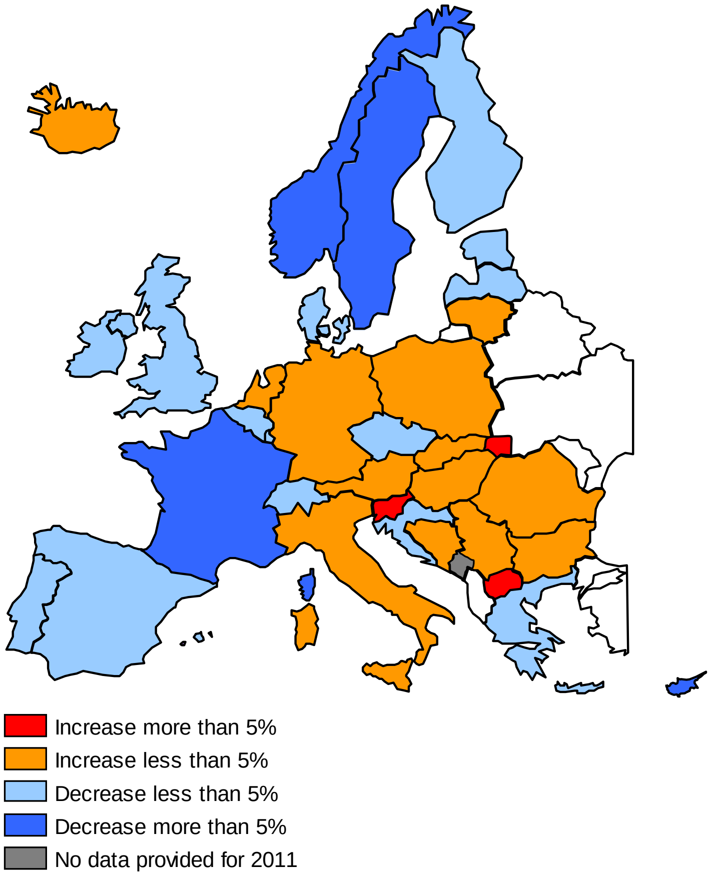

Map 4.1: Consumption growth per country in 2011

The average annual temperatures in most of the ENTSO-E countries in 2011 were higher than in 2010 (see Table 4.2 below). The exceptions were Czech Republic, Bulgaria, Iceland, Romania, the Former Yugoslavian Republic of Macedonia and Cyprus, with lower annual temperatures in 2011. Therefore, this warmer winter period over most of Europe in 2011 could be one of the reasons for the small decrease in the electricity consumption. Average annual temperature in France increased from 11.4 ºC in 2010 to 13.1 ºC in 2011. Consumption in France decreased from 513 TWh to 488 TWh which corresponds to 35 TWh. The total decrease in consumption in ENTSO-E was 40.55 TWh.

Average temperature [°C]	2010	2011	2011 minus 2010
AT	n.a.	n.a.	n.a.
BA	n.a.	n.a.	n.a.
BE	9.7	11,6	1,9
BG	12.4	11,5	-0,9
CH	8.5	10,2	1,7
CY	20.2	19,0	-1,2
CZ	7.2	2,6	-4,6
DE	7.8	n.a.	n.a.
DK	7.0	9,0	2,0
EE	5.0	7,0	2,0
ES	n.a.	16,7	n.a.
FI	n.a.	n.a.	n.a.
FR	11.4	13,1	1,7
GB	8.0	9,6	1,6
GR	18.0	18,0	0,0
HR	14.0	17,0	3,0
HU	10.6	11,5	0,9
IE	8.2	9,7	1,5
IS	5.1	4,6	-0,5
IT	16.3	n.a.	n.a.
LT	6.6	7,7	1,1
LU	8.6	10,6	2,0
LV	5.6	7,3	1,7
ME	16.0	16,0	0,0
MK	12.8	12,6	-0.2
NI	8.2	9,5	1,3
NL	9.1	10,9	1,8
NO	4.7	n.a.	n.a.
PL	7.6	9,1	1,5
PT	17.6	18,0	0,4
RO	9.6	9,2	-0,4
RS	13.0	13,1	0,1
SE	1.9	1,9	0,0
SI	10.7	11,8	1,1
SK	10.3	11,2	0,9
UA_W	8.0	9,0	1,0

Table 4.2: Temperature overview per country (°C)

4.2.2. NATIONAL COMMENTS ON CONSUMPTION

BE – Belgium

The average monthly temperature in 2011 was lower than the corresponding decennial monthly average temperature (2002-2011) for June, July, August and September. Compared to 2010, it was warmer during 2011 during summer as well as during winter. In relation to 2010, consumption during 2011 felt back by 4.2%. During summer this decrease in consumption accounted for 3.3%, during winter consumption declined with 5% compared to 2010.

FI – Finland

February was exceptionally cold, with the monthly average temperature ranging from four to six degrees lower than the long term average. From April until the end of the year the monthly average temperatures were above the long term average. The last two months in particular were exceptionally warm. The difference compared to the long term average was four to five degrees in November and, five to seven degrees in December. The impact of temperature in consumption was estimated to be around -1.0 TWh (-1.2%). It should be remembered that the previous year of 2010 was exceptionally cold and the impact of temperature on consumption was estimated to have been +1.1 TWh (+1.3%) in the opposite direction. Taking this into account, the consumption decreased, but not as much as the actual figures indicate.

FR – France

Demand dropped by 35 TWh in 2011 (-6.8%) to end up at the lowest value since 2003 (478.2 TWh). The main driver of this decrease (90%) were mild weather conditions throughout the year (2010 was the coldest year in twenty years while 2011 was the warmer since 1900) as a direct consequence of the high penetration of electric space heating in France. The fall was emphasized by a structural decrease in the energy sector and the economic downturn at the end of 2011.

IE – Ireland

Compared to 2010, consumption in Ireland decreased by 3.24%. Over the winter months consumption dropped by 5.85% when compared to 2010. The main contributor to the decrease in consumption was the mild winter experienced. Average yearly temperatures increased from 8.2°C in 2010 to 9.7°C in 2011.

PL – Poland

Consumption in 2011 in Poland increased by 1,5% compared with 2010. The growth could be higher if it were not for the fact that December 2011 was very mild – increase from January to November year by year amounted to 2.5%.

PT – Portugal

In 2011, the electricity demand registered the biggest drop in its history, decreasing by 3.2% (2.3% when corrected for the temperature effect and number of working days).

SI – Slovenia

Consumption of electricity on the transmission network in 2011 was 12.6 TWh, which is 5.3 % higher than in 2010.

SK – Slovakia

Tendency of consumption increase continued from 2010 until only the beginning of 2011, whilst in the second quarter the increase stopped and in the second half there was a small decrease. Consumption in 2011 when compared to 2010 was at the level of 100.35%.

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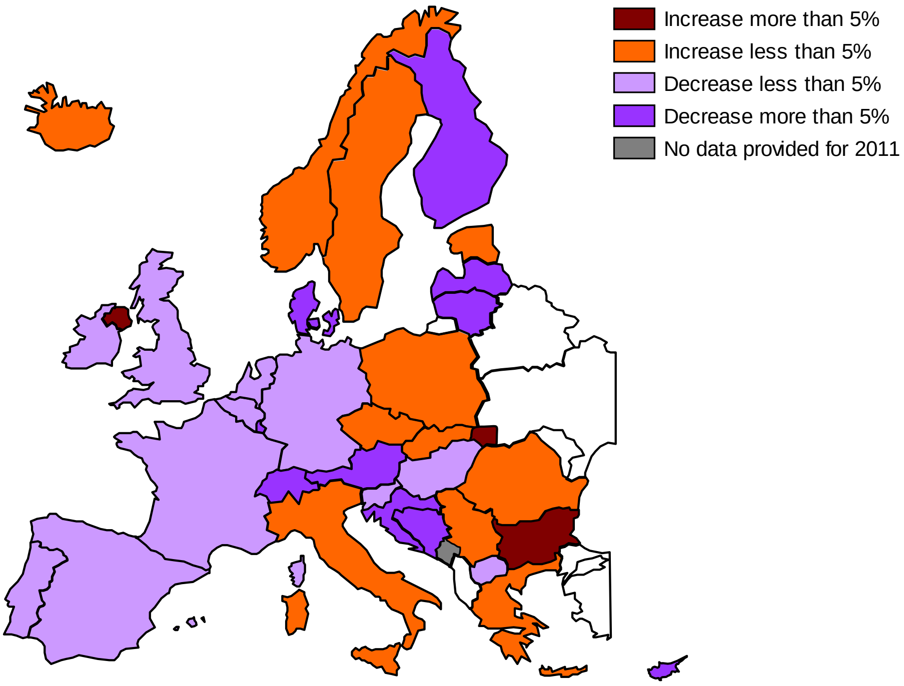
4.3. GENERATION

4.3.1. ENTSO-E OVERVIEW

The energy generation is very close to the energy consumption in the ENTSO-E system. This is due to the fact that, developing exchanges with non-ENTSO-E members (Russia, Belarus, Ukraine, Turkey and Morocco) are quite small compared to the size of the ENTSO-E system. In that respect, the energy generation in the ENTSO-E system follows the same trends as the energy consumption. Hence, following the increase of approximately 8% in 2010 until 3 400 TWh, the energy generation decreased slightly in the year 2011 by 1.23% up to 3 358 TWh.



Map 4.2: Increase / decrease of generation 2010/2011

Map 4.2 illustrates the yearly growth / decline of generation within ENTSO-E countries. As it was in 2010, in the year 2011, almost all systems in Western Europe (except for Italy and Northern Ireland system) noticed the decrease of generation. The decrease was also registered in Lithuania, Latvia, Finland and in Hungary, Slovenia, Croatia, Bosnia-Herzegovina, Former Yugoslavian Republic of Macedonia, and Cyprus. A fall down exceeding 10% took place in Croatia (24.8%), Lithuania (21.8), Luxembourg (18.9%) and in Bosnia (12%). In contrast, the biggest increase was in the Ukrainian West system (41.9%), Bulgaria (10%) and in the Northern Ireland system (5.5%). The growth for Ukrainian West system (see also under fossil fuel generation), is strictly connected with the huge increase of energy export, while the increase of generation within Northern Ireland was mainly due to the loss of imports from GB due to long term undersea cable faults on the Moyle Interconnector during 2011.

The decrease of generation described above is confirmed for all categories, except for RES, where a significant growth was noticed in absolute values (50,4 TWh) and also as share in total generation (increase from 20,6% to 22,4%). The results for 2010 and 2011 are shown in Figures

4.2 and 4.3. The share of nuclear in total ENTSO-E generation increased imperceptibly, despite the decrease in generation by 9 TWh. This decline was over two times smaller than the decrease of fossil fuel generation (25 TWh), which means that the influence of the German nuclear shut down in 2011 on generation structure was negligible. Despite the decline of fossil fuel generation, it remains to be the most important energy source for electricity generation in the ENTSO-E system and made up almost 50% of total generation. The share of RES in 2011 increased by 1.8% at the expense of non-renewable hydro generation (which decreased by 1.7%). This may well have been caused by the improvement of identification procedures regarding renewable parts of hydro generation, which has been observed in recent years as the result of problems with precise counting renewable hydro energy in some countries. Figure 4.2 for 2010 was updated based on new data delivered from correspondents during the 2011 data collection process. The update concerns renewable parts of hydro data, which caused a large increase of total RES, compared with graphs from the previous SAR report, where RES share amounted 18,6%.

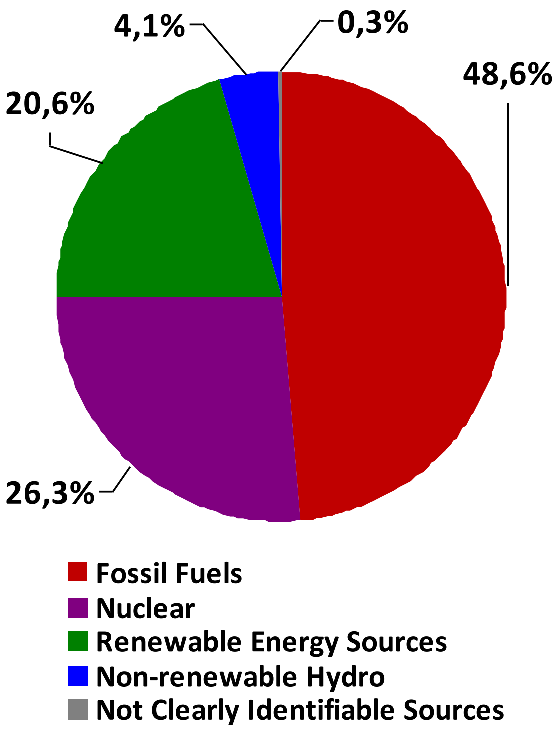


Figure 4.2: ENTSO-E generation mix in 2010

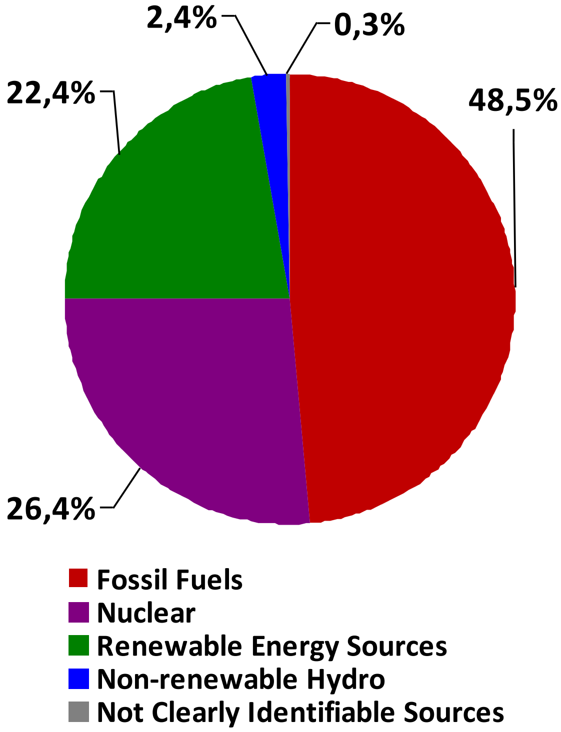
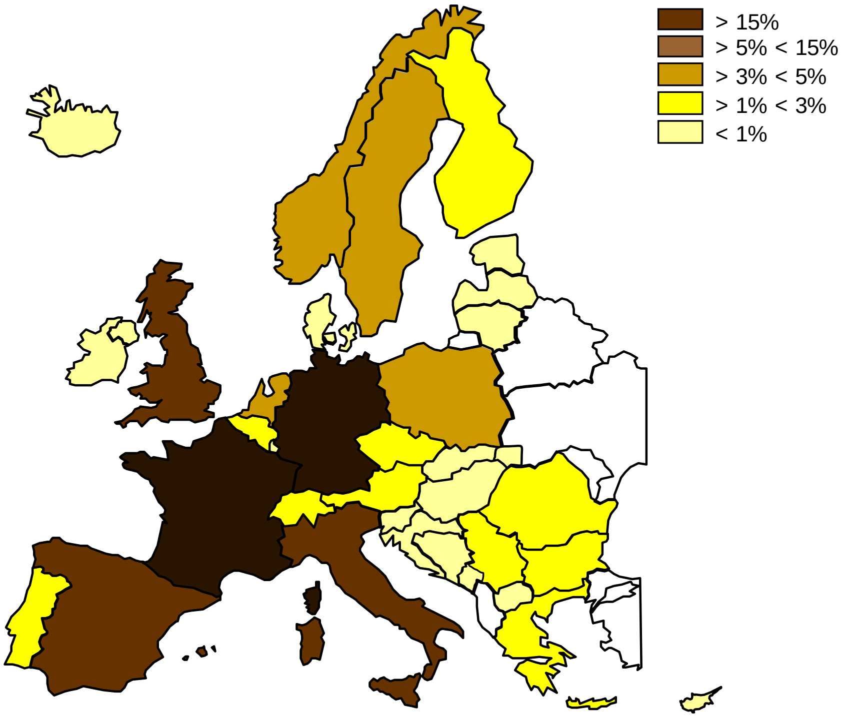


Figure 4.3: ENTSO-E generation mix in 2011

The countries with the highest share of generation in the total ENTSO-E generation have been the same for many years, which means: Germany and France (17.1% and 16%, respectively) followed by Great Britain (9.2%), Italy (8.5%) and Spain (7.8%). The remaining countries had a share of less than 3%, with the exception of Poland (4.5%), Sweden (4.4%), Norway (3.8%) and the Netherlands (3.3%). This situation is illustrated by Map 4.3 and Figure 4.4 below.



Map 4.3: Share of each ENTSO-E country in total ENTSO-E generation in 2011

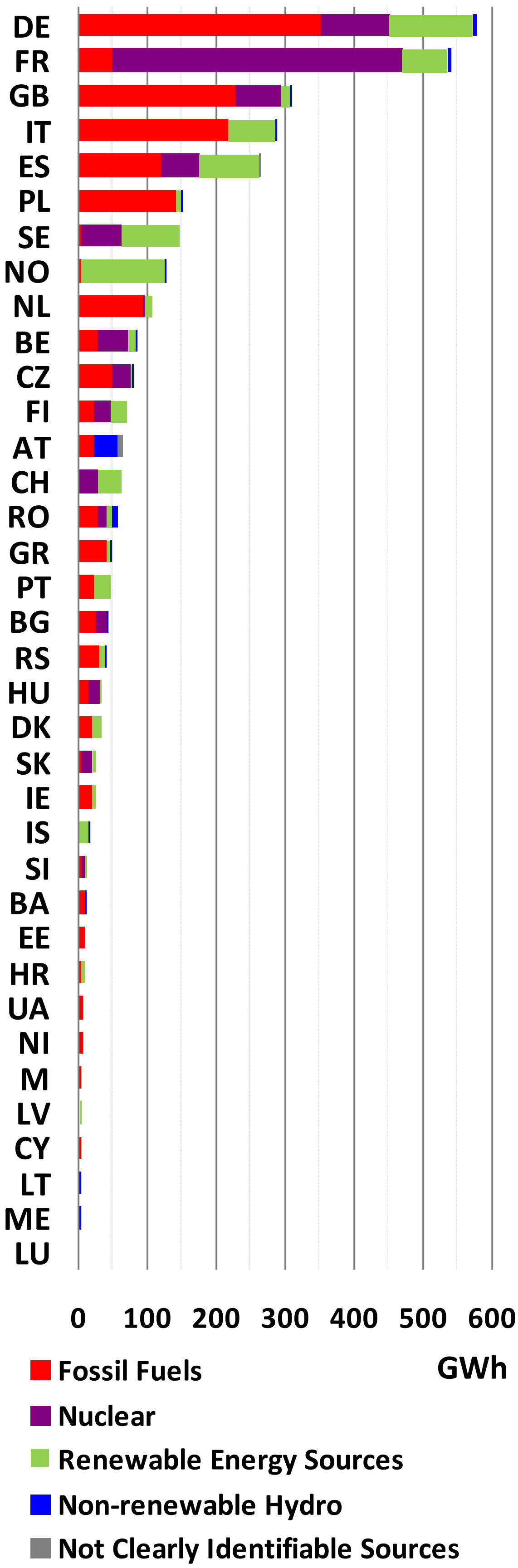


Figure 4.4: Generation mix in 2011

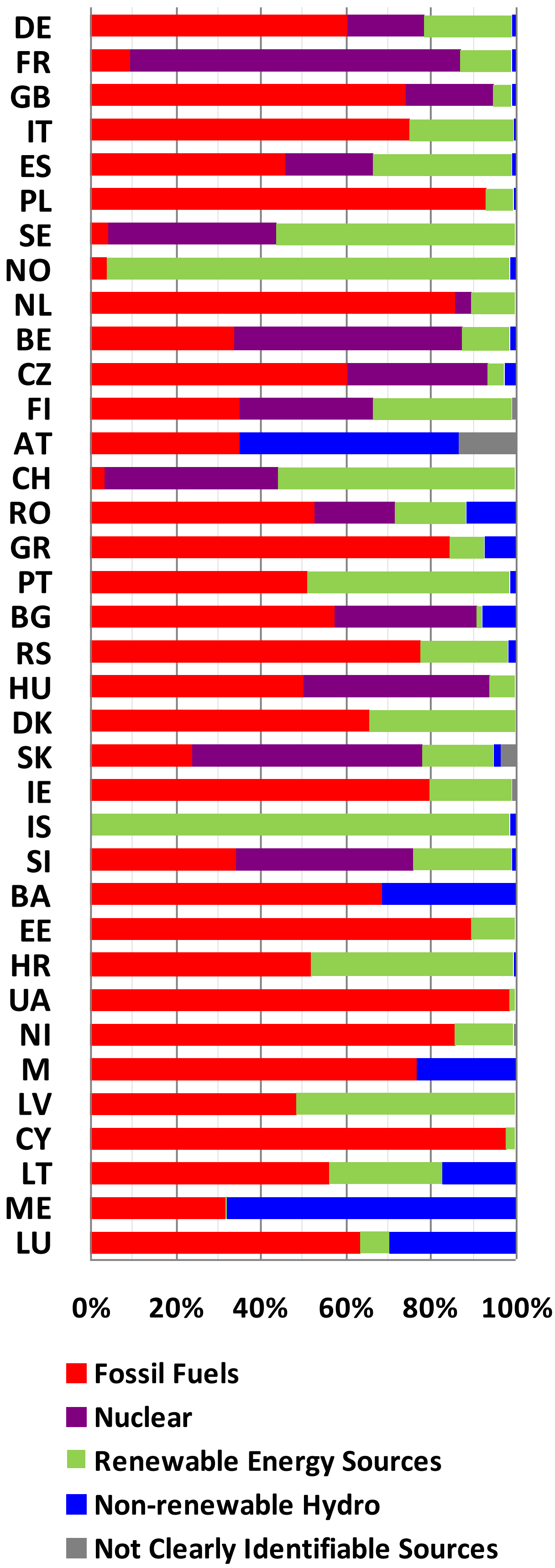


Figure 4.5: Generation mix in 2011

per country in GWh *per country in %*

The fact that fossil fuels are the main fuel used for the generation of electricity within the ENTSO-E area is illustrated in Figure 4.3. Figure 4.5 shows the share of the different individual fuel types in the total generation of each country. It is clearly visible that the red colour is dominant, which means that many countries rely on fossil fuels for their electricity generation.

4.3.2. FOSSIL FUELS

The fossil fuel generation slightly decreased from 1 653 TWh in 2010 to 1 628 TWh in 2011, which corresponds to 1.5%. As shown in Figure 4.6, this decrease was primarily driven by gas generation (59 TWh). The evolutions are made visible in Table 4.3 below.

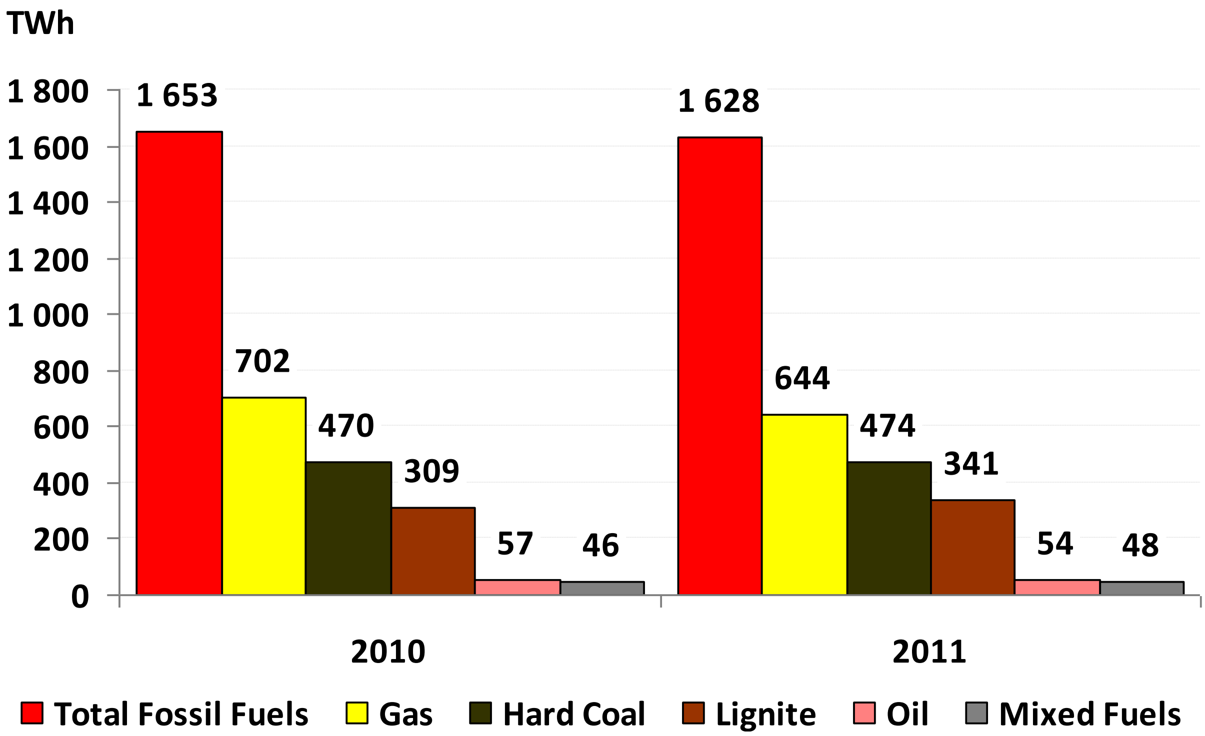


Figure 4.6: ENTSO-E fossil fuels Generation in 2010 and 2011

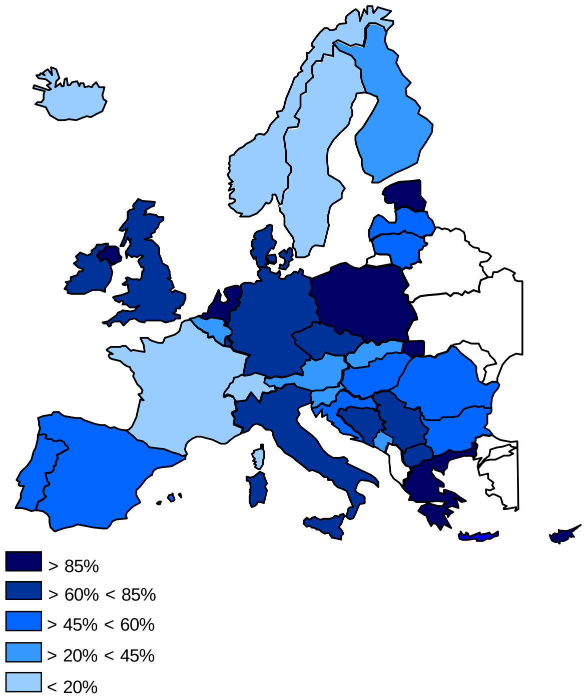
	Fossil Fuels	of which				
		Lignite	Hard Coal	Gas	Oil	Mixed Fuels
%	-1.5	10.2	0.7	-8.3	-5.6	3.5
Absolute value (TWh)	-24.7	31.6	3.2	-58.5	-3.1	1.6

Table 4.3: ENTSO-E Fossil Fuels generation increase/decrease from 2010 to 2011[7]

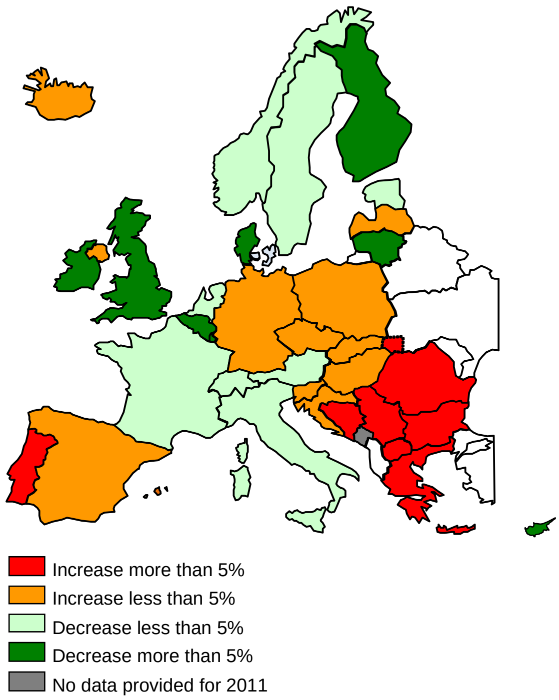
[7] Value of total fossil fuels is higher than the sum of listed subcategories. The difference means other or not identifiable fossil fuel sources.

Map 4.4 shows the share of fossil fuel in total generation for each country. Countries with the highest share in 2011 were: Ukrainian West system (98.5%) and Cyprus (97.7%), Poland (92.9%), Estonia (89.9%), the Netherlands (86%), Northern Ireland (85.9%) and Greece (84.7%).

The main contributors to the overall decrease in fossil fuel generation were Great Britain (24.6 TWh), France (8,2 TWh), Belgium (6,8 TWh) and Finland (6,2 TWh). Meanwhile massive increases took place in Spain (5.1 TWh), followed by Romania (4,8 TWh), Bulgaria (4,8 TWh too) and Greece (4.5 TWh). The increase / decrease of fossil fuel generation as a part of total generation is shown on Map 4.5[8].



Map 4.4: Share of fossil fuels in the total generation of each ENTSO-E country in 2011



Map 4.5: Increase / decrease of fossil fuels generation 2010/2011 as the part of total generation in 2011 per country

The countries with the highest increase of fossil fuel as part of total national generation were Ukrainian West system (30%), Bosnia (12.6%) and Bulgaria (10.6%). The growth for the Ukrainian West system, which was based on fossil fuels, is strictly connected with the huge increase of energy export. At the other end of the spectrum, in Lithuania, Luxembourg, Denmark and Ireland the decrease of fossil fuels (as a part of the total national generation) was 34%, 15.3%, 13.6% and 10.2% respectively. Such a significant decline in Lithuania's fossil fuel, when

[8] To avoid misunderstanding concerning the maps, which show the percentage increase / decrease of generation (mainly fluctuations in generation in countries, where 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 total generation in each country.

consumption increased slightly, was caused primarily by the simultaneous reduction of energy export with renewable generation growth.

4.3.3. RENEWABLE ENERGY SOURCES

In the report the following sources are considered as renewable energy sources (RES): wind, solar, biomass, renewable hydro (as run of river and renewable part of energy from storage and pomp storage hydro power plants) and other renewable (sources not mentioned in the subcategories, e.g. geothermal or sources not clearly indentified). Such division can be applied for most of countries.

For certain countries, the renewable energy sources (RES) values were not properly identified. They were occasionally included in the non-identifiable energy sources (e.g. Austria), or the RES share in hydro generation was only partially identified (e.g. Bosnia-Herzegovina and Czech Republic) or not identified at all[9] (e.g. Austria, and Bulgaria). Next some countries are not able to divide renewable hydro into run-of-river and renewable part of storage and pump storage and, as the result, there is no such division in the report.

Figure 4.7 below shows the total RES generation. It is a comparison which spans from the year 2008 to 2011.

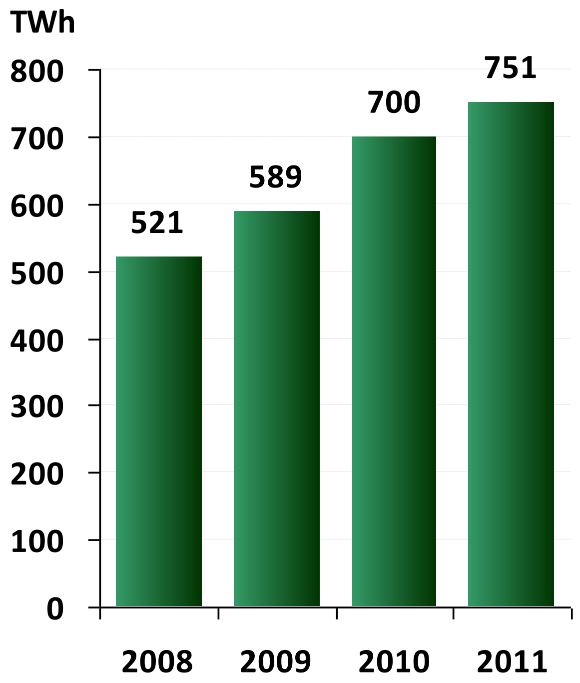


Figure 4.7: ENTSO-E renewable energy sources Generation in 2008, 2009, 2010 and 2011

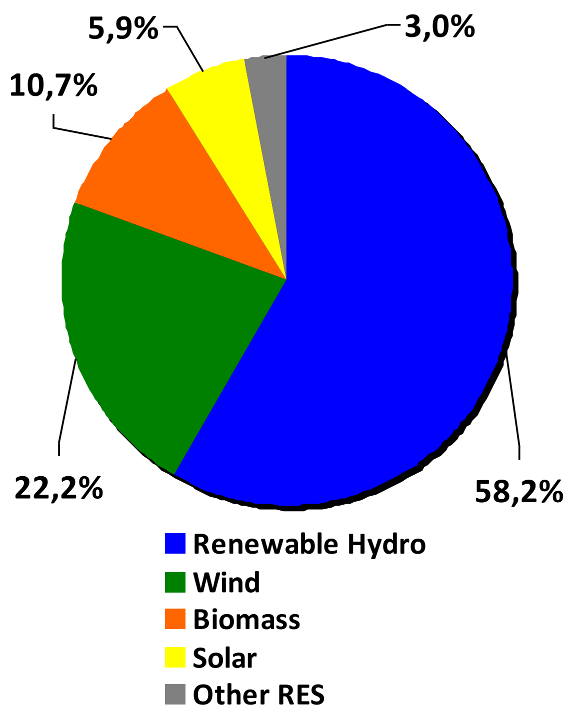


Figure 4.8: Share of each RES source in total RES generation in 2011

Table 4.4 shows that the generation from renewable energy sources increased by a mere 7,2% and that the growth came from wind, solar and biomass categories. The highest rise in absolute

[9] For these countries the renewable hydro generation was considered to be zero

values was for wind generation and amounted to 29.6 TWh. The main contributors to this increase in each category were: Germany for wind (9 TWh), Italy for solar (7.7 TWh) and Great Britain for biomass (10.7 TWh). A relatively significant raise was also balanced by quite a decline from renewable hydro generation with a drop in absolute value of 42.2 TWh. The main contributor to this decrease in absolute value was France – 17.9 TWh. Indeed, 2011 was the driest year in fifty years for France.

	Total	of which				
		Wind	Solar	Biomass	Renewable HPP	Other RES
%	**7.2**	21.6	100.6	27.4	-2.5	-25.0
Absolute value (TWh)	**50.4**	29.6	22.2	17.3	-11.2	-7.5

Table 4.4: Renewable energy sources generation increase/decrease from 2010 until 2011

The share of individual RES sources in the total ENTSO-E RES generation in 2011 is depicted in the above Figure 4.8.

The evolution of RES subcategories within the space of four years is presented in figure 4.9

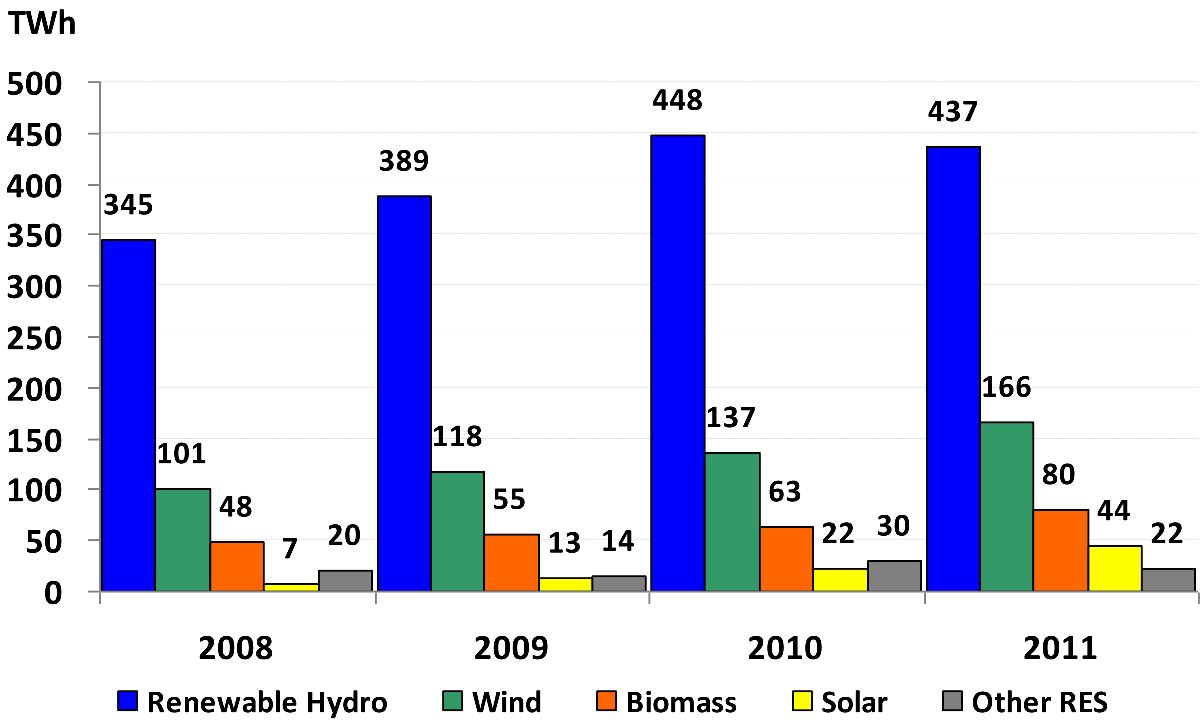
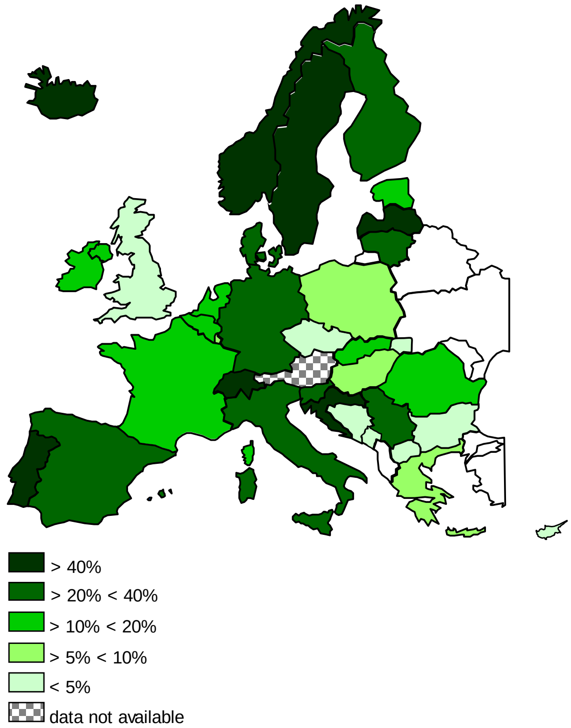


Figure 4.9: ENTSO-E Renewable Energy Sources generation in each category from 2008 to 2011

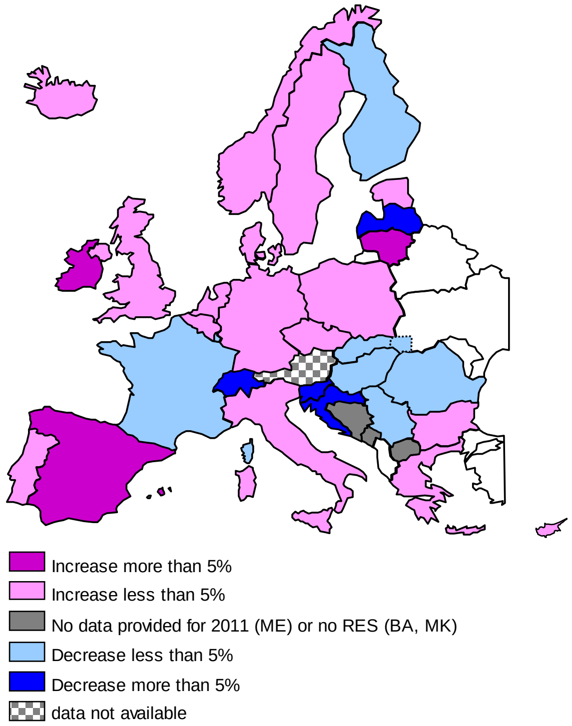
The highest share of RES production can be assigned to renewable hydro generation. The main contributors were Norway (120.5 TWh), Sweden (66TWh), Italy (45,8 TWh), France (45.5 TWh), Switzerland (33.8 TWh) and Spain (30.5 TWh). Following this we find wind generation, with the main contributors being, Germany (46.5 TWh), Spain (41.7 TWh),) France (11.9 TWh), Italy (9.6

TWh), Portugal (9 TWh), Denmark (8.9 TWh), and Great Britain (8.8 TWh). Next comes biomass generation with Germany (31.1 TWh), Sweden (10.7 TWh) and Finland (10.1 TWh) as the main contributors. Solar generation reached a share of approximately 6.4% and its main contributors were Germany (19 TWh), Spain (9.6 TWh) and Italy (9.3 TWh).

Following Map 4.6 shows the share of RES in the total generation of each country in 2011.



Map 4.6: Share of RES in the total generation of each ENTSO-E country in 2011



Map 4.7: Increase / decrease of RES generation 2010/2011 as the part of total generation in 2011 per country

In 2011, the highest share of RES in the national generation could be found in Iceland (98.6%) and in Norway (95%). These countries were closely followed by Sweden (56.4%), Switzerland (56%), Latvia (51.4%), Croatia (47.9%) and Portugal (47.6%). In the entire ENTSO-E area the share of RES in the total generation amounted to 22,4%.

The following Map (4.7) demonstrates the increase / decrease of RES as a part of total generation. The leaders of this growth are Spain (8.6%), Lithuania (6.1%) and Ireland (5.8%). In contrast, Croatia (30.6%) is presenting a big decline as well as Latvia with smaller decline – 9.2%. Such big fall of RES for Croatia is caused by the decrease of total hydro generation (most of hydro generation is renewable).

4.3.4. NUCLEAR POWER

The ENTSO-E nuclear generation (see Figure 4.10 below) decreased by only 1% (9.1 TWh), despite Germany's nuclear shut down after the Fukushima disaster – Germany's drop amounted to 30.8 TWh. Only two more countries noticed the decrease of nuclear generation in 2011, namely Spain with 4.1 TWh and Hungary with a negligible decline. In contrast, countries with a growth in nuclear generation include France (13.2 TWh), Great Britain (6.3 TWh) and Sweden (2.4 TWh). All changes in nuclear generation as part of the total are shown on Map 4.9 below.

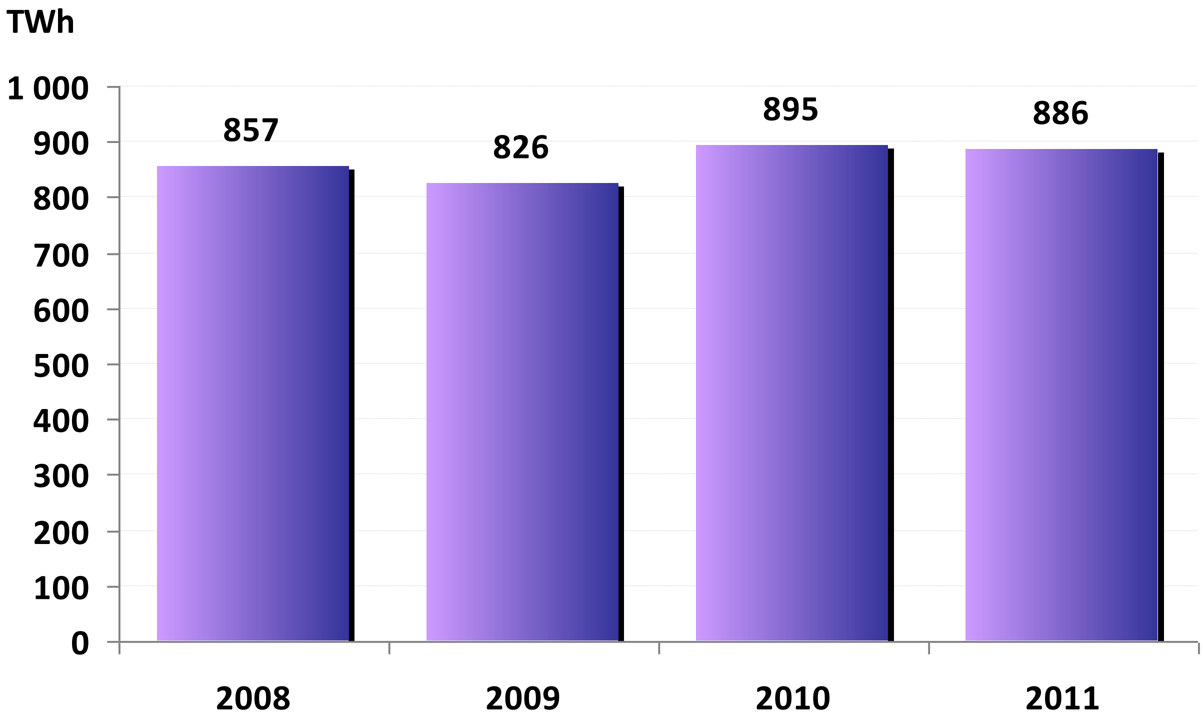
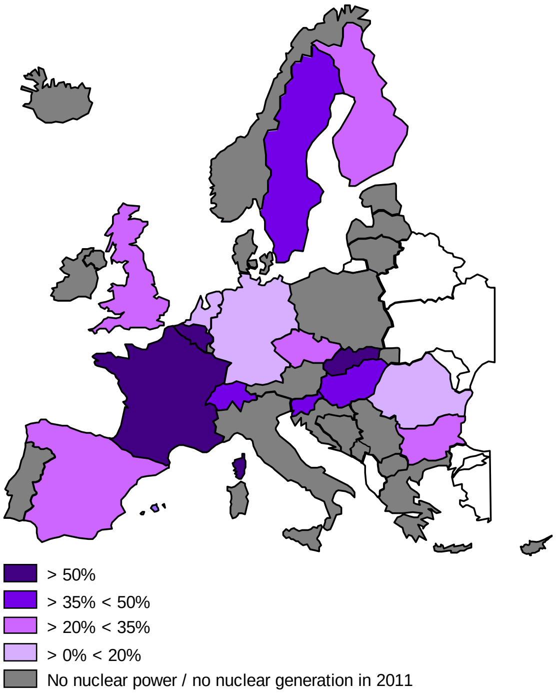
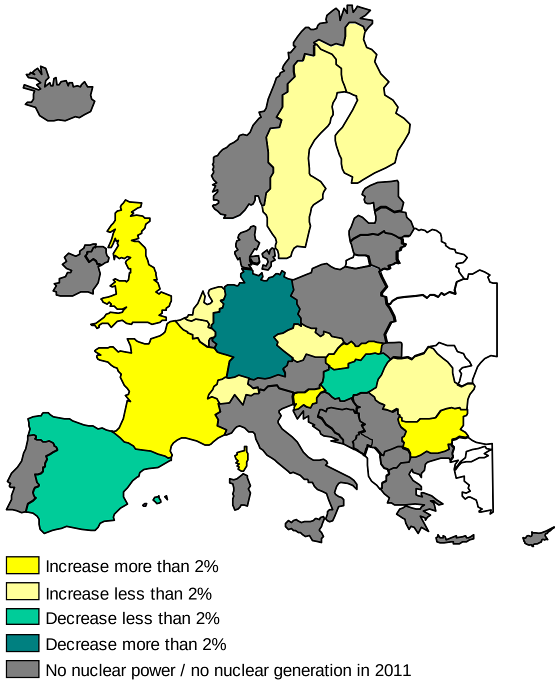


Figure 4.10: ENTSO-E nuclear generation from year 2008 to 2011

The Map 4.8 presents share of nuclear generation in total generation in each country. The highest shares are identical to those in 2010: France (77.7%), Slovakia (54.2%) and Belgium (53.7%). In 2011, nuclear generation, representing 25% of electricity produced within ENTSO-E, came from only 15 out of the 36 countries / systems only.



Map 4.8: Share of nuclear in the total generation of each ENTSO-E country in 2011



Map 4.9: Increase / decrease of nuclear generation 2010/2011 as the part of total generation in 2011 per country

4.3.5. NON-RENEWABLE HYDRO POWER GENERATION

This category only includes hydro power generation which cannot be considered as renewable (i.e. predominantly pure pumped storage hydro power plants) and it is counted as the difference between total hydro generation and confirmed by correspondents as a renewable part of hydro. The renewable part of hydro power plants' generation is included in the RES category (see Chapter 3.1 on methodology and 3.3.3 on renewable energy sources generation). However there were also certain countries which were not able to divide the hydro generation category into the requested subcategories (partially or at all), namely renewable and non-renewable. This caused some incorrectness in the final statements in this chapter. As stated, the change in 2010, hydro data emerged as a result of corrections made by correspondents, which improved the quality of the data and the evaluation year to year.

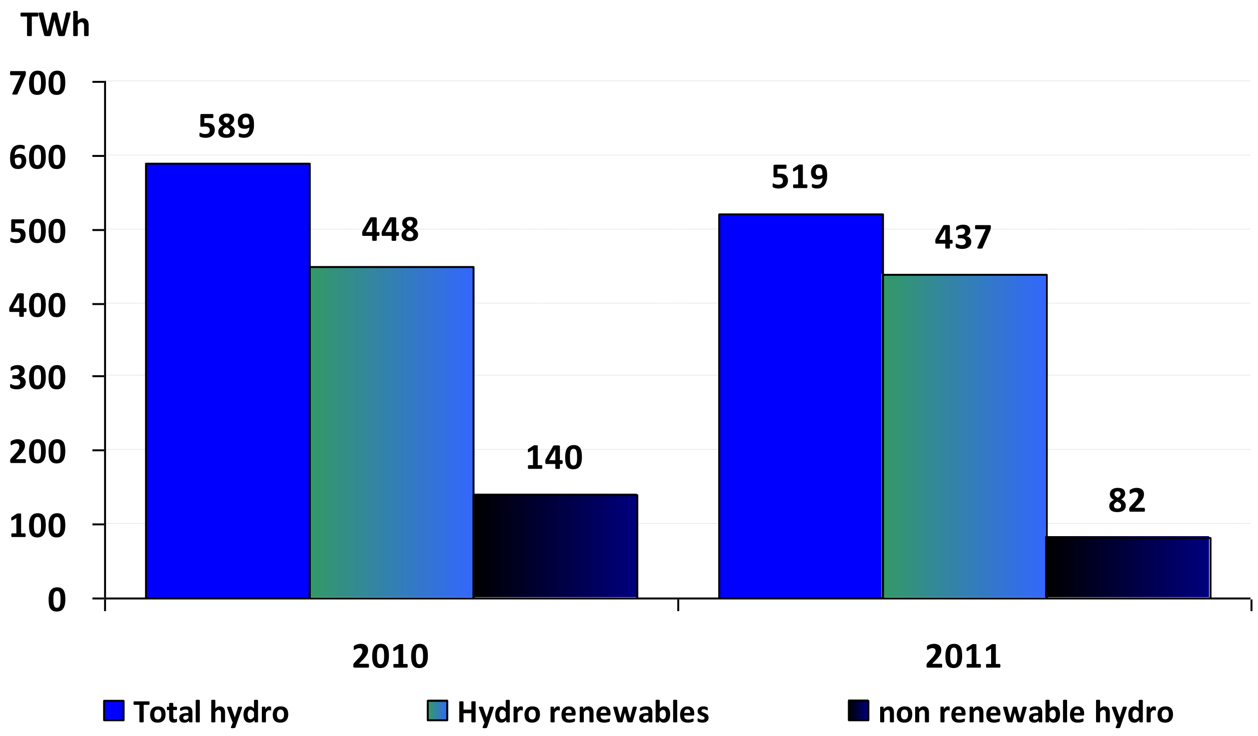


Figure 4.11: ENTSO-E hydro power plants generation in 2010 and in 2011

The total generation of hydro power plants in 2011 was 69 TWh lower than in 2010, thus amounting to 519 TWh. The decrease corresponds to a significant decline of non-renewable hydro – drop of 58 TWh (from 140 TWh to 82 TWh in 2011). All values are presented in Figure 4.11. The main contributor to the decline of the total hydro generation was France (17.7 TWh and Spain 12.3 TWh). Only five countries registered the growth of total hydro generation, among which were Norway with 4.8 TWh, and Great Britain with 1.5 TWh.

4.3.6. NATIONAL COMMENTS ON GENERATION

BE – Belgium

The national net generation was 6.8% lower in 2011 as compared to 2010. This decrease in net generation resulted from a decrease in fossil fuel generation (-26.8% compared to 2010) which counts for 34% of the Belgian generation in 2011. Nuclear generation, which has a share of 53.7% of net generation during 2011, remained stable compared to 2010. Although, the output of wind mills grew by 44.2% and the output of solar panels by 62.8% compared to 2010, they account only for 4.4% of the Belgian generation in 2011. In 2011 the operational hours compared to the installed capacity of onshore windmills was 2055 hours while it only was 1650 hours in 2010. Remaining renewable energy source generation (other than wind, solar and hydro) grew by only 0.7%. Run-of-river and pump-storage generation decreased respectively by 54.8% and 10.7% and they account for 1.6% of the Belgian generation during 2011.

CY – Cyprus

The reduction seen in respect to the last year generation is due to the resulting energy crisis. Loss of generation depends on the cyclic load disconnections during July and August 2011 as well as the energy savings made due to generation inadequacy.

DK – Denmark

Mixed fuels exist in the production but it is not possible to derive this data from the market.

FI – Finland

All hydro generation has been put in storage as the division between run-of-river and storage is not available. No pumped storage plants.

FR – France

As a direct consequences of a decreasing demand (-35 TWh), generation dropped by -8.3 TWh in 2011 which spared much generation for net exports to increase by +26.4 TWh.

Nuclear generation benefited from a high availability rate, the fourth highest in the whole history of the French nuclear industry. Hydro generation decreased by 17.3 TWh due to the driest conditions in fifty years. Renewable generation (other than hydro) continued its steady increase by a quarter (+26.4%) counting for 3.5% of national generation (12.8% together with hydro generation). Thermal generation dropped by 8.3 TWh due to a low demand in Europe.

IE – Ireland

The output of wind generation in 2011 increased by 35.42% when compared to 2010. The significant increase was due to increased wind generation capacity and below normal wind conditions in 2010. In 2011 wind generation capacity increased by 13% while average wind speeds increased from between (11 and 19 km/h) in 2010 to between (13 and 27 km/h) in 2011.

NI – Northern Ireland

Figures submitted under Oil category is Distillate Oil and NOT Heavy Fuel Oil.

PL – Poland

Since 2011 PSE Operator has been able to provide energy data concerning renewable sources co-firing in conventional thermal units. This data is based on information from producers and may differ from official statistics, which come from Regulatory. Availability of information concerning this energy caused significant growth of total renewable generation between 2010 (4.9 TWh) and 2011 (10.3 TWh), however the share of renewable in total generation was still low and amounted to 6.8%. Biomass co-firing in 2011 amounted to 4.9 TWh, which means that fossil fuel generation increased by around 5.5 TWh (3,8%) rather than the 0.6 TWh which could be found in the 2011 SAR report.

RO – Romania

For 2011 the national net generation did not register a significant difference as compared to 2010 (it increased by 0.7%). The meteorological drought occurred in 2011 caused the decrease of hydro generation by 37.5% that was compensated mostly by the 16% increase of fossil fuel generation as compared to 2010. The wind net generation increased by 76% due to the 52% growth of wind national generating capacity also compared to 2010.

SI – Slovenia

The total generation on the transmission network was 14.1 TWh. Compared to 2010 that is lower for 1.9 %. The nuclear power plant Krško produced more electricity than in 2010, fossil thermal and hydro units both produced less than in 2010. The 2011 energy mix on the transmission level was: Nuclear 42 % (100 % of its generation is considered), Thermal fossil 34 % and hydro 24 %. The ownership of nuclear power plant Krško is equally divided between Slovenia and Croatia, thus half of its generation is delivered to Croatia according to international agreement.

SK – Slovakia

Hydro power generation was at the lowest level for eight years in 2011 and it mirrored also on the total RES generation. Low generation was caused by weather conditions. The year before (2010) was in contrast, the most successful for hydro power generation. Production of solar power plants was 310 GWh, that is, 1.1% of total yearly production. However, in the summer of 2011, the solar generation was much more significant than previous years, due to an increase of installed capacity in the first half of 2011. The peak output of solar power plants was approximately 300 MW, taking into consideration the summer load of Slovakia power system 3 500 MW. Solar power plants' share of output was around 8% during summer days.

4.4. ENERGY FLOWS

4.4.1. 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 physical flows are metered at the exact border or at a virtual metering point estimated from the actual one. Some countries are isolated systems (e.g. Cyprus and Iceland) and some did not report data for 2011, meaning that their exchange balance is not considered here.

The exchange balance of the whole ENTSO-E system decreased from 5668 GWh in 2010 to 5040 GWh in 2011, that is, a decrease of around 11%. This is in contrast with the significant increase of approximately 125% observed from 2009 to 2010.

As in the three previous years, ENTSO-E was a net[10] importing system in 2011. Both imports and exports were higher in 2011 than in 2010 (about 1.6% and 1.8%, respectively). This contrasts with the situation observed from 2009 to 2010, where there was a higher increase in both imports and exports (around 16% for both). The following figures (Figure 4.11 and 4.12) show this situation.

[10] „net export"/„net import" means that the difference between Imports and Exports was in favour of Export and Import respectively

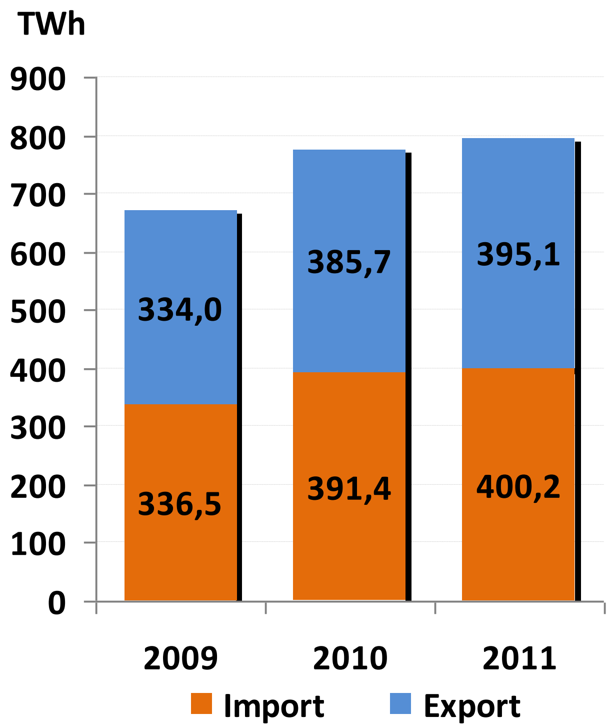


Figure 4.11: ENTSO-E Imports/Exports Summary

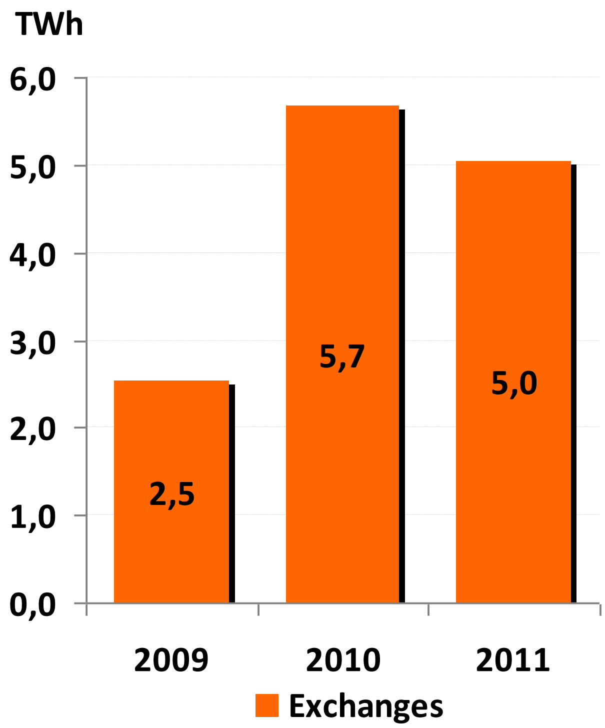


Figure 4.12: ENTSO-E Exchanges Balance Summary

In 2011, the biggest net exporting countries were France (57.1 TWh), the Czech Republic (17 TWh) and Bulgaria (10.5 TWh). Other net exporters were Sweden (7.2 TWh), Germany (6 TWh), Spain (5.7 TWh), Poland (5.2 TWh), Estonia (3.5 TWh), Norway (3.1 TWh), the control area of Ukraine-West (3.1 TWh), Romania (1.9 TWh), Bosnia Herzegovina (1.5 TWh) and Slovenia (1.3 TWh).

The main net importers were Italy (45.8 TWh) and Finland (13.9 TWh), followed by Austria (8.9 TWh), the Netherlands (8.8 TWh), Croatia (7.7 TWh), Lithuania (6.7 TWh), Hungary (6.6 TWh), Great Britain (4.8 TWh), Luxemburg (4.4 TWh), Switzerland (3.8 TWh) and Greece (3.3 TWh). The rest of the countries showed only insignificant net imports (less than 3 TWh). The situation described above is illustrated in Figure 4.13, as a comparison between 2009, 2010, and 2011.

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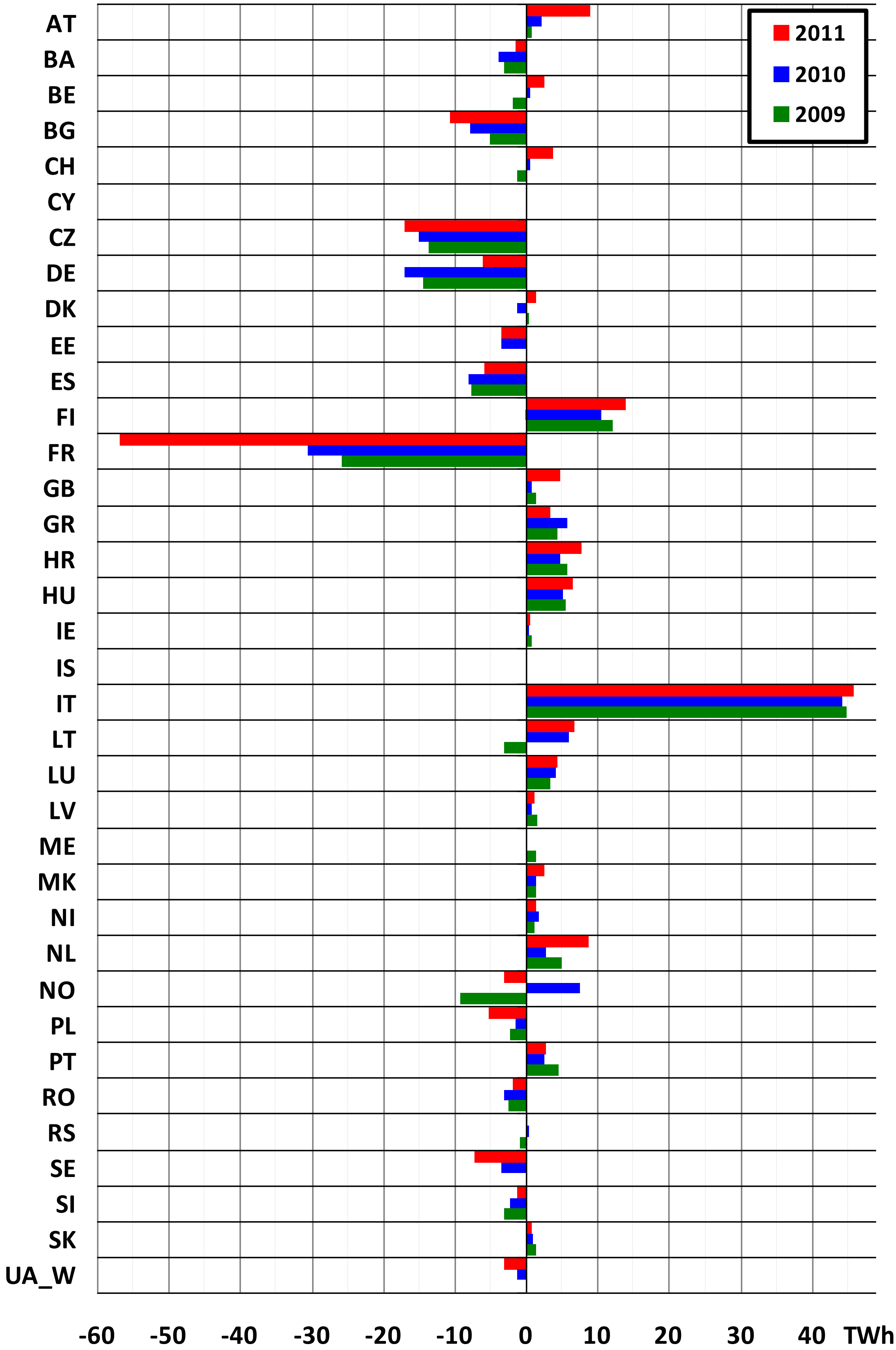
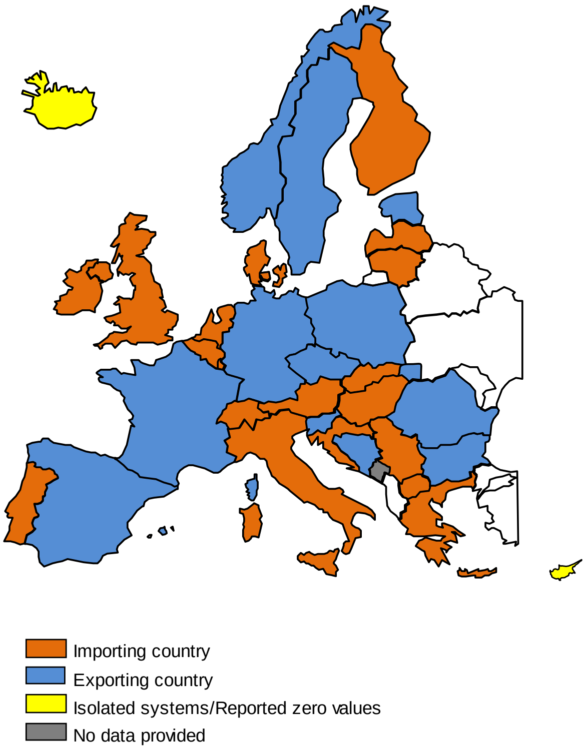


Figure 4.13: Comparison of exchanges balance for each country

(negative values: exporting / positive values: importing)

The comparison of individual countries in 2011 is given on Map 4.10.



Map 4.10: Net importing/exporting countries in 2011

4.4.2. NATIONAL COMMENTS ON EXCHANGES

BE – Belgium

The physical imports increased by 6% in 2011 compared to 2010 and the physical exports decreased by 11.2%. Like it was the case for 2010, Belgium was a net importer during 2011.

CY – Cyprus

Cyprus is an isolated system.

FR – France

Low national demand together with high availability of the nuclear park and the decommissioning of 8 nuclear units in Germany allow France to increase its exports by 89% to reach a pre-crisis level of 57,1 TWh. Mild temperatures ended up with a very low number of net importing days (4) and hours (19).

IS – Iceland

Iceland is an isolated system.

NI – Northern Ireland

Northern Ireland (NI) was a net importer during 2011 with net imports making up approximately 8% of demand. NI has an Interconnector with GB and a Tie-Line with IE. (NI operates a single electricity market (SEM) in Ireland, across both jurisdictions). An undersea cable fault on Pole 1 of the Moyle Interconnector with GB reduced the import capacity from GB - NI to 250MW from

26th June 2011. A further undersea cable fault on Pole 2 of the Moyle Interconnector with GB, reduced the import capacity from GB - NI to 0MW from 24th August 2011, with this situation continuing up to the end of 2011.

PL – Poland

Market conditions in 2011 caused significant increase of exchanges in export direction on synchronous profile. The volume of contracts in export directions growth by almost 200% in spite of the total offered capacity increased by 5% only.

PT – Portugal

The net imports increased by 7% from 2010 levels, accounting for 6% of the national demand.

SI – Slovenia

As in the past three years, in 2011 the electricity export was again higher than import. The imports increased on all borders (Italian, Austrian and Croatian) and the exports increased on Italian and Croatian and decreased on the Austrian border.

SK – Slovakia

The total volume of cross-border exchanges in 2011 rapidly increased (159% compared to 2010) and was close to 2007 when the maximum was measured. Import of electricity covered 2.5% of total consumption (3.6% in 2010).

High electricity transit flows via the transmission system of Slovakia began in July 2011 and continued until the end of the year and also in 2012. Due to high power flows the criterion n-1 often went un-fulfilled in Slovakia’s transmission system. The loading of some transmission lines was above 80 or even 90% and in some hours it was at the limit of the permanent transmission loading of the lines (e.g. tie-line between SK and UA). To prevent serious disturbances which could also spread to the neighbouring systems (cascade tripping of transmission lines) and to unload lines of the transmission system of Slovakia, which were at the limit of their transmission capacities, the first reconfiguration (changes) of connection in the selected substations (Lemešany and Varín) was performed on 29th December 2011.

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5. POWER BALANCE

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

5.1. ENTSO-E POWER BALANCE DATA SUMMARY

GW	2010	2011	Difference between 2010 and 2011	
			Absolute value	%
Net Generating Capacity	**910,7**	**932,6**	**21,9**	**2,4%**
Fossil Fuels	451,3	452,7	1,4	0,3%
Nuclear Power	133,9	125,7	-8,1	-6,1%
Total Non-renewable Hydro Power	66,5	65,4	-1,1	-1,7%
Renewable Energy (incl. renewable Hydro)	253,4	284,4	31,0	12,2%
Not identifiable energy sources	5,7	4,4	-1,3	-22,4%
Reliable Available Capacity	**658,5**	**661,5**	**3,0**	**0,5%**
Imports	40,1	50,7	10,7	26,7%
Exports	40,7	53,2	12,5	30,7%
Load	**521,2**	**473,8**	**-47,5**	**-9,1%**

Table 5.1: ENTSO-E Power Balance Summary for December 2011[11]

5.2. LOAD

5.2.1. ENTSO-E OVERVIEW

The evolution of the load in 2009, 2010 and 2011 is depicted in Figure 5.1 below. For 2009 the data for three countries were not represented, whereas for 2011 each TSO except for Croatia, provided data. The load of 2011 follows more or less the curves of 2010. December 2010 was a very cold month, with a much higher load than in December 2011, as shown in the figure below.

In general, the ENTSO-E monthly peak load was fairly normal throughout the whole of 2011. However, the monthly peak load was, for most of the year 2011, lower than for year 2010. The main reason for this is the temperatures in winter which were lower in 2010. Another reason is that many countries are experiencing financial and economic crises which have become stronger in 2011.

[11] The summation of certain subcategories for the whole ENTSO-E area does not necessarily have to be equal to the ENTSO-E summary value of the main category. See section 3.4

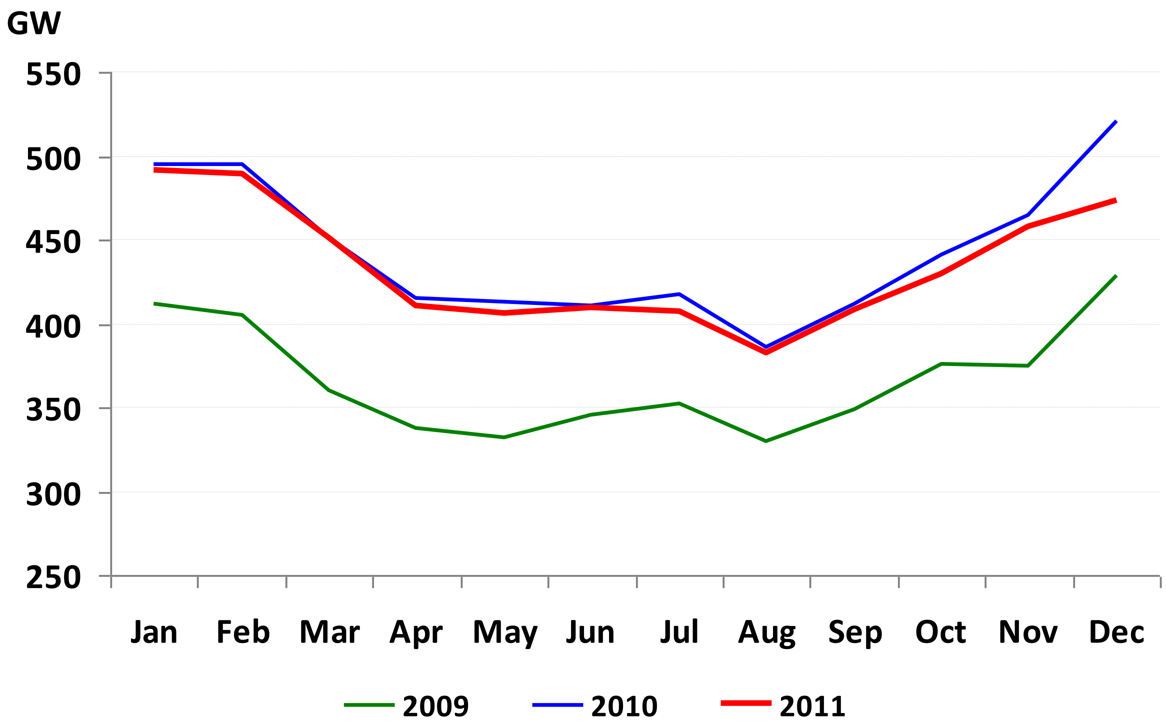


Figure 5.1: Load comparison between 2009, 2010 and 2011

GW	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	412	406	360	337	332	345	352	330	349	376	375	428
2010	494	495	451	415	413	410	418	386	411	440	464	521
2011	492	489	451	410	406	410	407	382	408	430	458	474

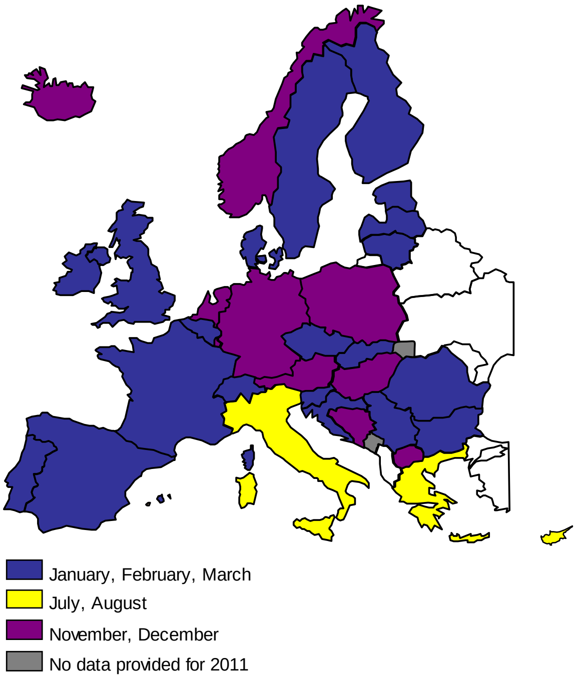
Table 5.2: Comparison of Load between 2009, 2010 and 2011

5.2.2. NATIONAL PEAK LOADS

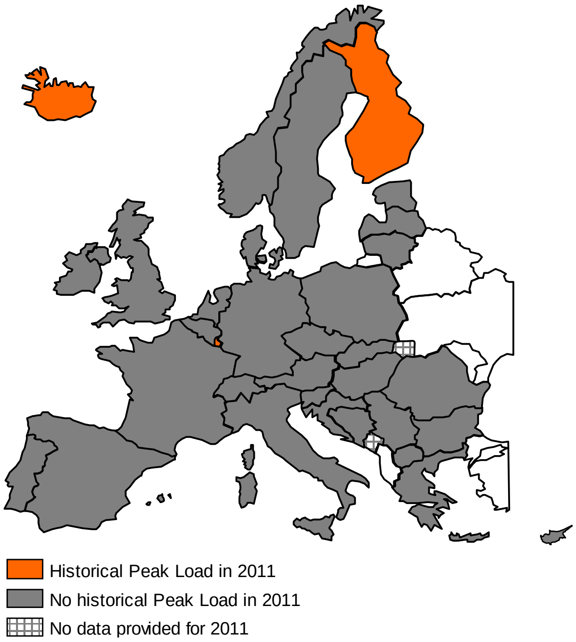
The peak loads in the different countries were, generally speaking, fairly normal in 2011. Furthermore, most of the ENTSO-E countries had their peak loads in January, February and December. Some southern countries had the peak load in the summer. Italy and Greece had their peak load in July whilst Cyprus had their peak load in August. Three of the ENTSO-E countries had an all-time high peak load in 2011 (Finland, Iceland and Luxembourg), as shown on Map 5.2 and in Table 5.3. Additionally, two countries had their peak load at the start of 2012. The distribution of peak load according to the month of measurement of the peak load is shown in Table 5.3 and on Map 5.1.

Country	Weekday	Calendar Day	Month	Time	Daily Average (°C)	Deviation from Normal (°C)	Peak Load (MW)	Compared to Last Year's (%)	Day of Historic Peak Load	Year	Historic Peak Load (MW)	Deviation from Normal (°C)
AT	Wednesday	21	12	17:00	n.a.	n.a.	**10 580**	-1,6 %	Wed 16 Dec	2009	10 821	n.a.
BA	Saturday	31	12	17:30	n.a.	n.a.	**2 150**	-1,1 %	Fri 31 Dec	2010	2 173	n.a.
BE	Wednesday	12	1	17:45	6,5	3,1	**14 314**	1,0 %	Wed 1 Dec	2010	14 391	-8,5
BG	Tuesday	1	2	19:00	-1,7	-2,3	**6 973**	-4,1 %	Wed 20 Dec	1989	8 396	n.a.
CH	Wednesday	19	1	11:45	3,0	0,0	**10 072**	-6,3 %	Fri 10 Dec	2010	10 749	-8,0
CY	Tuesday	23	8	8:00	39,0	3,0	**1 100**	-4,2 %	Tue 3 Aug	2010	1 148	0,0
CZ	Tuesday	1	2	12:00	-7,3	-7,2	**10 127**	-2,5 %	Wed 25 Jan	2012	10 485	-9,1
DE	Wednesday	7	12	18:00	n.a.	n.a.	**76 400**	-4,4 %	Tue 10 Dec	2002	79 700	n.a.
DK	Wednesday	5	1	17:00	-1,5	n.a.	**6 218**	-2,0 %	Tue 24 Jan	2006	6 436	n.a.
EE	Wednesday	23	2	8:45	n.a.	n.a.	**1 517**	-4,4 %	Thu 28 Jan	2010	1 587	n.a.
ES	Monday	24	1	19:00	4,9	3,7	**43 596**	-2,0 %	Mon 17 Dec	2007	45 450	-1,9
FI	Friday	18	2	9:00	n.a.	n.a.	**14 965**	2,6 %	Fri 18 Feb	2011	14 965	n.a.
FR	Tuesday	4	1	19:00	-1,2	-6,4	**91 720**	-5,2 %	Wed 8 Feb	2012	102 098	-4,9
GB	Thursday	6	1	18:30	2,9	-2,8	**56 164**	-6,5 %	Mon 17 Dec	2007	60 700	-2,9
GR	Wednesday	20	7	13:00	33,0	6,0	**10 055**	2,7 %	Mon 23 Jul	2007	10 414	5,0
HR	Tuesday	25	1	17:30	1,0	n.a.	**2 970**	-4,8 %	Thu 16 Dec	2010	3 121	n.a.
HU	Thursday	24	11	16:45	-2,4	-6,1	**5 931**	-2,2 %	Thu 29 Nov	2007	6 180	-5,7
IE	Wednesday	5	1	18:45	4,2	3,4	**4 644**	-8,8 %	Tue 21 Dec	2010	5 090	-4,7
IS	Wednesday	7	12	11:00	-5,8	-1,2	**2 138**	6,4 %	Wed 7 Dec	2011	2 138	-1,2
IT	Wednesday	13	7	12:00	29,5	2,5	**56 474**	0,1 %	Tue 18 Dec	2007	56 822	1,5
LT	Friday	25	2	08:00	-2,4	0,0	**1 743**	2,1 %	Tue 18 Apr	1989	3 153	n.a.
LU	Wednesday	21	12	18:00	2,1	1,9	**1 188**	7,3 %	Wed 21 Dec	2011	1 188	4,0
LV	Tuesday	15	2	11:00	n.a.	n.a.	**1 223**	-7,5 %	Tue 20 Apr	2004	n.a.	n.a.
ME												
MK	Saturday	31	12	14:00	4,0	7,0	**1 642**	0,9 %	Sat 18 Dec	2010	1 624	15,0
NI	Monday	10	1	18:30	4,6	-4,9	**1 766**	-0,6 %	Wed 22 Dec	2010	1 777	-11,9
NL	Wednesday	14	12	17:30	5,0	1,3	**18 049**	1,8 %	Tue 15 Jan	2008	18 465	n.a.
NO	Wednesday	21	12	18:00	n.a.	n.a.	**22 129**	-7,8 %	Wed 6 Jan	2010	23 994	n.a.
PL	Thursday	22	12	17:15	-1,8	-0,8	**22 906**	-2,9 %	Tue 26 Jan	2010	23 447	-13,1
PT	Monday	24	1	20:45	7,7	-2,0	**9 192**	-2,2 %	Mon 11 Jan	2010	9 403	-2,5
RO	Thursday	3	2	19:00	-7,8	-6,8	**8 724**	3,1 %	Thu 23 Nov	1989	10 248	n.a.
RS	Wednesday	2	2	19:00	-7,8	n.a.	**7 341**	-4,1 %	Fri 31 Dec	2010	7 656	n.a.
SE	Wednesday	23	2	8:00	-13,1	-9,8	**26 000**	-2,6 %	Mon 5 Feb	2001	27 000	9,0
SI	Wednesday	2	3	20:00	0,8	n.a.	**1 995**	1,3 %	Thu 26 Jan	2006	2 110	1,0
SK	Tuesday	1	2	9:00	-7,1	-7,5	**4 279**	-1,5 %	Tue 12 Dec	1989	4 471	n.a.
UA_W												

Table 5.3: National peak loads overview



Map 5.1: *Month of Peak Load*



Map 5.2: Historical Peak Load in 2011

5.2.3. NATIONAL COMMENTS ON LOAD AND PEAK LOAD

AT – Austria

Monthly peak load is not available. Therefore, the peak load on all of the third Wednesdays was taken.

BE – Belgium

Several load-shedding contracts with industrial customers are in force. The estimated contribution for 2011 is 261 MW. These contracts are part of the system services reserve and were in 2011 activated four times (but not at reference points), namely 22/06/2011, 22/10/2011, 09/12/2011 and 15/12/2011.

The maximum peak level during 2011 was measured the 12th January even though the average temperature observed during this day was 3°C higher than the average decennial temperature (2002-2011). The maximum Belgian peak load of 2011 almost equalled the maximum historic peak level measured the 1st of December 2010.

The monthly peak load used for the Belgian assessment is the maximum value of the real measurements and estimates of a particular month and not the maximum value of the hourly average values of real measurements and estimates that are entered on the ENTSO-E webpages.

Date	12 January 2011
Average temperature observed during the day (°C)	6,51°C
Deviation from normal or average temperature (°C)	+3,07°C
Hour (Central European Time)	17u45
Peak load (MW)	14314
Difference from last year peak load (%)	0,5%

Historic peak load (MW)	14391
Date of historic peak load	1 December 2010
Deviation from normal temperature (°C)	-8,5°C

CY – Cyprus

Due to the explosion at the ´Vasilikos´ Power Station and the reduction of the generation adequacy during the period that the max demand occurs, the value of 1100MW is estimated as max demand of the year 2011. The estimated max demand takes into account similar temperature levels of previous years, the reduction of demand due to energy saving during the crisis period and the cyclic load rejection program.

DE – Germany

Preliminary value for 2011, modifications may be possible.

FI – Finland

The peak value indicated was the one-hour average peak load. This was the historical peak load.

FR – France

Mild temperatures compared to normal conditions plus an economic down turn getting stronger at the end of 2011 pushed load down. Yearly peak load was 4.5 GW lower than the 2010 historical peak load.

IE – Ireland

Ireland experienced mild weather over the 2011/12 winter period, in contrast with the previous 2010/11 winter period which was very cold. The peak load in 2011 was down 9% on 2010, the mild winter being the main contributor to the decrease.

LT – Lithuania

Precise details only known for the year when historic instantaneous peak appeared.

NI – Northern Ireland

Northern Ireland experienced one of the mildest winters on record over the 2011/12 winter period. This was in stark contrast with the 2010/11 winter period which was one of the coldest winters on record.

NO – Norway

The date of historic high peak load is unsure.

PL – Poland

Provided peak load is instantaneous value with the measuring step amounted 15 minutes. There was no new historical peak load in 2011 due to fairly mild conditions in January, February and December 2011.

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PT – Portugal

The annual maximum load was 200 MW lower than in 2010

SI – Slovenia

The 2011 peak load was measured on the evening of March 2nd. Usually the peak load is observed in December or January. The reason for this is the fact, that the biggest industrial consumer increased its consumption in March.

SK – Slovakia

See national comments´ section for consumption.

5.3. GENERATING CAPACITY

5.3.1. ENTSO-E OVERVIEW

The NGC in the ENTSO-E system increased during the whole 2011. Respectively, NGC of ENTSO-E was higher in every month compared to 2010 (see Table 5.4).

GW	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NGC in 2010	884	885	888	891	894	895	898	901	904	905	908	911
NGC in 2011	902	904	903	904	908	912	915	918	922	927	930	933
Change in% between 2011 and 2010	**2,0**	**2,1**	**1,8**	**1,4**	**1,5**	**1,9**	**1,8**	**1,9**	**2,1**	**2,3**	**2,4**	**2,4**
Change in absolute value between 2011 and 2010	18	19	16	13	14	17	16	17	19	21	22	22

Table 5.4: Increase/decrease of NGC in whole ENTSO-E from 2011 to 2010 per month

The NGC evolution for different years is graphically illustrated in Figure 5.2. In 2011 the net generating capacity (NGC) growth shape was quite similar as in the previous year. Just 1 GW drop in March is noticeable. This fall is mainly due to NGC decreases in Germany (4.8 GW from February to March). The decrease of NGC in Germany is a result of the decisions of the German government to speed up the nuclear phase out starting with the shutdown of nuclear power plants in Germany immediately after the Fukushima catastrophe.

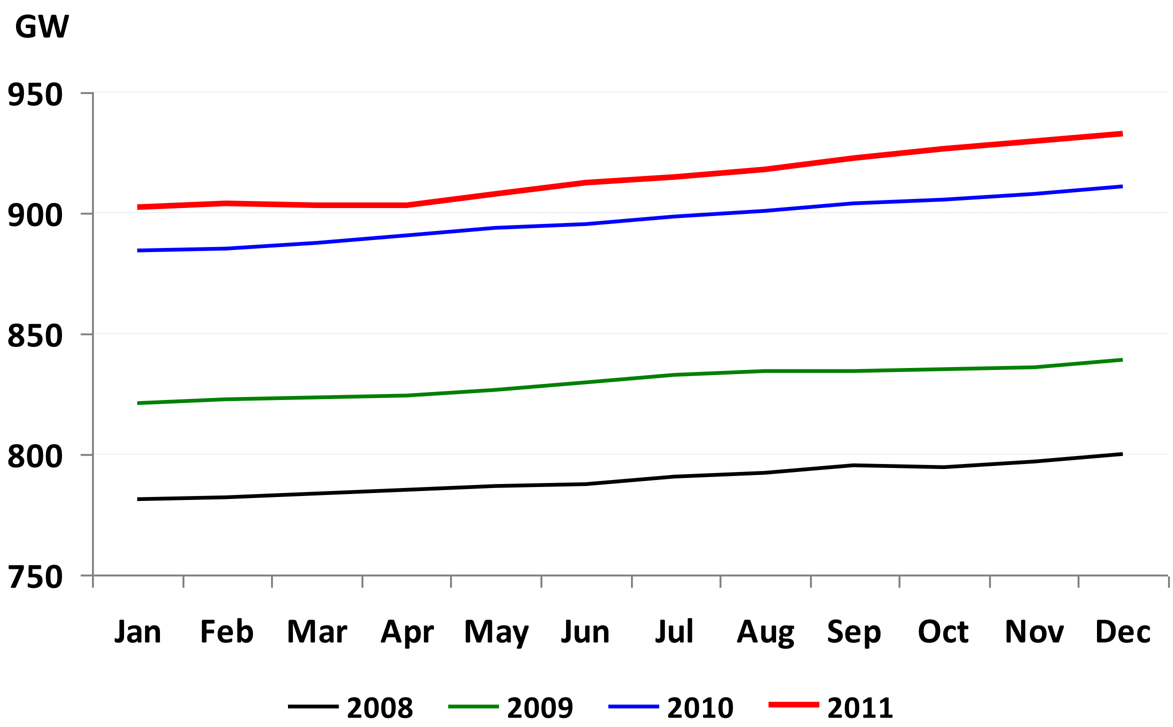

Figure 5.2: The evolution of the ENTSO-E NGC from year 2008 to 2011

The share of each individual primary source type as a percentage of the NGC in 2011 is presented in Figures 5.3 and 5.4. Crucial for the ENTSO-E generating capacity mix in 2011 were fossil fuels with 48,5%, followed by renewable energy sources with 30,5% (including renewable and run of river hydro power plants), nuclear power (~13,5%) and hydro power plants considered as non-renewable energy sources (7%).

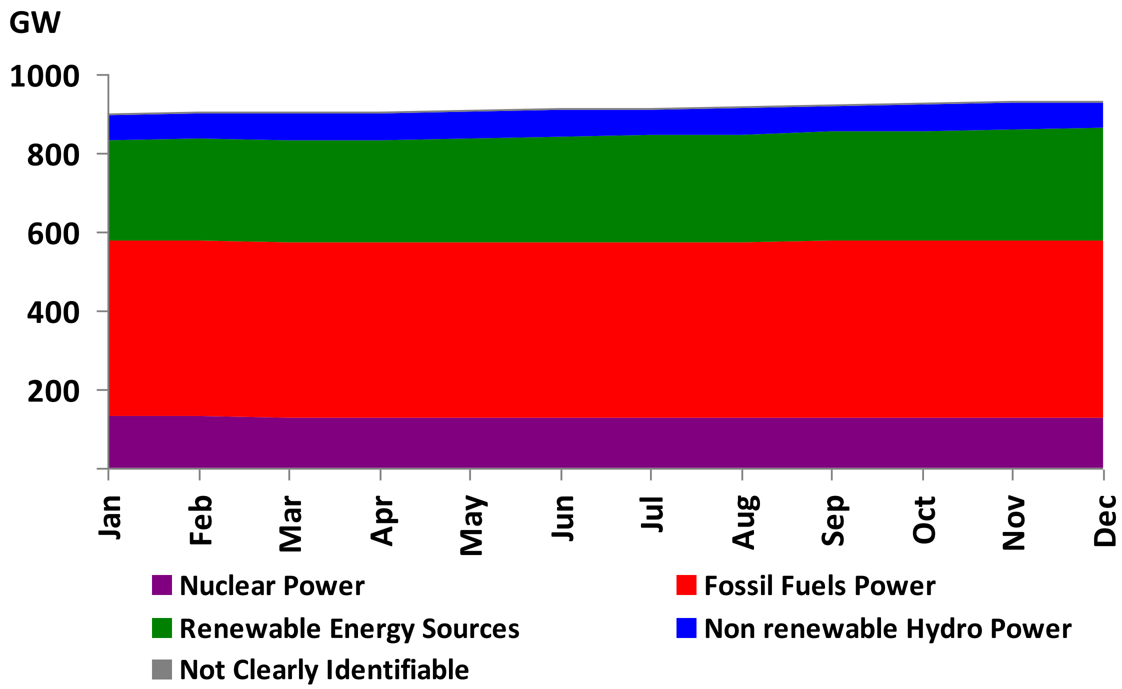

Figure 5.3: ENTSO-E generating capacity mix in 2011

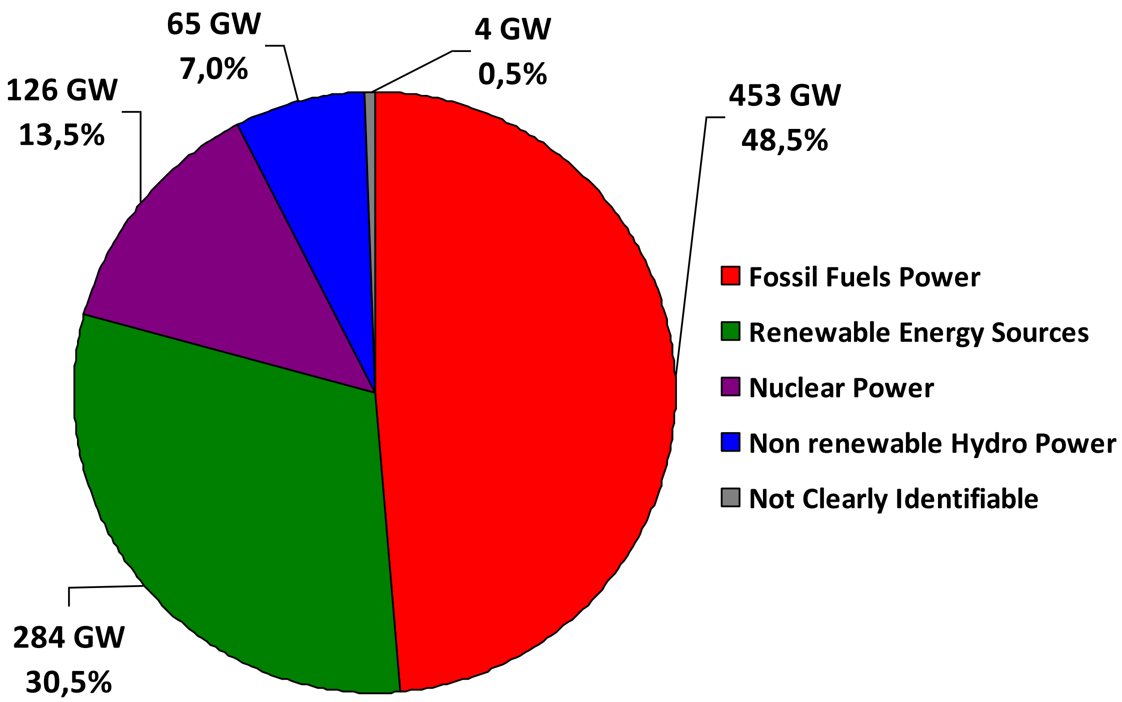

Figure 5.4: ENTSO-E generating capacity mix in December 2011 in%

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5.3.2. FOSSIL FUELS

The fossil fuels generating capacity was growing during the whole 2011 with only exception in period between March and April (1,3 GW drop). The total share of fossil fuels in the NGC in 2011 was almost 49%.

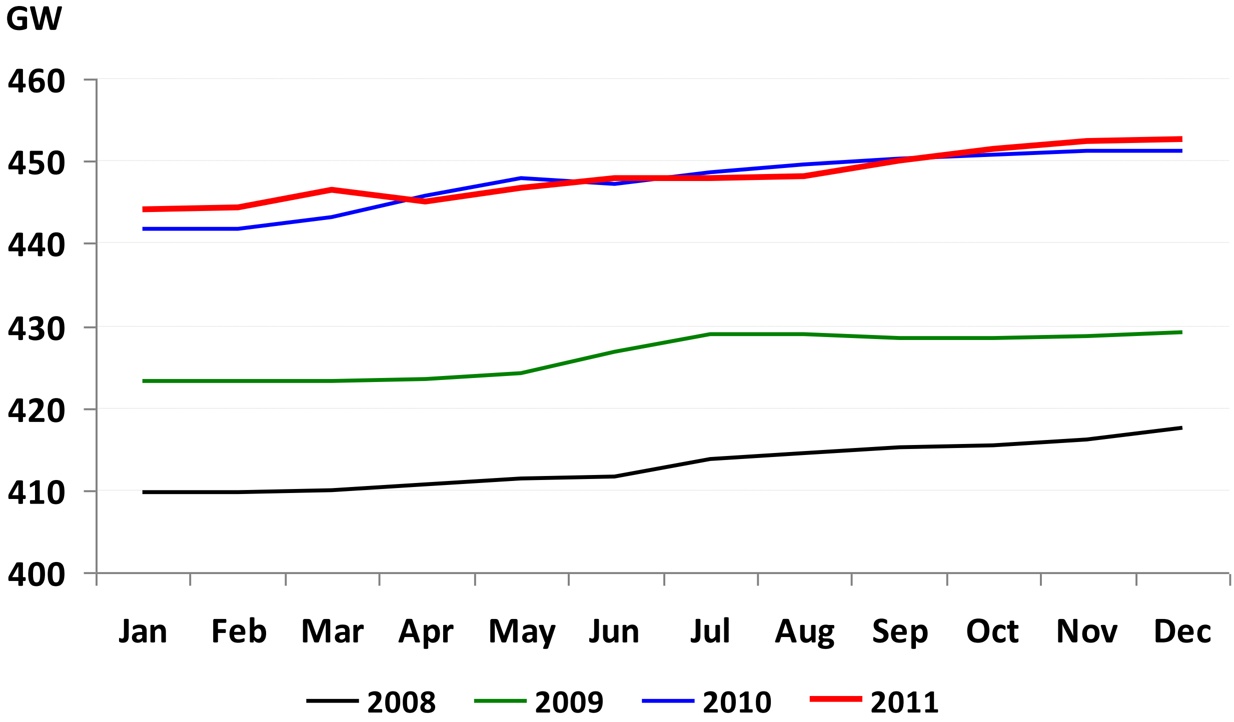

Figure 5.5: ENTSO-E Fossil Fuels generating capacity

In 2011 the generating capacity of fossil fuels in ENTSO-E was on average 0,15% higher than in 2010 (considering the month by month increase/decrease of fossil fuels). For example, in December 2011 the generating capacity of fossil fuels in ENTSO-E was 0,3% higher than in December 2010. This increase in fossil fuel generating capacity was also reported by certain countries (e.g. Hungary ~11%, followed by Great Britain 4,3%, Greece 4%, Ireland 3%).

The two most important categories of fossil fuel power plants were gas-fired units with a 42% share and hard coal units with a 26% share (see Figure 5.6 and Table 5.5 below).

The highest increase was recorded for gas (5,4% for example, in Hungary, Greece, Belgium, France, Great Britain) and oil-fired units (with 0,9%, caused primarily by an increase in Cyprus and Great Britain).

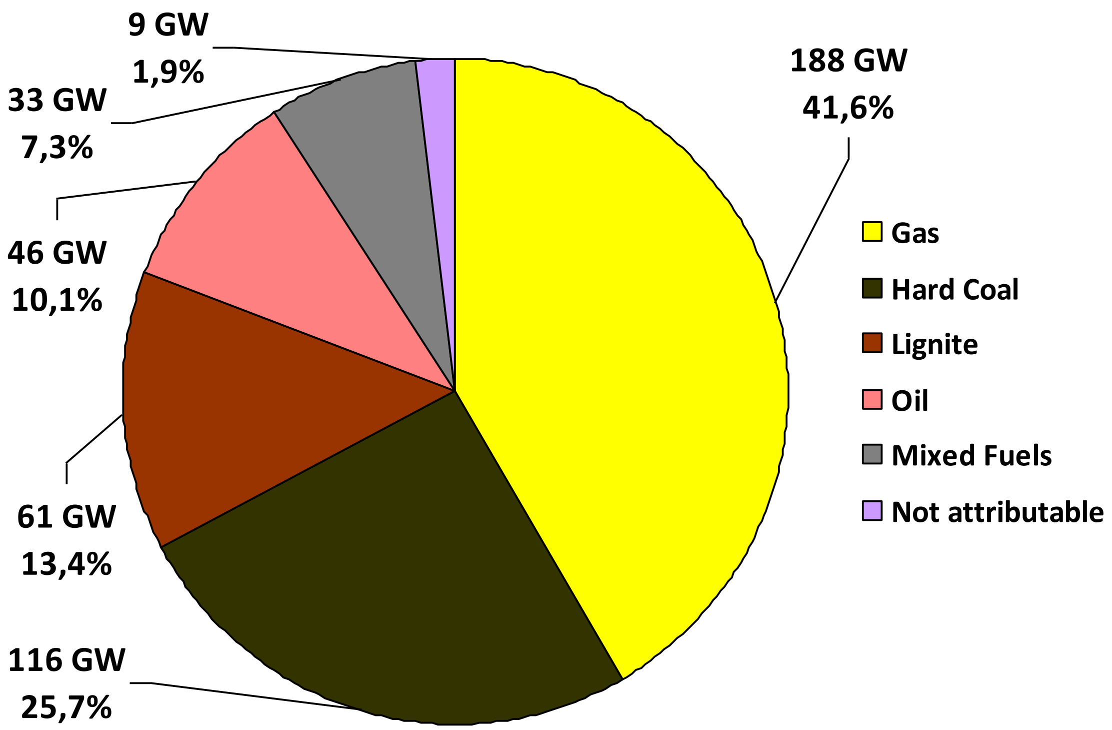

Figure 5.6: The share of the different fossil fuels in the total fossil fuel generating capacity in December 2011

The highest decrease (around 9,6%) was recorded for Not Attributable Fossil Fuels, and stemmed primarily from a decrease in Belgium Austria and France whilst Mixed Fuels units (about 8%), were influenced by decreases in Germany, Portugal and Republic of Serbia.

GW	December 2010	December 2011	Difference between 2011 and 2010	
			Absolute value	%
Fossil Fuels	451,3	452,7	1,4	0,3
Lignite	61,7	60,8	-0,9	-1,5
Hard Coal	120,0	116,2	-3,9	-3,2
Gas	178,9	188,5	9,6	5,4
Oil	45,4	45,8	0,4	0,9
Mixed Fuels	35,7	32,9	-2,8	-8,0
Not attributable Fossil Fuels	9,5	8,6	-0,9	-9,6

Table 5.5: Overview of Fossil Fuels generating capacity mix in December 2010 and 2011

5.3.3. RENEWABLE ENERGY SOURCES

This category also includes run-of-river hydro power plants and other types of hydro power plants, which could be considered as renewable energy sources and biomass power plants as a separate category.

The total share of the RES as a percentage of the NGC was more than 30% for the whole of ENTSO-E in December 2011. Respectively, the generating capacity of RES was 12,2% higher than in 2010.

GW	December 2010	December 2011	Difference between 2011 and 2010	
			Absolute value	%
RES	253,4	284,4	31,0	12,2
Wind	80,7	89,7	9,0	11,2
Solar	26,1	47,5	21,5	82,4
Biomass	14,4	12,8	-1,6	-10,9
Renewable hydro	129,8	131,0	1,2	1,0
Other RES	2,5	3,3	0,8	30,9

Table 5.6: Overview of RES generating capacity mix in December 2010 and 2011

Looking at Figure 5.7, it is evident that approximately 46% of the RES generating capacity belonged to renewable hydro, 32% to wind, 17% to solar, 4% to biomass and ~1% to other RES.

Comparison with RES share between 2011 and 2010

When considering the share of RES, the comparison between 2010 and 2011 is shown in Figures 5.7 and 5.8. The share of renewable hydro capacity took a major part of the total RES capacity and was at 51% in 2010 and 46% in 2011. In 2011 the share of installed wind capacity as part of the total RES remained the same as the last year at 32%. Hydro share of capacity decreased by 5%, whilst the share of solar installed capacity increased by 6%. This indicates that solar technology still remains the most popular among investors in RES capacity. The same tendency was observed in 2010.

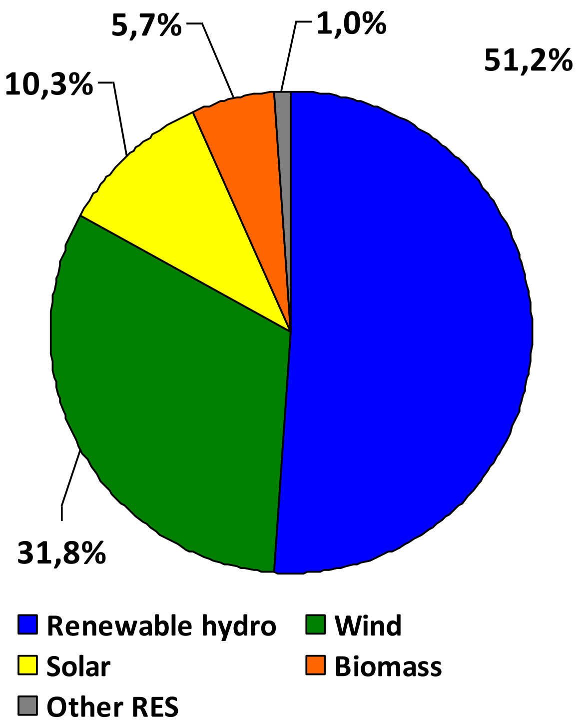

Figure 5.7: ENTSO-E renewable energy sources generating capacity mix in December 2010

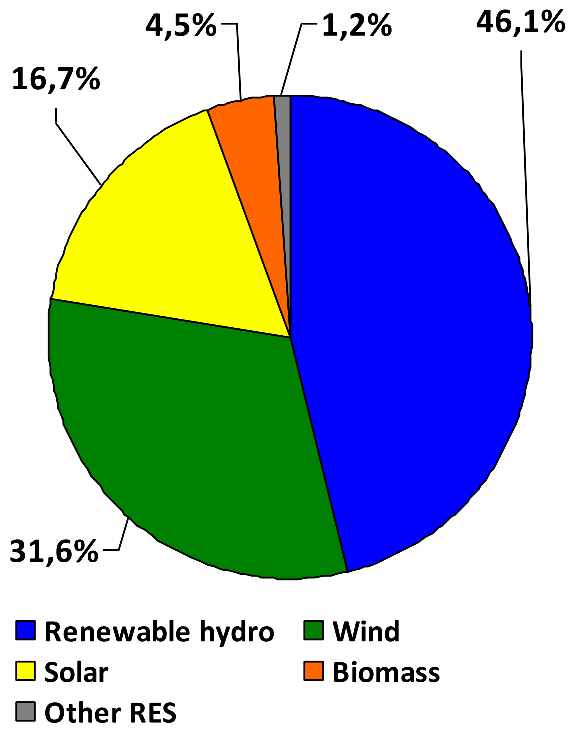

Figure 5.8: ENTSO-E renewable energy sources generating capacity mix in December 2011

5.3.4. NUCLEAR POWER

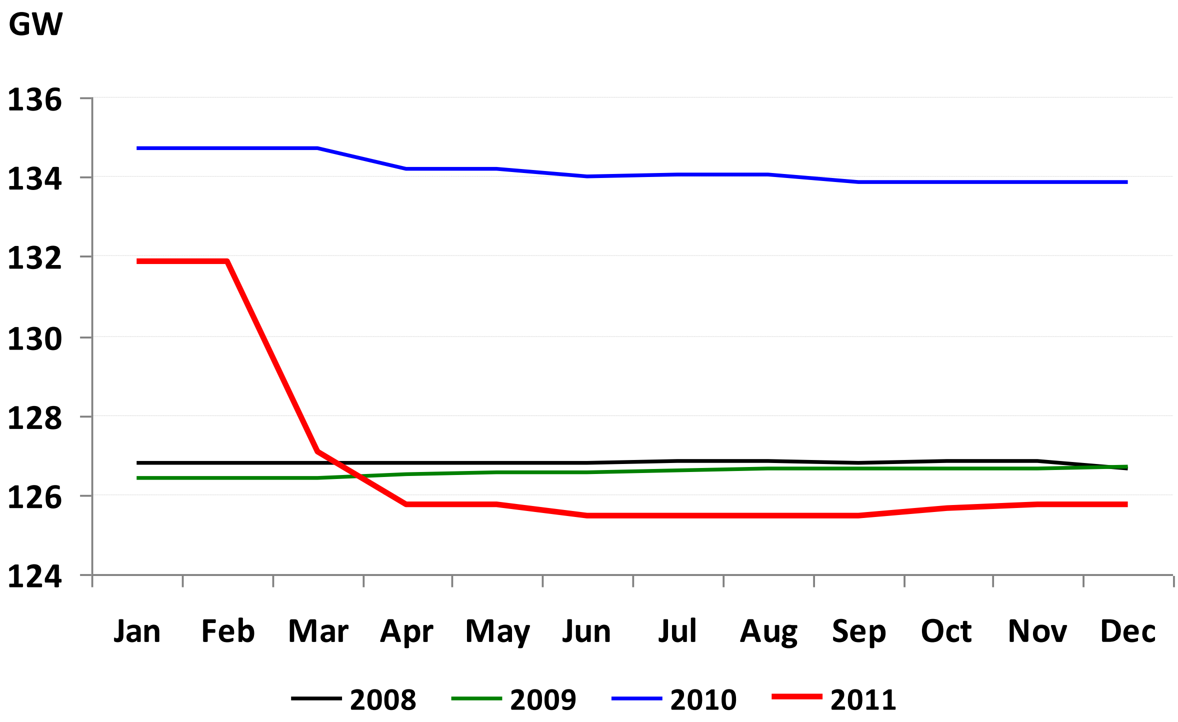

Figure 5.9: ENTSO-E Nuclear generating capacity in 2008, 2009, 2010 and 2011

The evolution of the nuclear generating capacity since 2008 is shown in Figure 5.9. During the year 2011 the nuclear generating capacity fluctuated. It was mainly affected by Germany.

The share of the nuclear generating capacity in some individual ENTSO-E countries as a part of the total installed nuclear capacity in ENTSO-E in 2011 is shown in Figure 5.10; the category “others” means countries with a share of less than 5%.

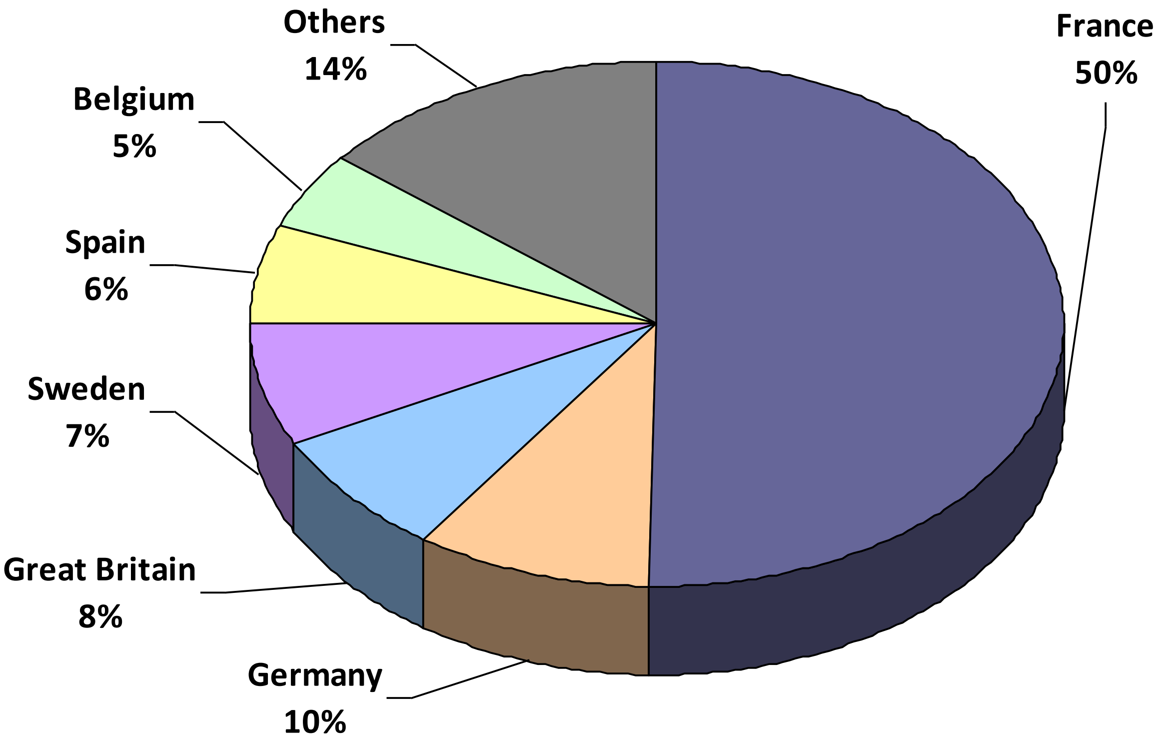

Figure 5.10: The share of nuclear generating capacity in the individual countries as a part of the total installed nuclear capacity in ENTSO-E in 2011

France (50%) together with Germany (10%) made up 60% of the total ENTSO-E nuclear generating capacity. A similar situation was reported in 2010 – 63% of total nuclear generating capacity was covered by France and Germany.

5.3.5. NON-RENEWABLE HYDRO POWER

Unless otherwise stated, this chapter considers hydro power plants’ (HPP) generating capacity without the part considered as a renewable energy source.

The evolution of the generating capacity of this kind of power plant is shown in Figure 5.11. It is clearly visible that during 2011 significant changes or fluctuations were not recorded, non-renewable hydro generating capacity remained quite stable.

The evolution of the total hydro power plants’ generating capacity is shown in Figure 5.12.

The total HPP installed capacity has not recorded any evident fluctuations during the year 2011.

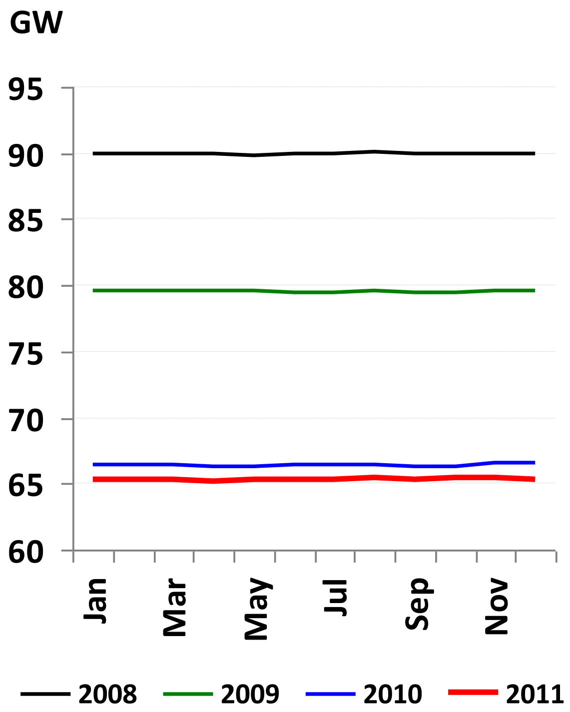

Figure 5.11: Non-renewable hydro power plants generating capacity from 2008 to 2011

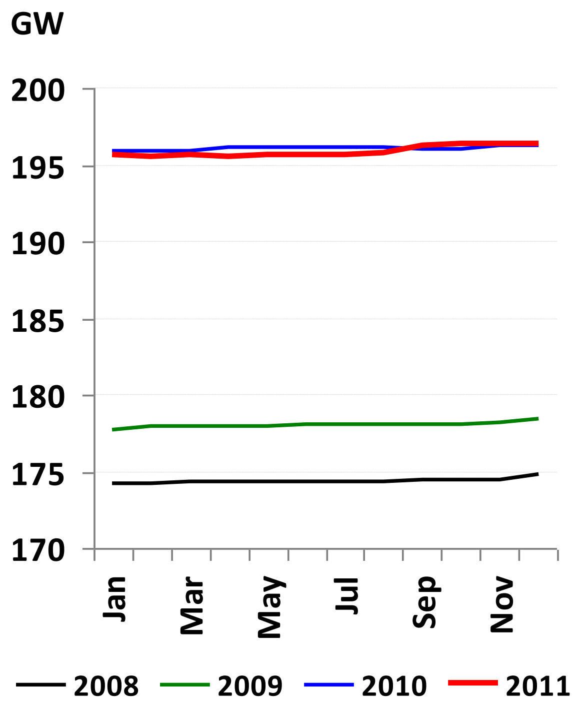

Figure 5.12: Total hydro power plants generating capacity from 2008 to 2011

5.3.6. NATIONAL COMMENTS ON GENERATING CAPACITY

AT – Austria

599MW capacity considered as not attributable.

BE – Belgium

Notwithstanding the decommissioning of some major gas units total capacity rose during 2011. Compared to December 2010, 1335 MW of additional generation capacity was connected to the grid in December 2011. The significant rise in installed capacity of solar PV (1135 MW compared to 2010) played the main role in the increase in total capacity. Besides the change in installed capacity of solar PV, the commissioning of thermal plants (mainly gas – 832 MW), onshore wind (168 MW) and biomass/waste-plants (180 MW) also had a positive impact on the total installed generation capacity.

In some cases fossil fuel power stations burn a mixture of fossil fuels and renewable energy sources. The installed generation capacity of this type of units is allocated to the different fuels proportionally to the importance of each energy source in the used fuel combination. In 2011, the installed generation capacity of this type of units totalled 670 MW. An application of the allocation rule explained above resulted in the following split-up: 533 MW of fossil fuel power stations and 137 MW of installed generating capacity of renewable energy sources.

The Elia grid is limited to a voltage level of 30 kV or higher. Fossil-fuel power stations connected to a voltage below 30 kV and for which no actual measurements are provided to Elia, are classified as non-attributable fossil-fuel power stations. Due to a reclassification the amount of non-attributable fossil-fuel power stations decreased during 2011 compared to 2010.

FI – Finland

All hydro capacity is placed in ´storage´ category as the division between run-of-river and storage is not available. There is no pumped storage capacity

FR – France

French net generating capacity rose by 2.6 GW in 2011.

2 new CCGT has been commissioned together with 0.9 GW of on-shore wind farms and 1.3 GW of solar generation, ground-mounted farms mostly.

IE – Ireland

There was no new conventional generation connected in 2011. Wind generation capacity increased by 13%. Ireland's only pumped storage station was out of operation for whole of 2011.

IS – Iceland

Renewable capacity – geothermal.

IT – Italy

On the basis of the provisional data, the installed generating capacity rose by nearly 5.5 GW (+5.4%). Wind farms and photovoltaic solar parks made a very significant contribution to this increase for a total installed capacity of over 2.7 GW of new plants (+6.9%). Thermal power plants increased by 3.6%, corresponding to 2.6 GW. Hydropower power plants were fairly stable.

Data reported are provisional.

NI – Northern Ireland

No new conventional generation was commissioned in Northern Ireland during 2011. Wind Generation capacity increased from 361MW to 405MW and is expected to increase dramatically over the coming years. 9 Generating Units are capable of running on different fuels.

The data has identified the fuel type which these have been run on and this has been added into the appropriate fuel type. The 2 coal Units (348MW) in NI are also capable of running on Heavy Fuel Oil at a higher capacity of 476MW. However, the units normally run on coal and so are included in the coal category. It should also be noted that Units included in the ´Oil´ category are run on ´Distillate Oil´ and not ´Heavy Fuel Oil´. Wind figure includes small Scale wind. Also included in NCG Renewable are Small Scale Tidal and Landfill Gas. Only small scale Hydro exists in Northern Ireland. Non-identifiable NGC Estimated for Northern Ireland.

PL – Poland

In 2011 a new conventional thermal unit was commissioned in Bełchatów PP. This was the biggest unit in the Polish power system with a net capacity of 787 MW.

PT – Portugal

The year 2011 also saw the commissioning of new wind power stations totalling approximately 375 MW. Hydro capacity was reinforced with the commissioning of new generating units, totalling 431 MW, in the run-of-river plants of Picote and Bemposta.

SK – Slovakia

Generating capacity as of the end 2011 increased by 372 MW. The nuclear power plant Jaslovské Bohunice increased installed capacity by 120 MW (total capacity is 1000 MW). Two units of gas turbines (64 MW and 58 MW) started operation in 2011. In the first half of 2011 a boom in solar power plants installations was observed due to good legislative conditions. The total installed capacity of solar power plants reached 507 MW (generating capacity of Slovakia is 8152 MW).

5.4. UNAVAILABLE CAPACITY

5.4.1. ENTSO-E OVERVIEW

The Unavailable Capacity refers to the part of the Net Generating Capacity which is not reliably available to power plant operators due to limitations on the output of power plants. It consists of the Non-Usable Capacity, System Services Reserve, Maintenance and Overhauls and Outages.

GW	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	238,1	245,5	261,3	300,1	313,7	301,8	311,1	313,7	310,8	295,8	264,0	237,1
2011	243,2	247,4	265,1	302,4	325,7	323,2	321,4	336,0	339,2	323,2	307,5	271,1

Tab. 3.7: ENTSO-E Unavailable Capacity overview

The structure of the unavailable capacity in 2011 is shown in Figure 5.14.

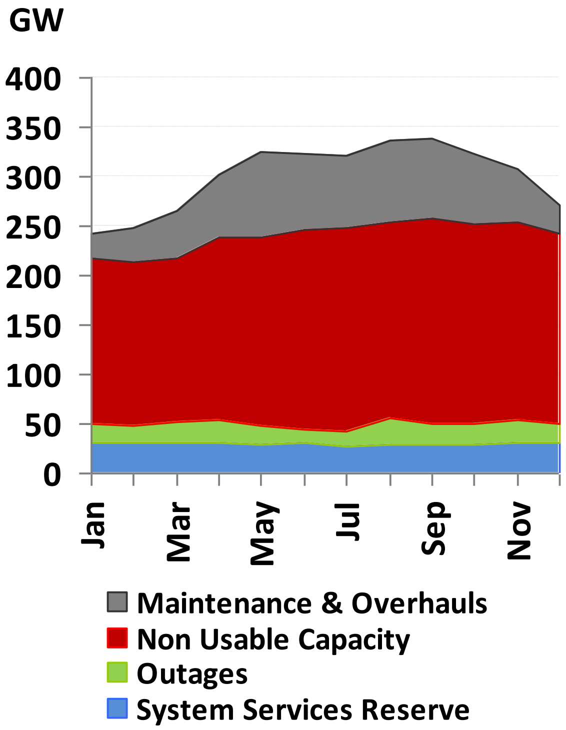

Figure 5.14: Unavailable Capacity overview for 2011

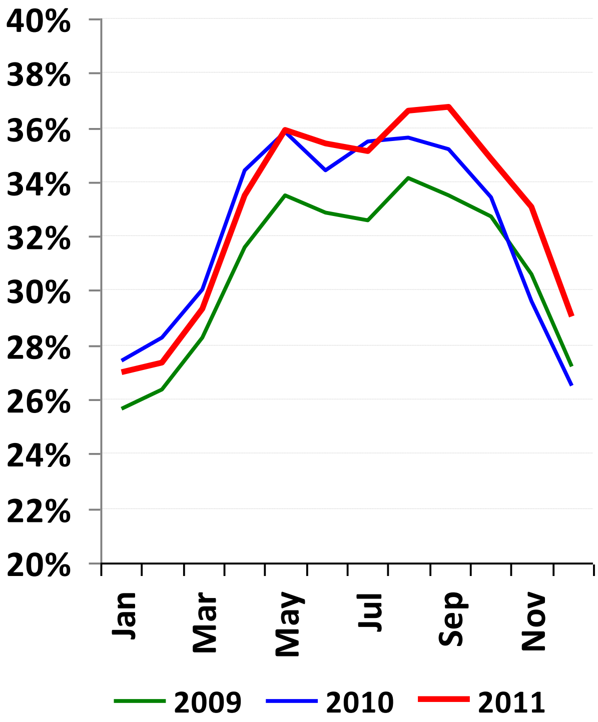

Figure 5.15: Comparison of Unavailable Capacity as a part of NGC in 2009, 2010 and 2011

Most of the Unavailable Capacity was non-usable capacity, that is, the capacity representing reductions of the NGC due to different reasons. This was followed by maintenance and overhauls, system services reserve, and outages. The total amount of unavailable capacity in 2011 was higher when compared to year 2009, although when compared to 2010 it was higher from June to December. With regards to the remaining months, the total amount of unavailable capacity in 2011 was lower than in 2010. The comparison between 2009, 2010, and 2011 is shown in Figure 5.15. It is evident that the Unavailable Capacity in 2011 was between 2009 and 2010 values in the first half of 2011 and the highest in the second part of 2011.

5.4.2. NON-USABLE CAPACITY

This capacity represents aggregated reductions of the NGC due to the following causes:

- Limitation due to an intentional decision by the power plant operators (e.g. mothballed power stations which may be re-commissioned if necessary or power stations bound by local authorities which are not available for interconnected operation).
- Unintentional temporary limitation (e.g. power stations of which the output power cannot be fully injected due to transmission constraints).
- Limitation due to fuel constraints management.

For more details see the methodology document[12].

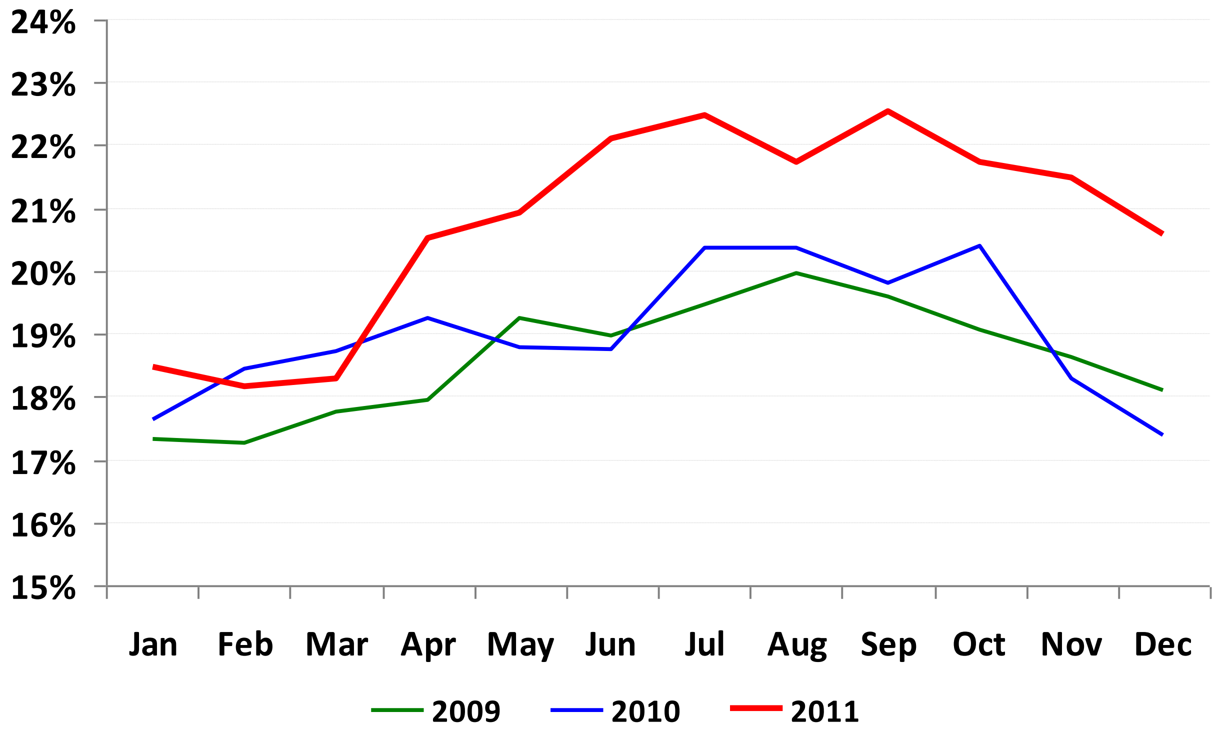

Figure 5.16: Comparison of Non-Usable Capacity as a part of NGC in 2009, 2010 and 2011

Figure 5.16 shows the Non-Usable Capacity as a part of the NGC in 2009, 2010 and 2011. The lines for 2009 and 2010 are very similar, however the values for 2011 are higher than in previous years for almost every month (with the exceptions being February and March). It seems like the 8 nuclear decommissioning in Germany increased the renewable share in generating capacity of Germany and thus its non usable share.

5.4.3. SYSTEM SERVICES RESERVE

The system services reserve (SSR) is a part of the NGC which is required to compensate for

[12] https://www.entsoe.eu/dataportal/statistics/docs/ENTSOE_SAR_Data_Collection_Guidelines.pdf

real-time imbalances or to control the voltage, frequency and so on (the primary control reserve, the secondary control reserve and the amount of tertiary reserve can be activated within one hour and are required by the TSO according to its operating rules). The system services reserve does not include the longer-term reserve prior to one hour.

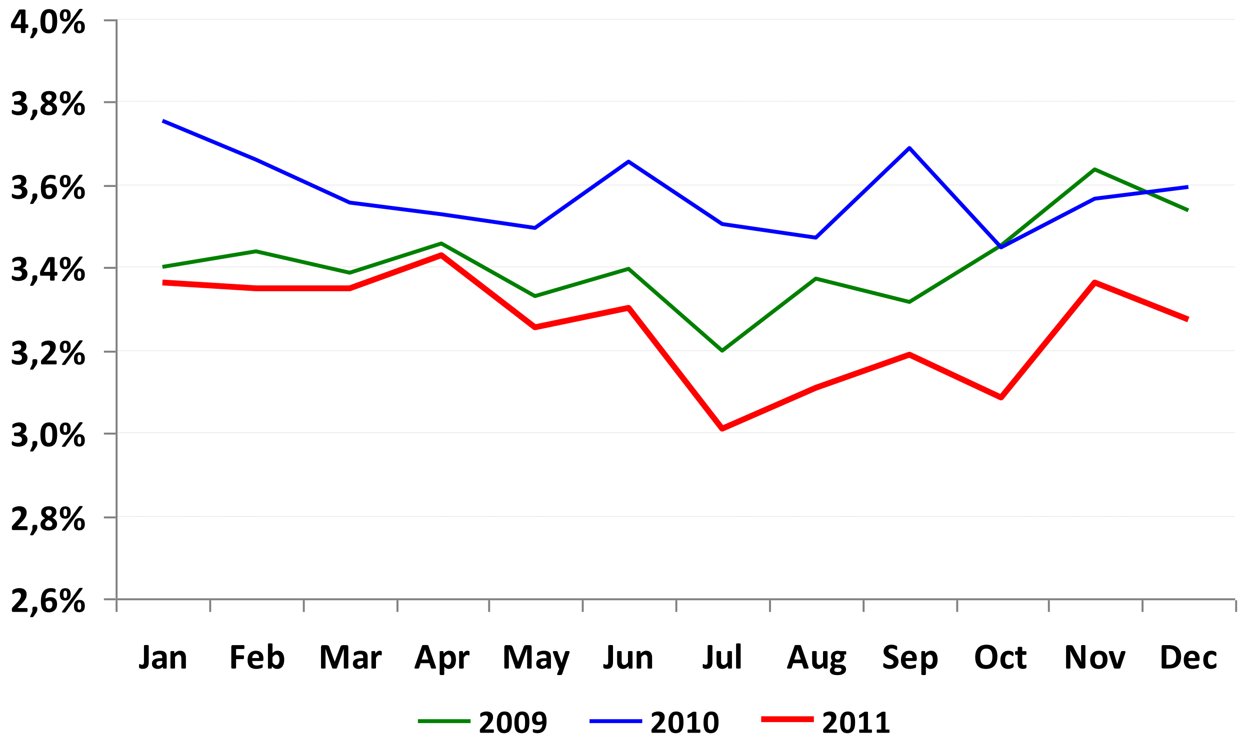

Figure 5.17: System Services Reserve as a part of NGC in 2008, 2009 and 2010

One can see from Figure 5.17 that SSR as a part of the NGC for 2011 is placed below 2009 and 2010, that is, the SSR had a lower share of the NGC in 2011 than in the previous two years. The most likely cause of this is the fact that in 2011 the SSR value was lower when compared to the years 2009 and 2010, whilst even the NGC in 2011 was lower in most of the months.

The remaining Unavailable Capacity subcategories, that is, outages and maintenance and overhauls, were lower in 2011 than in 2010 (the exceptions were March, August, October and November). However, these, as well as the above mentioned statements, are affected by the fact that the data for 2008 and 2009 was not provided by every TSO, whereas for 2010 it was. Another possible reason relates to the fact that NGC in 2011 is lower than in 2010.

5.4.4. NATIONAL COMMENTS ON UNAVAILABLE CAPACITY

BE – Belgium

Non-usable capacity is calculated on the basis of production profiles based on real measurements of the year under consideration. This implies that non-usable-capacity-values can differ highly from one year to another. However, in 2011 the monthly non-usable capacity at reference points differed only slightly from those measured in 2010.

In 2011 the system service reserves in the Elia control area consisted of 106 MW primary control power, 798 MW minutes reserves (137 MW secondary reserve, 400 MW tertiary reserve and 261MW of the minute reserve are load shedding contracts with industrial customers) and 440 MW other reserves. The 440 MW 'Other reserves' are contractually imposed by Elia on the producer with the largest unit in our control area and fall under the operational responsibility of the producer concerned.

FI – Finland

Outages are included in the non-usable capacity. Maintenance and overhauls include only units more than 100 MW, whilst others are in non-usable capacity.

FR – France

Nuclear units experienced the fourth highest availability rate in the whole history of the French nuclear industry.

LU – Luxembourg

Non-usable capacity consists of temporary lack of wind.

NI – Northern Ireland

Non-usable capacity figure is primarily due to wind generation not being at maximum availability.

NO – Norway

In normal conditions.

PT – Portugal

In 2011, renewable generation supplied approximately 46% of the electricity demand (18% wind, 22% hydro and 6% other), below the 52% registered the year before, when very favourable meteorological conditions were met. In fact, annual wind power production registered a decrease for the first time, even with the commissioning of new wind power locations. Despite the commissioning of new hydro capacity, hydro power production remained 8% below the average.

SK – Slovakia

The combined cycle power plant located in Malženice (430 MW) was out of operation from 20th August 2011 until the end of the year.

5.5. RELIABLY AVAILABLE CAPACITY

The Reliably Available Capacity (RAC) of a power system is the difference between the Net Generating Capacity and the Unavailable Capacity. The RAC is the part of the NGC which is actually available to cover the load at a reference point.

Figure 5.18 shows the RAC as a part of the NGC in absolute values for 2011. Minimum values were reported during the summer months (May, August and September, from 564 GW to 572 GW), when the Unavailable Capacity was at its highest levels. On the other hand, Figure 5.19 shows the share of the RAC as a percentage of the NGC in 2009, 2010 and 2011. One can see that the course of the lines in each reported year is very similar, and its share in the NGC in each month of 2011 was lower than in the previous year of 2009, but higher than in 2010. This was probably caused by the fact that the NGC in 2011 was lower compared to the 2010 but higher than in 2009.

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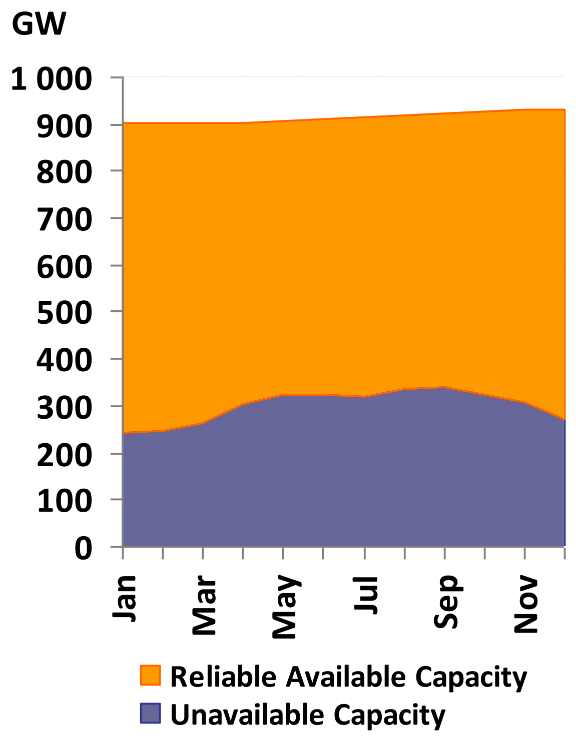


Figure 5.18: RAC as a part of NGC in absolute values for 2011

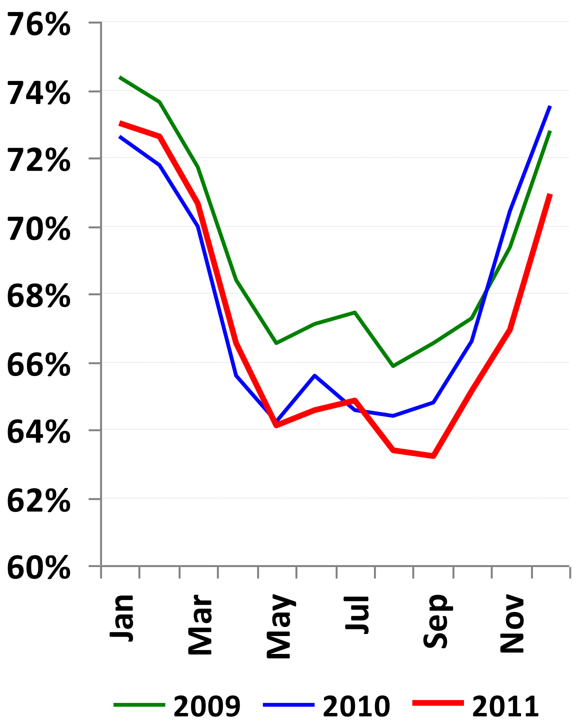


Figure 5.19: RAC as a part of NGC in 2009, 2010 and 2011

5.6. GENERATION ADEQUACY

5.6.1. REMAINING CAPACITY

The remaining capacity (RC) is the part of the net generation capacity (NGC) left in the system to cover any unexpected load variation and unplanned outages at a reference point. The remaining capacity of a power system is the difference between the reliably available capacity and the load.

ENTSO-E OVERVIEW

GW	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	198,3	200,1	230,2	226,7	217,5	212,0	210,1	219,0	206,0	185,5	205,3	182,7
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	167,0	167,5	187,3	190,9	176,3	179,4	186,5	199,8	175,1	173,8	164,0	187,7

Tab. 3.8: ENTSO-E Remaining Capacity overview

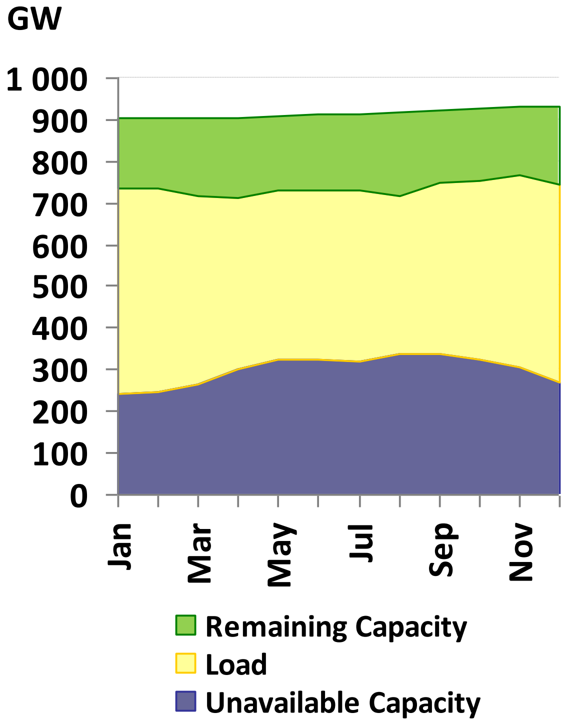


Figure 5.20: Remaining Capacity as a part of NGC in absolute values for 2011

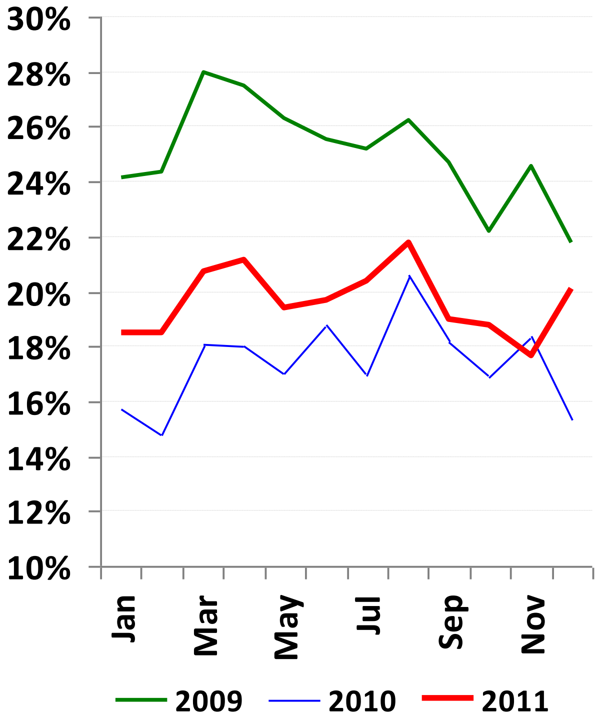
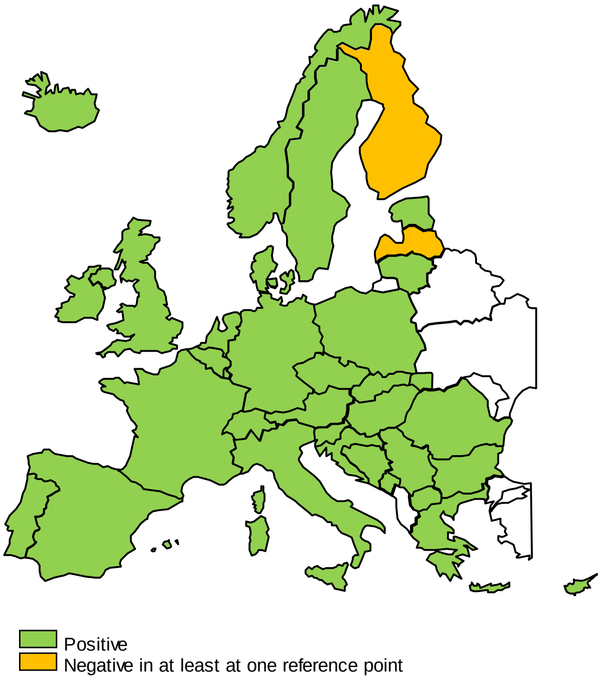


Figure 5.21: Remaining Capacity as a part of NGC in 2009, 2010 and 2011

Compared to 2010, remaining capacity was higher in 2011 with the exception of November (see Figure 5.21). The reasons for this may well be twofold. Since both the unavailable capacities and load were on average lower in 2011 than 2010, the calculated remaining capacity ended up being higher.

5.6.2. NATIONAL REMAINING CAPACITY

In the majority of the ENTSO-E countries the RC was positive during the whole year (without considering the influence of exchanges). Only Finland and Latvia reported negative RC. For Finland it was reported for five reference points (February and June to September); for Latvia it was only reported for one reference point (December). This situation is shown on Map 5.3 which highlights the countries with a number of reference points and with a negative RC.



*Map 5.3: Reference points with negative RC in 2011
(without exchanges)*

When looking at the exchanges (see Map 5.4), the situation was much better for Finland and also Latvia (no negative RC including exchanges). In addition, for Ukraine-West one reference point (February) was reported with negative RC including exchanges.

*Map 5.4: Reference points with negative RC in 2011
(including exchanges)*

5.6.3. REMAINING MARGIN

ENTSO-E OVERVIEW

The Remaining Margin (RM) in a power system is the difference between the Remaining Capacity and the Margin Against Peak Load. It is the part of the Net Generating Capacity left in the system to cover any unexpected load variation and unplanned outages over the analysed period of which the Margin Against Peak Load is representative.

As reference points in the System Adequacy Retrospect are monthly, the related Margin Against Peak Load must also be monthly, and this is called the margin against monthly peak load (MaMPL). It is calculated as the difference between the actual monthly peak load metering and the load at the reference point.

GW	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
Remaining Capacity	167,0	167,5	187,3	190,9	176,3	179,4	186,5	199,8	175,1	173,8	164,0	187,7
Margin Against Monthly Peak Load	56,5	56,0	59,1	40,2	37,8	42,8	47,6	56,6	42,6	40,9	51,6	54,5
Remaining Margin	110,5	111,5	128,3	150,7	138,5	136,6	138,9	143,3	132,4	132,9	112,4	133,3

Tab. 3.9: ENTSO-E Remaining Margin overview for 2011

Throughout the entire year of 2011 the amount of Remaining Margin was always positive and higher than 10%. This means that the ENTSO-E system as such did not rely on imports of electricity from neighbouring counties and had enough generating capacity to cover its demand at any time during the year. These values are generally higher than in 2010, as the MaMPL parameter was lower by approximately 5% on average, whereas the difference between the MaMPL in 2009 and 2008 was 12% on average. In January and February, the Remaining Margin was below 10%. Figures 5.22 and 5.23 show this based on the aggregated values of the different countries.

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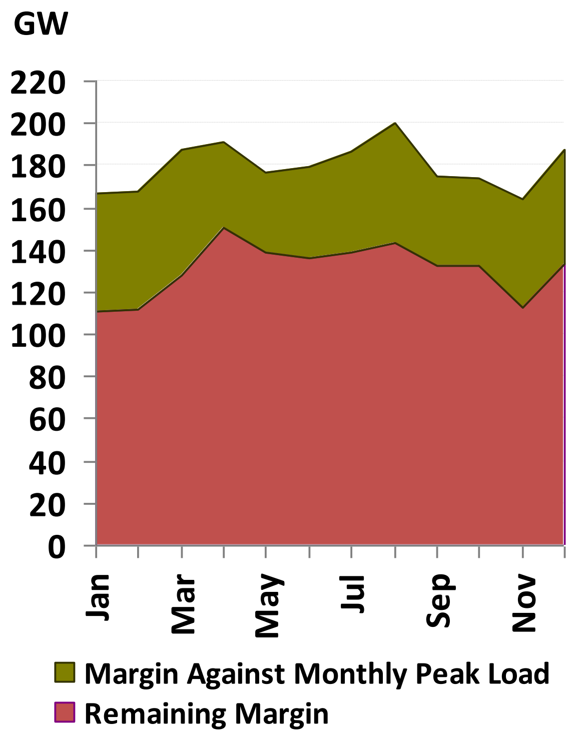

Figure 5.22: Remaining Margin plus Margin Against Monthly Peak Load in absolute values for 2011

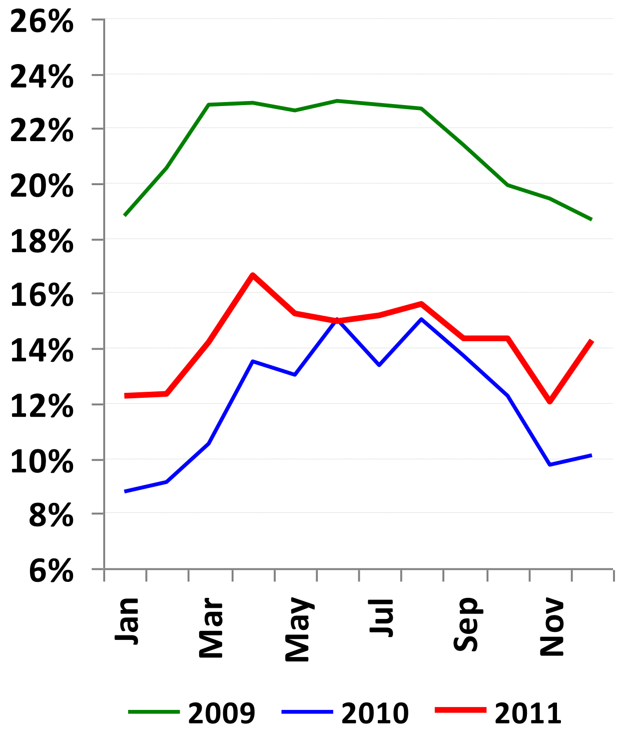

Figure 5.23: Remaining Margin as a part of NGC in 2009, 2010 and 2011

5.6.4. NATIONAL COMMENTS ON REMAINING CAPACITY AND REMAINING MARGIN

BE – Belgium

In 2011 the remaining capacity without exchanges at the reference time was sufficient to reach an adequacy between generation and consumption in Belgium without having to rely on import. Only in January 2011, the remaining capacity without exchanges at the reference time was lower than 5% of the net generation capacity. Due to the fact that the analysis is only done for 12 moments in a year, not all critical moments are captured. Reality has shown us that the desired safety level for the generation-load balance was not attained during week 4, 6 and 50 of 2011. The lowest remaining capacity was attained on December 16th, namely a remaining capacity of -565MW due to the combined forced outage of two nuclear power units.

An important remark should be made here. At the assessed reference time (11 am) solar PV can be used to produce electricity. The solar generating capacity has increased significantly in 2011, namely with 1135 MW compared to December 2010. This increase in installed capacity can indeed be used at the reference time but not at peak times during winter months (January till March and October till December). For instance in December 2011 at 6 pm CET the remaining capacity would be reduced with 130MW assuming everything else unchanged.

CY – Cyprus

The explosion of Vasilikos power station resulted in the loss of 865 MW of generation adequacy. A cyclic load rejection schedule was activated to manage the situation.

FR – France

Mild temperatures and deterioration in economic conditions ended up in a low demand and no adequacy stress.

IE – Ireland

Non-usable capacity figure is primarily due to wind generation not being at maximum availability.

PT – Portugal

The average remaining capacity was 35% of the NGC, with a minimum of around 29% in July.

SI – Slovenia

In 2011 Remaining Capacity in Slovenia was positive during the whole year. In the tables, 100 % of NPP Krško is considered although half of its generation belongs to Croatia in accordance with the international agreement. No problems associated with the system adequacy were observed.

SK – Slovakia

Remaining capacity of Slovakia was positive during the whole year 2011 (with and also without considering exchanges).

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