European Network of
Transmission System Operators
for Electricity

ENTSO-E Report

SYSTEM ADEQUACY RETROSPECT 2010

European Network of Transmission System Operators for Electricity

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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[1] incorporated in accordance to the 3rd Energy package to pursue the role and tasks provided to TSOs cooperation in the European rule setting process and network planning.

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 in 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 acceptability of the transmission infrastructure
- Taking positions on issues that can have an impact on the development and operation of the transmission system or market facilitation

[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); ENTSO-E (Union for the Coordination of the Transmission of Electricity); UKTSOA (UK Transmission System Operators Association)

- Enhancing communication and consultation with stakeholders and the transparency of TSO operations.

II. ABOUT THE SYSTEM ADEQUACY RETROSPECT REPORT

This ENTSO-E System Adequacy Retrospect 2010 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 2010 with a focus on the power balance, margins and generation mix.

This System Adequacy Retrospect 2010 analysis can serve as a tool for monitoring 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 (further referred to only as 'SAR 2010') report has been prepared based on data collected from each ENTSO-E country in April 2011 and are based on provisional data for most of TSOs. Compared to the previous year, when national data correspondents were requested to provide complete data sets for both 2008 and 2009, and when data for some ENTSO-E countries were missing, the data for year 2010 have been provided in full by every national data correspondent.

Although this report focuses on data for 2010 (which were still provisional for most of TSOs at the end of the data collection period), it is very interesting to also compare the outcomes for 2010 with the results from previous years (the two previous years at least). While processing this SAR 2010, the aim was to also provide readers with this kind of comparative assessment. However, because the databases for 2008 and 2009 were incomplete when processing the SAR 2009, this influenced the evaluation process and the assessment process for SAR 2010 as well. Even if such comparisons were made and described in this report, the results would obviously have lower informative value. Therefore, the reader should keep this fact in mind during the reading of 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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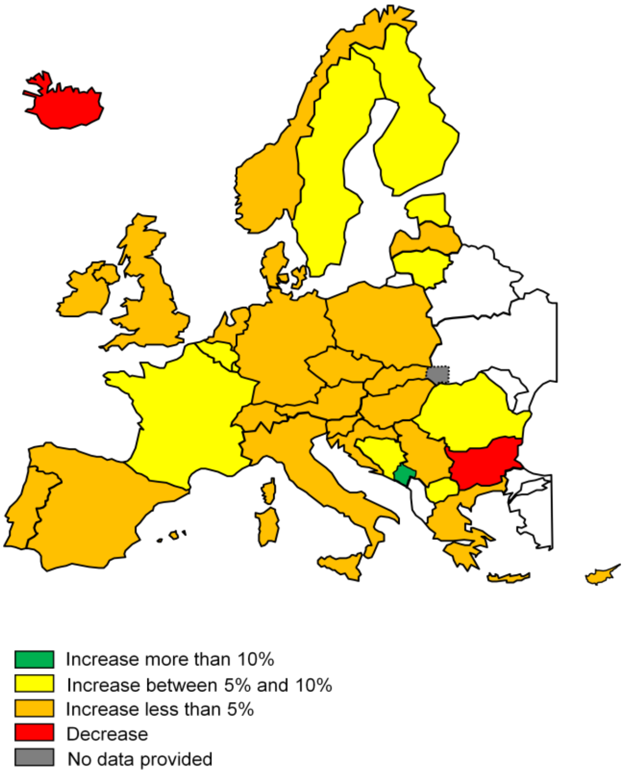
2. EXECUTIVE SUMMARY

ENERGY BALANCE

	2009	2010	Difference between 2010 and 2009	
			Absolute value	%
Total Generation	**3 144 173**	**3 399 844**	**255 671**	**8%**
Fossil Fuels	1 623 203	1 653 043	29 840	2%
Nuclear Power	825 531	895 421	69 890	8%
Total Non-renewable Hydro Power	79 091	41 943	-37 148	-47%
Renewable Energy (incl. renewable Hydro)	589 270	634 047	44 778	8%
Not identifiable energy sources	10 914	10 849	-65	-0.6%
Imports	336 478	391 355	54 877	16%
Exports	333 956	385 687	51 731	15%
Exchanges Balance	**2 522**	**5 668**	**3 146**	**125%**
Pumping	39 875	45 575	5 700	14%
Consumption	**3 106 819**	**3 365 136**	**258 317**	**8%**

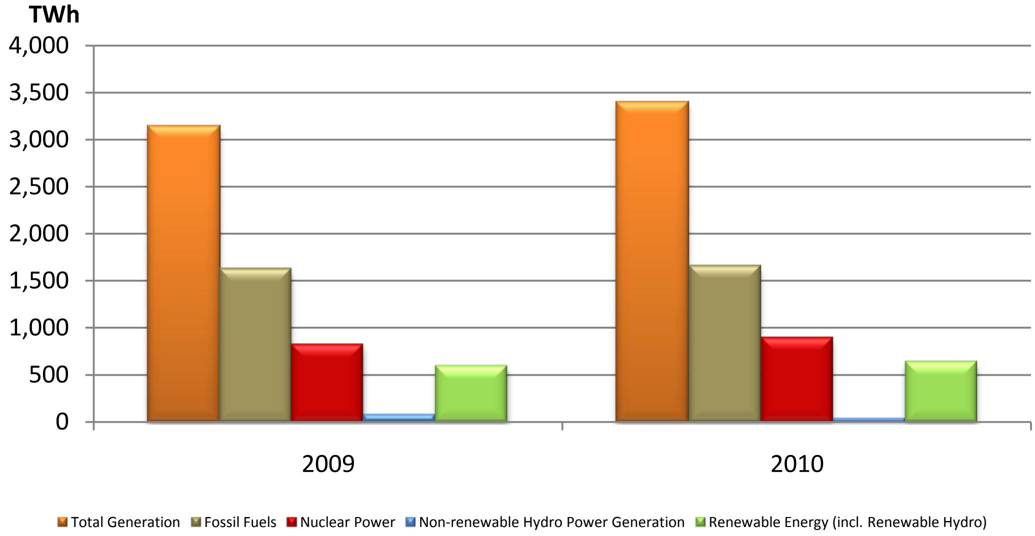
ENTSO-E Energy Summary (GWh)

The influence of the worldwide financial and economic crisis on the ENTSO-E power system that started in 2008, was not as significant in 2010 as in 2009. The figures shown in this report remark that the electricity consumption is strongly influenced by the economic recovery. However, the colder winter periods at the beginning and end of the year had the biggest impact, increasing the consumption reported by almost every country.



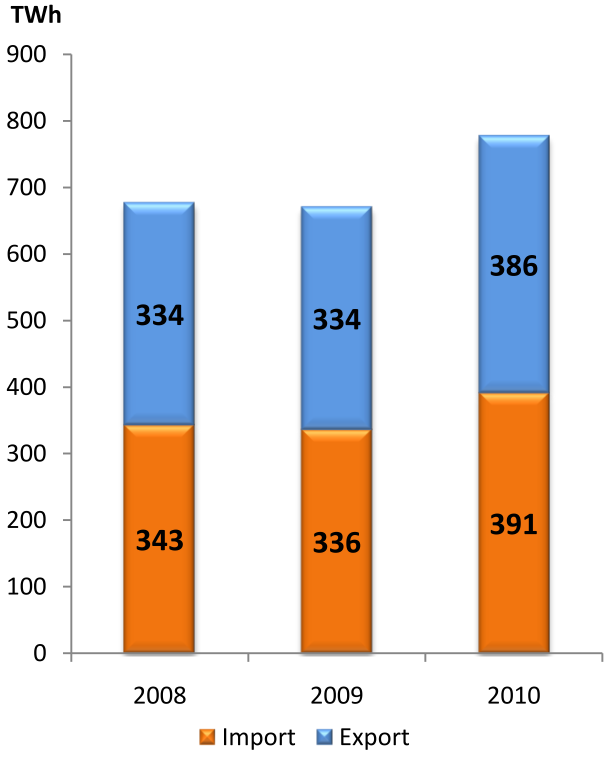
Consumption growth per country in 2010

The total ENTSO-E consumption in 2010 was 258 TWh higher (8% increase) than in 2009, while the total ENTSO-E generation was about 250 TWh higher in 2010 than in 2009 (8% increase). All the fuel generation categories, except oil, enlarged their production. The most striking raise of generated energy was reported for nuclear power plants (8%), followed by renewable generation (4%).

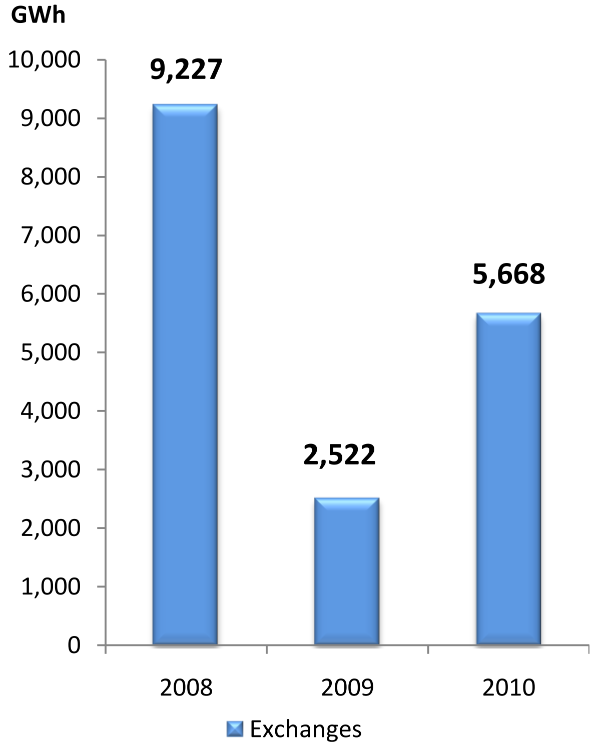


ENTSO-E generation overview

Most of the energy (49%) was produced by fossil fuel power plants (coal, oil, etc.). The second most-used fuel was nuclear (26%), followed by renewable energy sources (19%). Non-renewable hydro power generation covered 1.2% of the total generation. The rest was provided by a category covering energy sources that 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 2010. The net energy flows (imports minus exports) of the whole ENTSO-E system were more than 5.6 TWh. The main net exporting ENTSO-E countries were the same as in the previous year, meaning France (30.5 TWh), Germany (17 TWh), and the Czech Republic (14.9 TWh); the main net importers within ENTSO-E were once more Italy (44.2 TWh) and Finland (10.5 TWh).

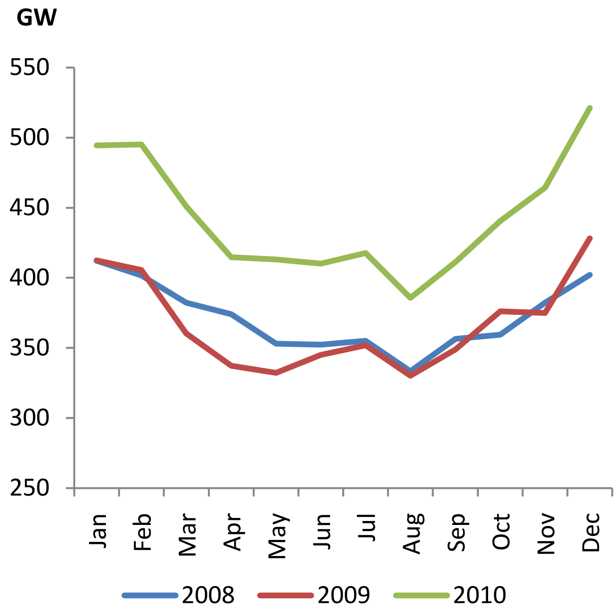
POWER BALANCE

	2009	2010	Difference between 2010 and 2009	
			Absolute value	%
Net Generating Capacity	**839 233**	**895 610**	**56 377**	**7%**
Fossil Fuels	429 177	448 673	19 496	5%
Nuclear Power	126 713	132 234	5 521	4%
Total Non-renewable Hydro Power	77 316	66 488	-10 828	-14%
Renewable Energy (incl. renewable Hydro)	196 517	231 912	35 395	18%
Not identifiable energy sources	7 270	5 668	-1 602	-22%
Reliable Available Capacity	**610 772**	**658 511**	**47 739**	**8%**
Imports	39 461	40 053	592	1.5%
Exports	36 974	40 671	3 697	10%
Load	**428 097**	**521 247**	**93 150**	**22%**

ENTSO-E Power Balance Summary (MW)

[3] „net export"/„net import" means that the difference between imports and exports was in favour of export or import respectively.

All the comparisons and assessments made for power balance are done for the month of December 2010 (unless otherwise stated). The load in each month of 2010 was higher than in previous years (21% on average). There are present differences in the countries month by month when comparing the load increase; however, the total ENTSO-E result is in favour of load growth compared to the previous years.



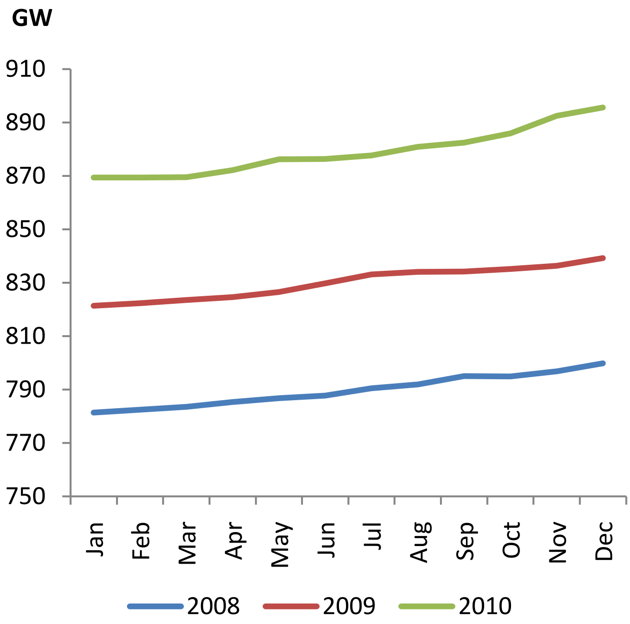
ENTSO-E Load[4]

Thirteen countries recorded a new absolute historical peak load value in 2010 (e.g. Cyprus, Switzerland, Norway, Poland, etc.).

The net generating capacity (NGC) was increasing during the whole of 2010 without any decrease. Crucial for the ENTSO-E generating capacity mix in 2010 were the fossil fuels with slightly more than 50% followed by renewable energy sources (almost 26% including renewable hydro power plants), nuclear power (almost 15%) and hydro power plants considered as a non renewable energy source (about 8.5%). Very similar values were also observable in 2009. The fossil fuels generating capacity increased by about 5% and nuclear by 4%; on the other hand, the generating capacity of renewable energy sources (including renewable hydro) increased by 18%.

The minimum values of reliably available capacity (RAC) in 2010 were reported during the summer period (May, July and August), when unavailable capacity was at the highest level. In absolute values the RAC in each month of 2010 was slightly higher than in previous years when its share of the NGC was lower (with a few exceptions).

[4] The figures are influenced by a lack of information for years 2008 and 2009.

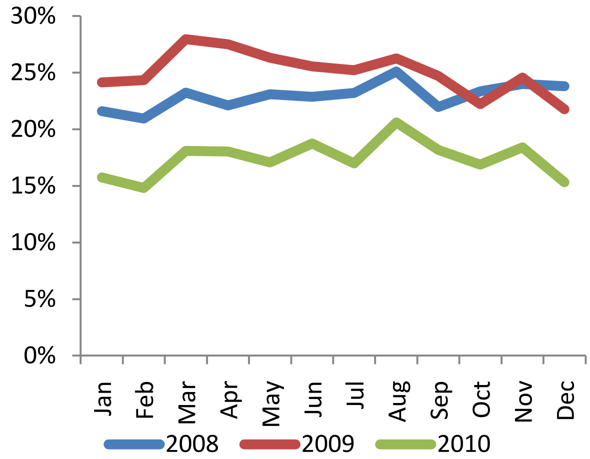


ENTSO-E Net Generating Capacity[5]

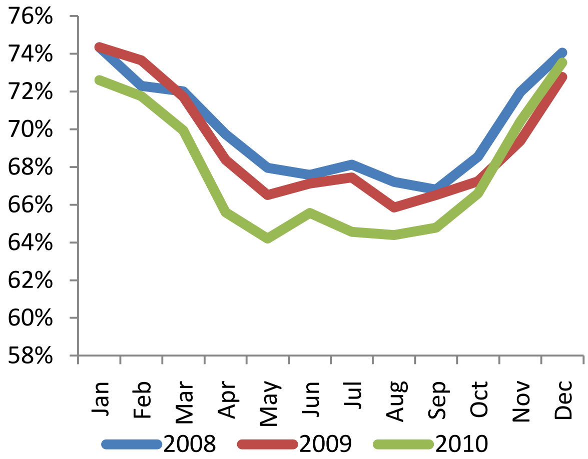
GENERATION ADEQUACY

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	168 652	163 935	181 983	173 616	181 593	180 052	183 381	198 712	174 603	185 493	191 231	190 248
2009	198 306	200 087	230 158	226 691	217 519	211 950	210 144	218 983	206 014	185 464	205 295	182 675
2010	136 769	128 787	157 214	157 356	149 486	164 304	148 970	181 476	160 458	149 591	164 133	137 264

ENTSO-E Remaining Capacity Overview (MW)



ENTSO-E Remaining Capacity as a part of NGC

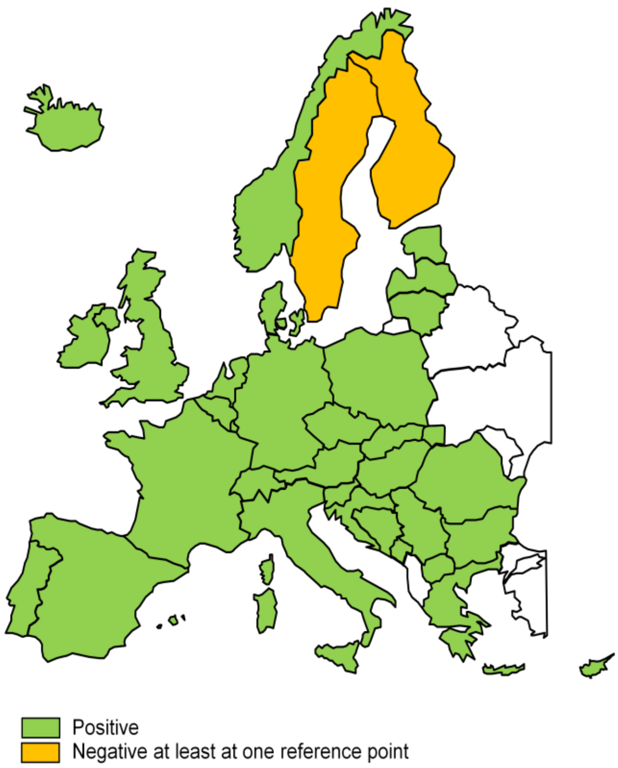


ENTSO-E Reliable Available Capacity as a part

[5] The figures are influenced by a lack of information for years 2008 and 2009.

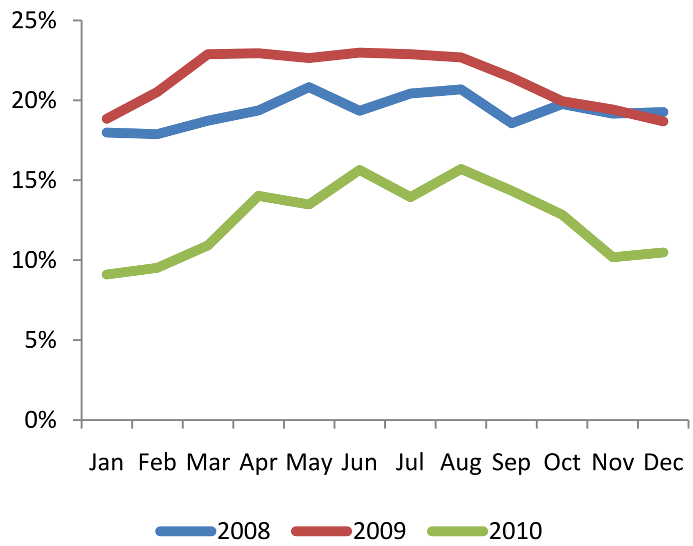
of NGC

The remaining capacity (with consideration of the importing/exporting capacity) was lower than in previous years during the whole of 2010. The reason for this could have been the significantly higher load and Unavailable Capacity in this year compared to 2009 and 2008.



Number of reference points with negative RC (w/o exchanges)

During the whole of 2010 the remaining margin parameter was positive and higher than 5% of the NGC, i.e. the ENTSO-E system did not rely on imports of electricity from neighbouring countries and had enough generating capacity to cover its demand at any time during the year.



3. METHODOLOGY

3.1. SUMMARY

The ENTSO-E SAR report is published by 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[6].

The system adequacy of a power system in this report is 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 within 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[7].

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

[6] https://www.entsoe.eu/resources/publications/system-development/sar-reports/
[7] CET/CEST – Central European Time/ Central European Summer Time

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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 that is not reliably available to power plant operators due to limitations of 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 be monthly too 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 the definitions mentioned previously are illustrated in Figure 3.1

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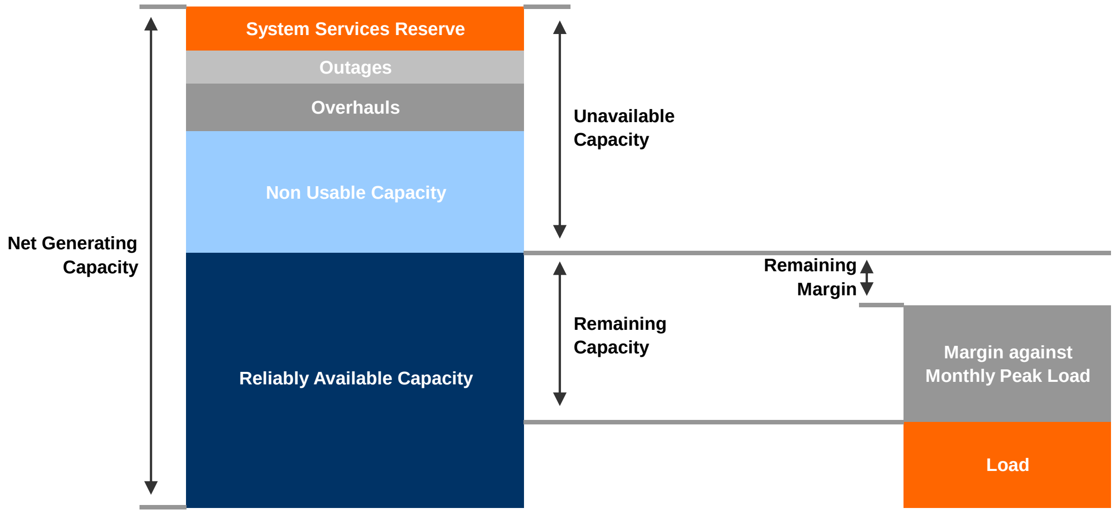

Figure 3.1: Generation adequacy analysis

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 might 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 2010 report all of the data correspondents have provided the data. This means there is no gap in the data provided from the point of view of country representativeness.

A separate issue, however, is 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; i.e., if no data were available for particular category for the TSO, the option “n.a.” (not available) should have been chosen. Many correspondents have used this option for some categories/subcategories; as a consequence of this, the summation of some subcategories for the whole ENTSO-E area does not necessarily have to be equal to the ENTSO-E summary value of the main category.

A very good example of this fact could be the hydro category, which has been divided into two subcategories: run-of-river, and storage and pumped storage. For some countries such a division was not feasible, and therefore the correspondents provided only the total value for the hydro category (the rest was "n.a."). Therefore, for example, the ENTSO-E summation of run-of-river category and the storage and pumped storage category does not match the total of the ENTSO-E hydro category.

4. ENERGY BALANCE

4.1. ENTSO-E ENERGY DATA SUMMARY

	2009	2010	Difference between 2010 and 2009	
			Absolute value	%
Total Generation	**3 144 173**	**3 399 844**	**255 671**	**8%**
Fossil Fuels	1 623 203	1 653 043	29 840	2%
Nuclear Power	825 531	895 421	69 890	8%
Total Non-renewable Hydro Power	79 091	41 943	-37 148	-47%
Renewable Energy (incl. renewable Hydro)	589 270	634 047	**44 778**	**8%**
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Imports	336 478	391 355	54 877	16%
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Pumping	39 875	45 575	5 700	14%
Consumption	**3 106 819**	**3 365 136**	**258 317**	**8%**

Table 4.1: ENTSO-E Energy Summary (GWh)

The difference between the total generation value for the whole ENTSO-E, reported in the Table 4.1 above, and the sum of respective subcategories in the same table is caused by the fact, that not every TSO was able to provide ENTSO-E with complete data sets for hydro power plants subcategories (the data was not available to the TSOs). The mentioned difference is about 5%.

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 started at the end of 2008. Its consequences were first visible in 2008, and 2009 was influenced much 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 (Figure 4.1).

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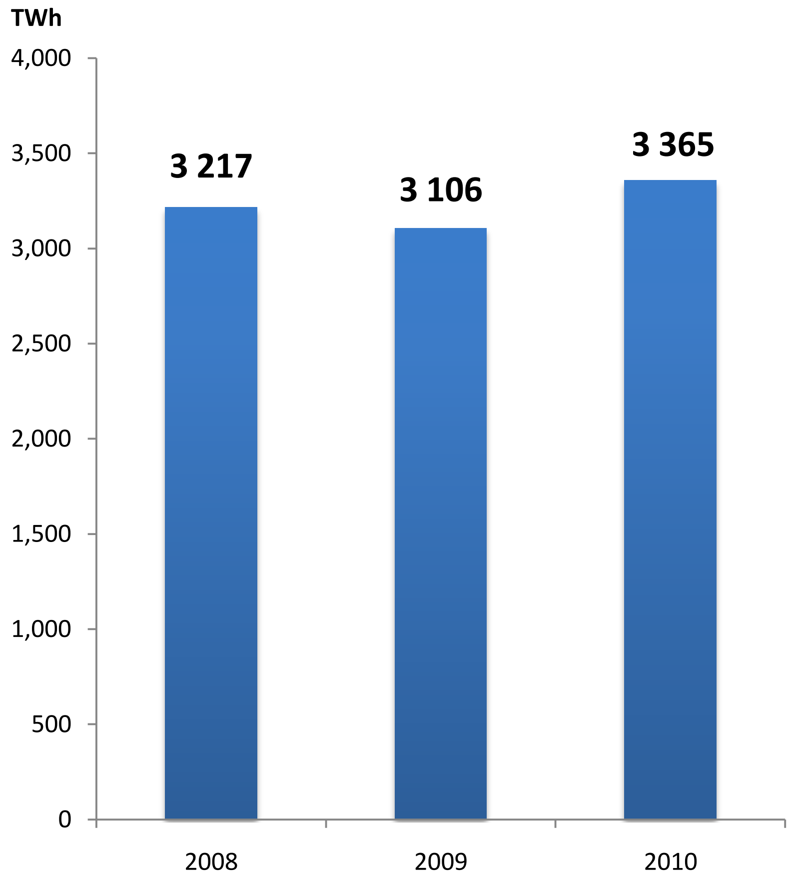
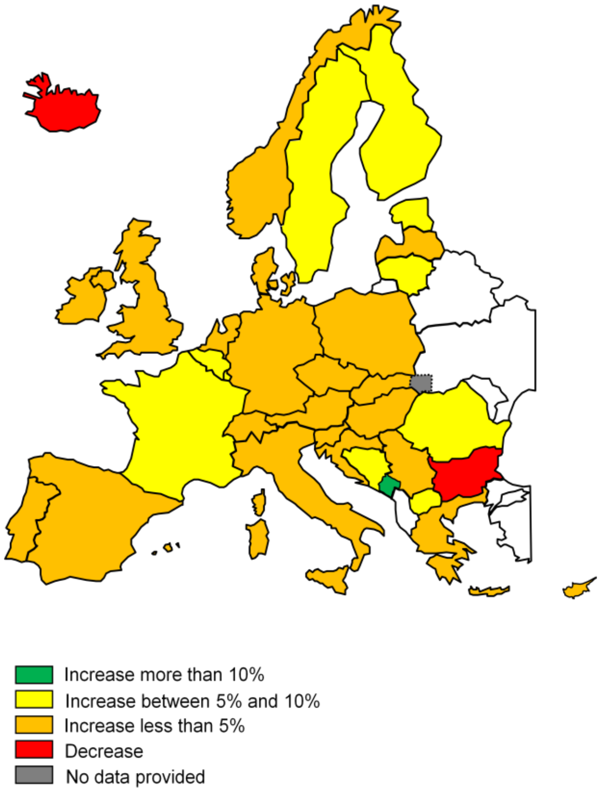


Figure 4.1: Consumption for 2008, 2009 and 2010

The total consumption in ENTSO-E increased from about 3 100 TWh in 2009 to 3 365 TWh in 2010, which means a surplus of about +8% (approx. 258 TWh) compared to 2009.

The only countries with decreasing consumption were Iceland (-1%) and Bulgaria (-2%). In the remaining countries the total consumption increased. On the other hand, the highest increases were reported by Montenegro (33%), Finland (8%), Luxemburg (8%), Estonia (7%), Bosnia and Herzegovina (6.5%), the Former Yugoslavian Republic of Macedonia (6%), France (5.5%), Belgium (5.7%), and Romania (5.5%).

The situation for the total consumption in 2010 compared to the consumption in 2009 for all of the countries is shown on Map 4.1.



Map 4.1: Consumption growth per country in 2010

The average annual temperatures in most of the ENTSO-E countries in 2010 were lower than in 2009 (see Table 4.2 below). The exceptions were Italy, Iceland, Greece and Cyprus, with no more than 1 ºC higher annual temperatures in 2010. Therefore, this colder winter period over most of Europe in 2010 could be one of the reasons for the increase in the electricity consumption.

	2009	2010	2010 minus 2009
	Average temperature [°C]	Average temperature [°C]	Average temperature [°C]
AT	n.a	n.a.	n.a.
BA	n.a	n.a.	n.a.
BE	11.0	9.7	-1.3
BG	12.4	12.4	0.0
CH	16.0	8.5	-7.5
CY	19.3	20.2	0.9
CZ	9.1	7.2	-1.9
DE	9.9	7.8	-2.1
DK	n.a	7.0	n.a.
EE	6.1	5.0	-1.1
ES	16.4	n.a.	n.a.
FI	0	n.a.	n.a.
FR	12.4	11.4	-1.0
GB	9.2	8.0	-1.2
GR	17.4	18.0	0.6
HR	17.0	14.0	-3.0
HU	11.8	10.6	-1.2
IE	9.4	8.2	-1.2
IS	4.8	5.1	0.3
IT	15.5	16.3	0.8
LT	8.0	6.6	-1.4
LU	9.53	8.6	-0.9
LV	6.0	5.6	-0.4
ME	n.a	16.0	n.a.
MK	n.a	12.8	n.a.
NI	9.0	8.2	-0.8
NL	10.0	9.1	-0.9
NO	7.7	4.7	-3.0
PL	8.8	7.6	-1.2
PT	17.9	17.6	-0.3
RO	11.0	9.6	-1.4
RS	13.6	13.0	-0.6
SE	3.8	1.9	-1.9
SI	11.5	10.7	-0.8
SK	10.8	10.3	-0.5
UA_W	n.a	8.0	n.a.

Table 4.2: Temperature overview per country (°C)

4.2.2. NATIONAL COMMENTS ON CONSUMPTION

AT – Austria

No comments provided.

BA – Bosnia-Herzegovina

No comments provided.

BE – Belgium

The average monthly temperature in 2010 was lower than the corresponding decennial monthly average temperature (2001-2010) for January, February, May, November and December. The highest deviation from the average decennial monthly temperature was measured in December 2010, namely 3.6°C lower than the decennial average temperature for that month. The maximum peak load for Belgium in 2010 was observed in this month. The average temperatures in summer were 1°C higher than the corresponding decennial average (2001-2010) but nevertheless the load in this period grew by 6% compared to the summer consumption in 2009. The winter 2010 had lower temperatures than the decennial average. In combination with the starting recovery from the financial and economic crisis, the consumption during the winter increased by 5.5% compared to 2009.

BG – Bulgaria

No comments provided.

CH – Switzerland

No comments provided.

CY – Cyprus

No comments provided.

CZ – The Czech Republic

No comments provided.

DE – Germany

It has to be pointed out that, due to the current legal rules, the German TSOs are not responsible for provision of investigations about national demand and generation. Furthermore market participants are not obliged to provide detailed information contributing to the calculation of a national power balance to the German TSOs. Hence a lot of the data required for the SAR are estimations and approximations gained from experiences in the past before the liberalization of the electricity market.

DK – Denmark

No comments provided.

EE – Estonia

No comments provided.

ES – Spain

No comments provided.

FI – Finland

The beginning and end of the year were exceptionally cold. The difference in the long term average was about six degrees in January, three degrees in February, two degrees in November, and six degrees in December. These low temperatures were estimated to have increased the consumption by 1.1 TWh (1.3%). On the other hand, July was exceptionally warm, but this is estimated to have had no noticeable impact on consumption.

FR – France

Rising demand driven by cold weather conditions and economic recovery.

In 2010, French internal electricity demand rose by 5.5% compared with 2009, reaching a total of 513.3 TWh. The lower temperatures in 2010, as compared with 2009, accounted for two-thirds of this rise in demand. According to the French meteorological agency Météo France, it was the coldest year since 1987.

A third of the rise in demand recorded in 2010 is structural growth, driven by the economic recovery and the increasing use of electricity for new purposes. For the first time ever, the annual French electricity demand broke the 500 TWh barrier in 2010.

The households´ consumption continues to increase, industrial consumption begins rising once more.

Electricity demand by customers connected at low voltage levels (domestic customers, professionals, public services, street lighting, and various tertiary consumers) rose strongly in 2010 by over 7% compared with 2009, following a more modest 2% increase between 2008 and 2009.

Excluding the effect of temperatures in 2010, which was lower on average than the previous year, demand growth in this customer segment remains moderate at 1.5% for 2010, compared with a figure of 2% for the previous year. Demand by large-scale industry was up by 3.7% compared with 2009. Although it did not reach the levels seen in 2007 or 2008, the figure for 2010 appears to confirm the rising trend which began in the final quarter of 2009.

Electricity demand by SMEs-SMIs rose in 2010 by more than 3%, having fallen by over 2% in 2009. If the impact of meteorological conditions is filtered out, the rate of growth is approximately +1%, compared with -2.5% the previous year.

The national consumption adjusted for meteorological contingencies reaches 488.1 TWh in 2010, 1.9% more than in 2009, after a decrease of 1.6% the year before.

http://www.rte-france.com/uploads/media/pdf_zip/publications-annuelles/rte-be10-fr-02.pdf

GB – Great Britain

No comments provided.

GR – Greece

No comments provided.

HR – Croatia

No comments provided.

HU – Hungary

No comments provided.

IE – Ireland

The start and the end of 2010 saw unusually cold weather. The December in 2010 was one of the coldest on record, and Ireland experienced a new system demand peak in the week before Christmas. This cold weather was the primary driver of our demand increase, and we expect that consumption would have been the same as or lower than that in 2009 had weather conditions been similar.

IS – Iceland

No comments provided.

IT – Italy

In 2010, **electricity consumption** reached 326.2 billion kWh, rising by +1.8% compared to 2009, with a fairly positive performance in almost all months.

The result was due mainly to the economic recovery, being temperatures quite stable on a yearly basis. Furthermore, in summer temperatures were lower to the correspondent figures of 2009.

The amended variation by temperature and calendar of electricity demand between 2010 and 2009 was actually +2.0%.

Data reported are provisional and related to April 2011.

LT – Lithuania

No comments provided.

LU – Luxembourg

After slowing down in 2008 and 2009 due to the economic crisis, the consumption in Luxembourg increased again in 2010 by about 7.5%.

LV – Latvia

No comments provided.

ME – Montenegro

No comments provided.

MK – Former Yugoslavian Republic of Macedonia

No comments provided.

NI – Northern Ireland

Transmission losses were estimated at 146 GWh resulting in a net consumption of 9 035 GWh.

NL – The Netherlands

No comments provided.

NO – Norway

No comments provided.

PL – Poland

After a decrease in the energy consumption in 2009 (as a result of the economic crisis started in the 4th quarter of 2008), in 2010 PSE Operator registered a 4.9% growth in the electricity consumption. The absolute value amounted to 143.6TWh, which is the historical maximum of energy consumption in Poland.

PT – Portugal

Electricity consumption recovered from the decline in the previous year, growing 4.7% (3.3% when corrected for the temperature effect and the number of working days).

RO – Romania

No comments provided.

RS – Republic of Serbia

No comments provided.

SE – Sweden

No comments provided.

SI – Slovenia

In respect to year 2009, the consumption in 2010 increased by 5 %. The consumption in 2010 was still 11% lower than in 2007, before the global financial crisis struck.

SK – Slovakia

The year 2010 featured an increase in electricity consumption in Slovakia compared to 2009. The annual consumption increased by about 5%. After a huge decline in 2009, the consumption reached the level of 2005. More information can be found at:

http://www.sepsas.sk/seps/dokumenty/RocenkySed/Rocenka_SED_2010.pdf (in English).

UA-W – Ukraine-West

No comments provided.

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 (e.g. Morocco and Turkey) are quite small compared to the size of the ENTSO-E system (see Chapter 4.4). In that respect, the energy generation in the ENTSO-E system follows the same trends as the energy consumption (see Chapter 4.2). Hence, after a decrease of about 3% in 2009, following the global financial crisis at the end of 2008 and reported in the 2009 SAR report[8], the energy generation became increasing again in year 2010 with 8% up to 3400 TWh compared to 3144 TWh in 2009.

As shown in Figure 4.2, fossil fuels in 2010 were the most important energy sources for electricity generation in the ENTSO-E system. Their share in the ENTSO-E generation mix went below 50%, with 49% in 2010 compared to 52% in 2009. In fact, energy generated from fossil fuels increased from 1623 TWh in 2009 to 1653 TWh in 2010, but this increase was slower than the increase of the rest of the generation as a whole. The second share in the energy mix went to nuclear with 26% in 2010 as in 2009. Again, following the increase in demand, the base-load nuclear generation was much higher in 2010 with 895 TWh than in 2009 with 825 TWh. The share of renewable energy sources (RES) was stable at about 19% also in 2010, but the actual RES generation increased from 589 TWh in 2009 to 634 TWh in 2010.

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[8] https://www.entsoe.eu/resources/publications/entso-e/sar-reports/

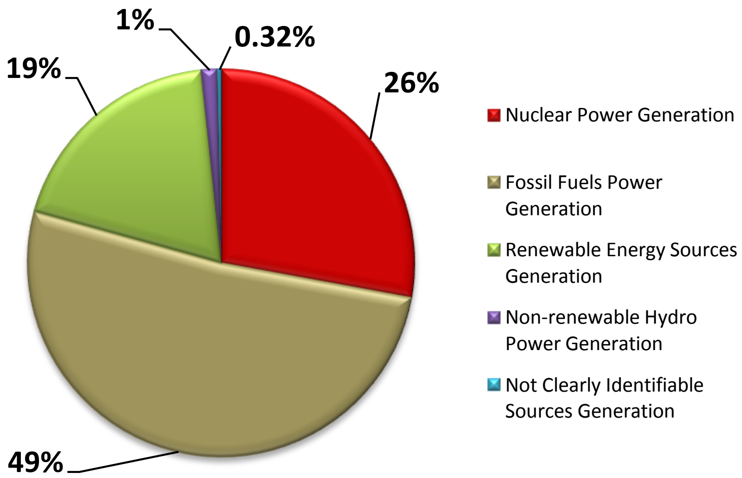
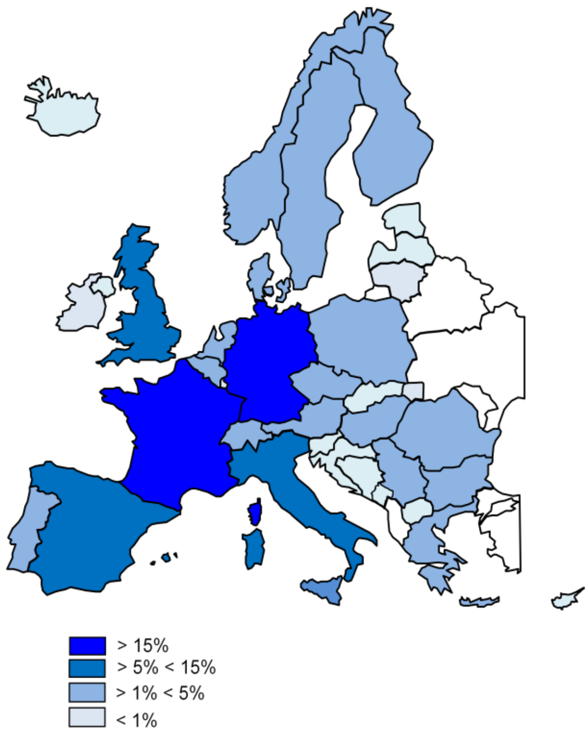


Figure 4.2: Total ENTSO-E generation mix in December 2010

A mere stable 0.3% of the energy mix cannot be connected to one of the categories identified here due to a lack of information for the TSOs.

The countries with the highest share of generation in the total ENTSO-E generation were Germany and France (17% and 16% respectively) followed by Great Britain (9.5%), Italy (almost 8.5%) and Spain (8%). The rest of the countries had a share of less than 5%, and almost all of them had a share of less than 3% in the total ENTSO-E generation. This situation is illustrated by Map 4.2 and Figures (4.3 and 4.4) below.



Map 4.2: Share of each ENTSO-E country in total ENTSO-E generation in 2010

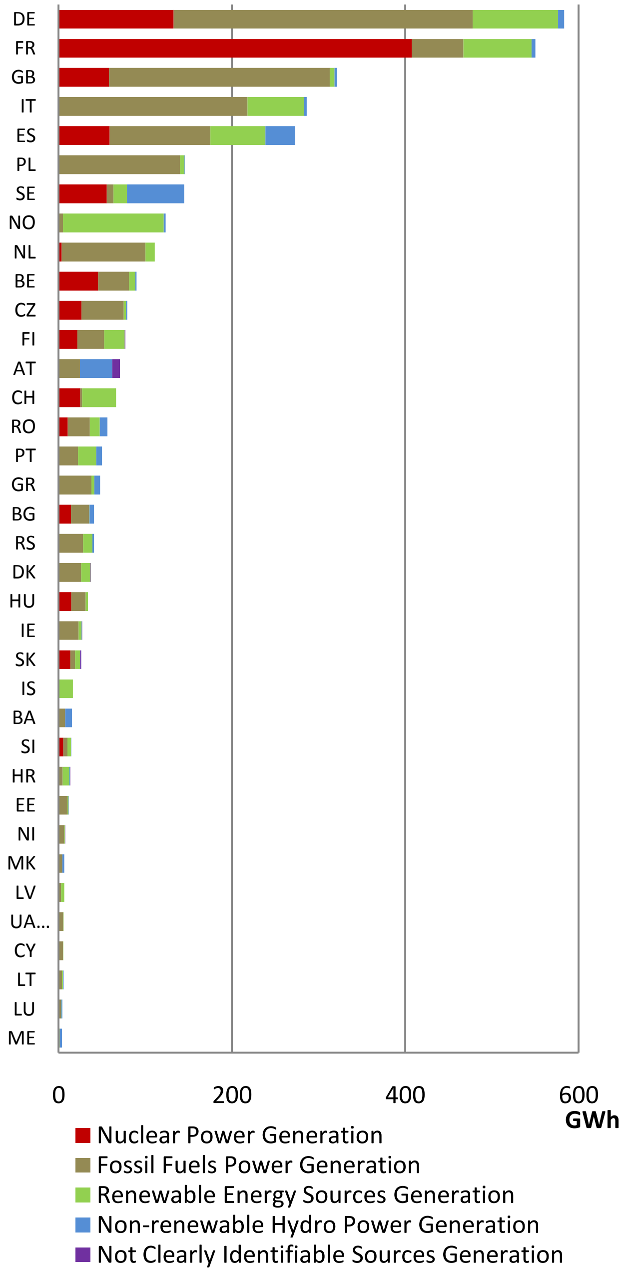


Figure 4.3: Generation mix in 2010 per country [GWh]

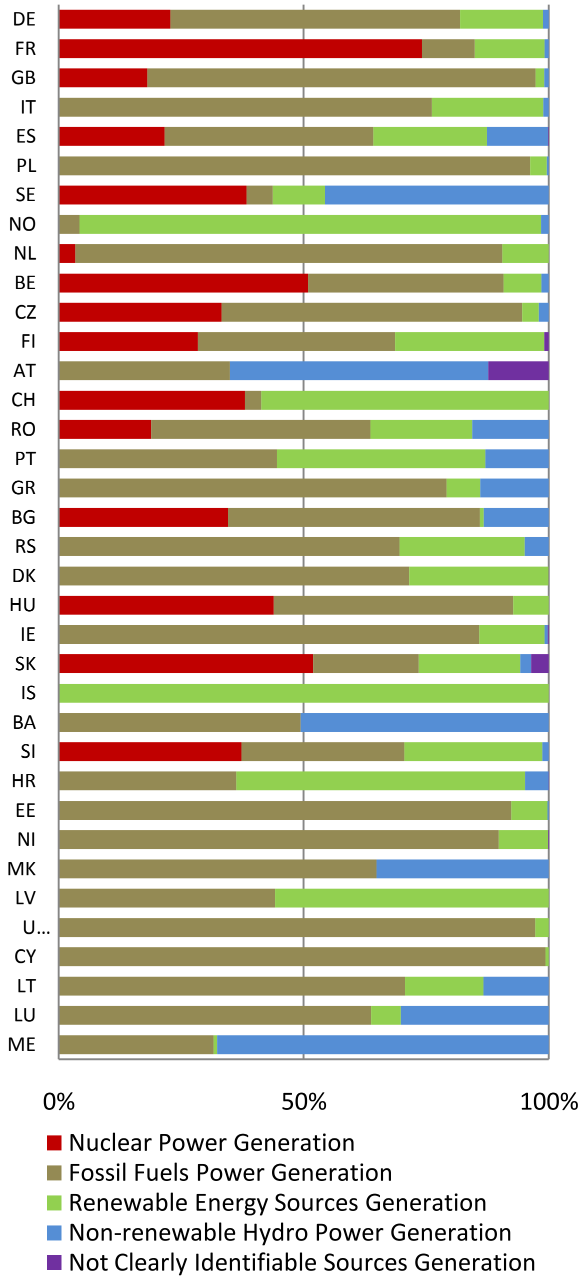


Figure 4.4: Generation mix in 2010 per country in %

The fact that fossil fuels are the main fuel used for the generation of electricity within the ENTSO-E area is illustrated in Figure 4.4. This figure shows the share of the different individual fuel types in the total generation of each country. It is clearly visible that the brown colour is dominant, which means that many countries rely on fossil fuels for their electricity generation.

4.3.2. FOSSIL FUELS

The fossil fuels generation slightly increased from 1623 TWh in 2009 to 1653 TWh in 2010, less than 2%. As shown in Figure 4.5, this increase was mostly driven by gas generation (33 GWh) and all fossil fuels, with the exception of the oil category, which decreased by about 16%

(10.5 GWh). The evolutions are made visible in Table 4.3 below. This confirms a lasting trend of gas as the most dynamic fossil fuel for electricity generation.

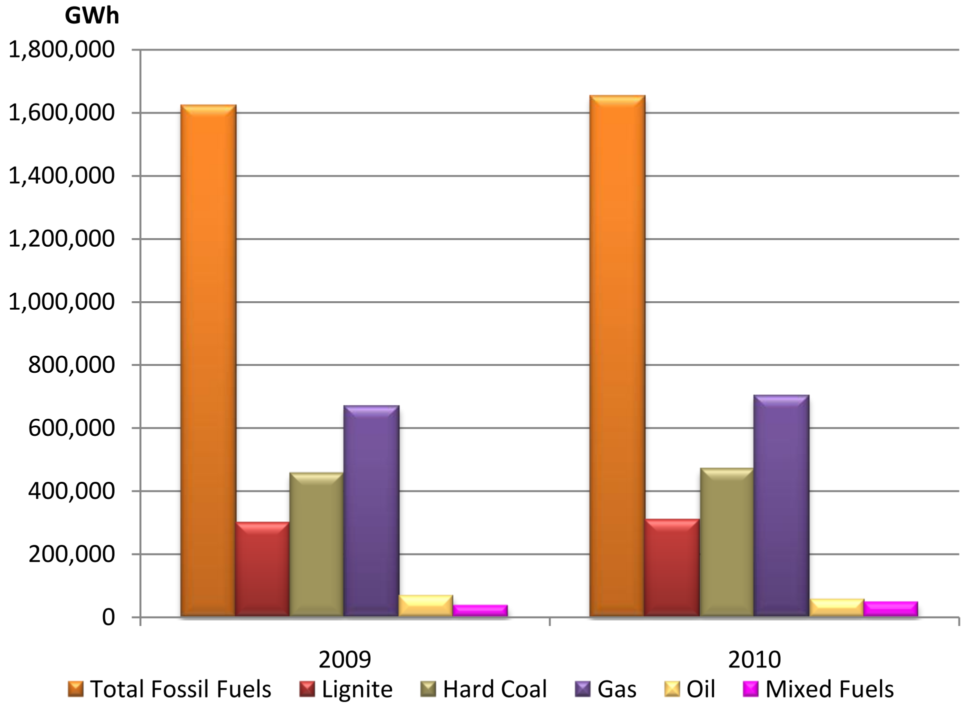


Figure 4.5: ENTSO-E fossil fuels Generation in 2009 and 2010

	Fossil Fuels	of which				
		Lignite	**Hard Coal**	**Gas**	**Oil**	**Mixed Fuels**
%	1.84%	2.84%	3.08%	5.07%	-15.50%	30.27%
Absolute value (GWh)	29 840	8 528	14 077	33 861	-10 397	10 778

Table 4.3: ENTSO-E Fossil Fuels generation increase/decrease from 2009 to 2010

The main contributors to the overall increase in fossil fuels generation were Great Britain (10.2 TWh), Germany (8.6 TWh) and Finland (6.3 TWh). Meanwhile massive decreases took place in Spain (26.7 TWh), followed by Portugal (5.5 TWh) and Greece (3.7 TWh).

Most of the important decreases in oil generation took place in Great Britain (7 TWh), Germany (4.6 TWh) and Greece (1.5 TWh). Meanwhile, oil generation increased in a few other countries, such as Sweden (1.7 TWh), for example.

The percentage of the increase/decrease of fossil fuel generation in each country is depicted in Map 4.3 and the share of fossil fuel generation of each country compared to its total generation is shown in Map 4.4.

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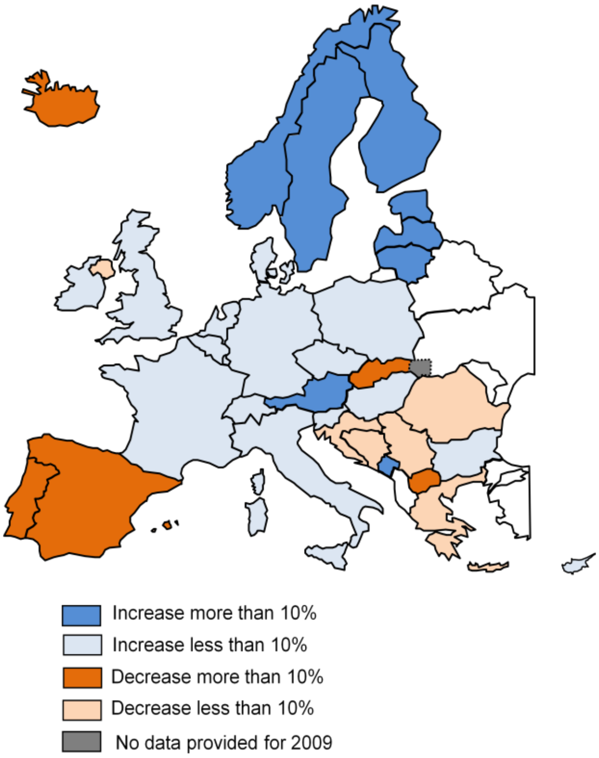
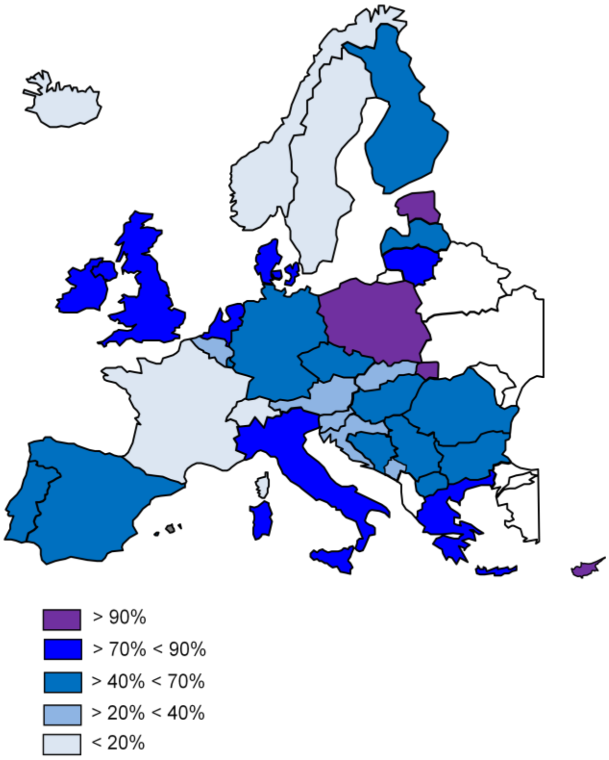


Map 4.3: Increase/decrease of fossil fuels generation in per country from 2009 to 2010



Map 4.4: Share of fossil fuels in the total generation of each ENTSO-E country in 2010

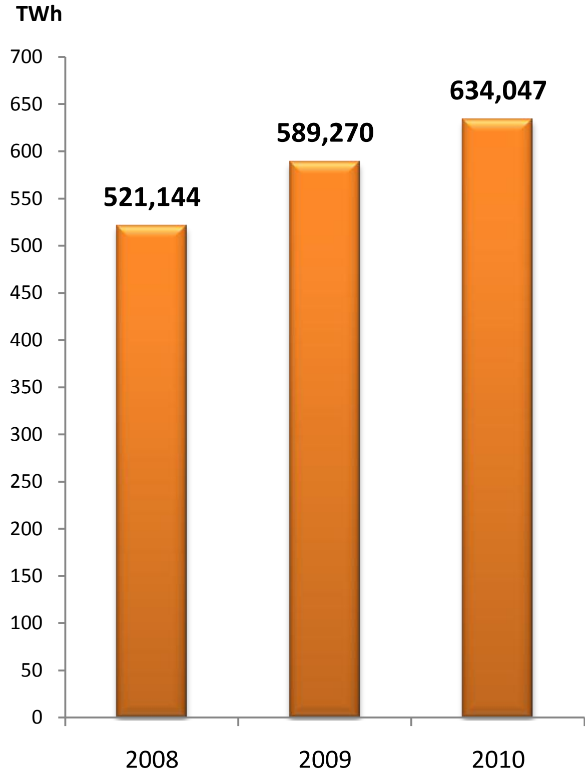
The countries with the smallest share of fossil fuels in the total generation were Iceland (0.01%) Switzerland (3.3%) and Norway (4.3%). At the other end of the spectrum, in Cyprus, Poland and Estonia the share of fossil fuels in the total national generation was 99.4%, 96.2% and 92.4% respectively.

4.3.3. RENEWABLE ENERGY SOURCES

For some countries the renewable energy sources (RES) values were not properly identified. They were sometimes included in the non-identifiable energy sources (e.g. Austria), or the RES share in hydro generation was only partially identified[9] (e.g. Bosnia-Herzegovina, and Spain) or not identified at all (e.g. Sweden, Bulgaria, and Estonia).

Figure 4.6 below shows the total RES generation. It is a comparison of 2008, 2009 and 2010.

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



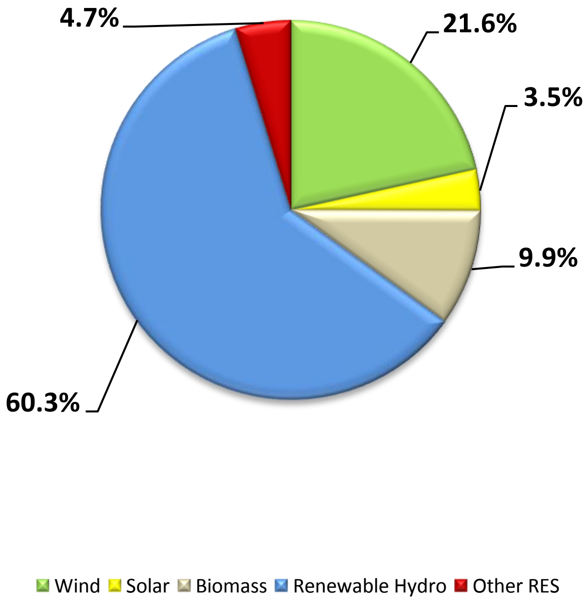


Figure 4.6: ENTSO-E renewable energy sources Generation in 2008, 2009 and 2010

Figure 4.7: Share of each RES source in total RES generation in 2010

Table 4.4 shows that the generation from renewable energy sources increased by almost 8%, yet it increased significantly in all of the RES categories except for renewable hydro, which decreased by 7 TWh. The most important decreases in renewable hydro took place in Norway (10 TWh), for example. Meanwhile, the renewable hydro generation increased in France (6.4 TWh) and Portugal (4.3 TWh).

The most striking increase in RES generation was in solar generation with a massive 70% (9 TWh), while wind generation increased by 16% (19 TWh).

	Renewable Energy Sources	of which				
		Wind	Solar	Biomass	Renewable HPP	Other RES
%	**7.60%**	16.09%	69.71%	13.60%	-1.71%	112.79%
Absolute value (GWh)	**44 778**	18 973	9 080	7 533	-6 655	15 847

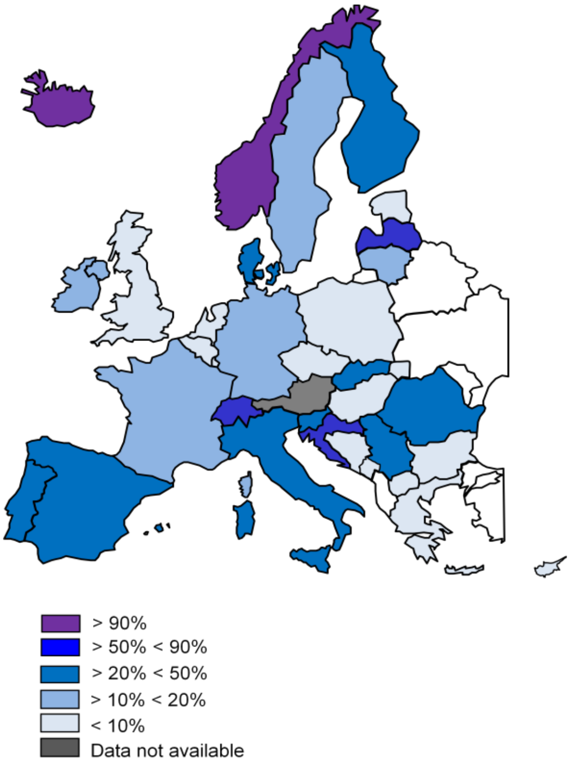
Table 4.4: Renewable energy sources generation increase/decrease from 2009 till 2010

The share of individual RES sources in the total ENTSO-E RES generation in 2010 is depicted in the above Figure 4.7.

The highest share of RES production can be assigned to renewable hydro generation. The main contributors were Norway (115.4 TWh), France (63.4 TWh), Italy (50 TWh), Germany (18.9 TWh), and Switzerland (37 TWh). Then comes wind generation and the main contributors were Spain (42.7 TWh), Germany (36.5 TWh), France (9.6 TWh), Portugal (9 TWh), and

Denmark (7.8 TWh). Next comes biomass generation with Germany (31.2 TWh), Finland (10.3 TWh), the Netherlands (6.2 TWh) and Belgium (5.1 TWh) as the main contributors. Solar generation reached a share of about 3.8% and its main contributors were Spain (12 TWh) and Germany (6.7 TWh). For more information see Chapter 4.3.6.

Following Map 4.5 shows the share of RES in the total generation of each country in 2010.



Map 2.5: Share of RES in the total generation of each ENTSO-E country in 2010

In 2010, the highest shares of RES in the national generation could be found in Iceland and Norway (99.9% and 94.2% respectively). Croatia follows with almost 59%, Switzerland with 58%, and Latvia had 56%. The whole ENTSO-E area had a share of RES in the total generation of about 19%.

Figures 4.8, 4.9 and 4.10 below show the RES generation mix in 2008, 2009 and 2010 excluding renewable hydro power plants (HPP) from the RES category. The highest contribution in each year came from wind and biomass, together with about 79%. The generation from solar power plants increased by about 50% in 2010 (from 6% to 9%).

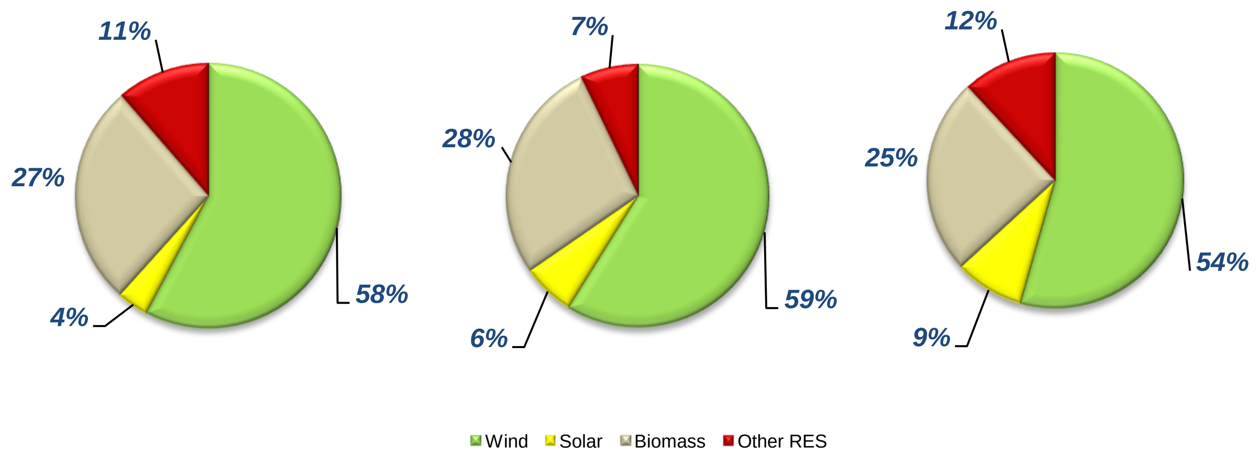


Figure 4.8: Share of each RES source (excluding renewable HPP) in the total RES generation in 2008

Figure 4.9: Share of each RES source (excluding renewable HPP) in the total RES generation in 2009

Figure 4.10: Share of each RES source (excluding renewable HPP) in the total RES generation in 2010

4.3.4. NUCLEAR POWER

The ENTSO-E nuclear generation (see Figure 4.11 below) increased by 8.5% (70 TWh). Map 4.6 below shows the share of nuclear generation of each country compared to its total generation in 2010.

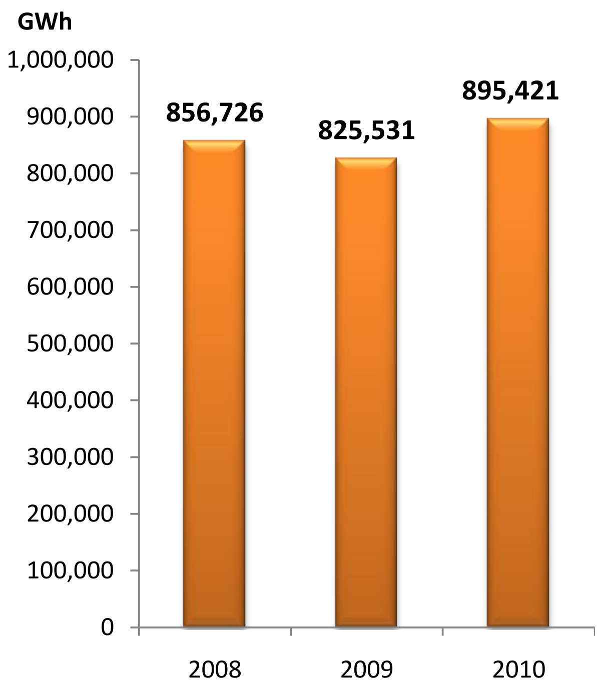
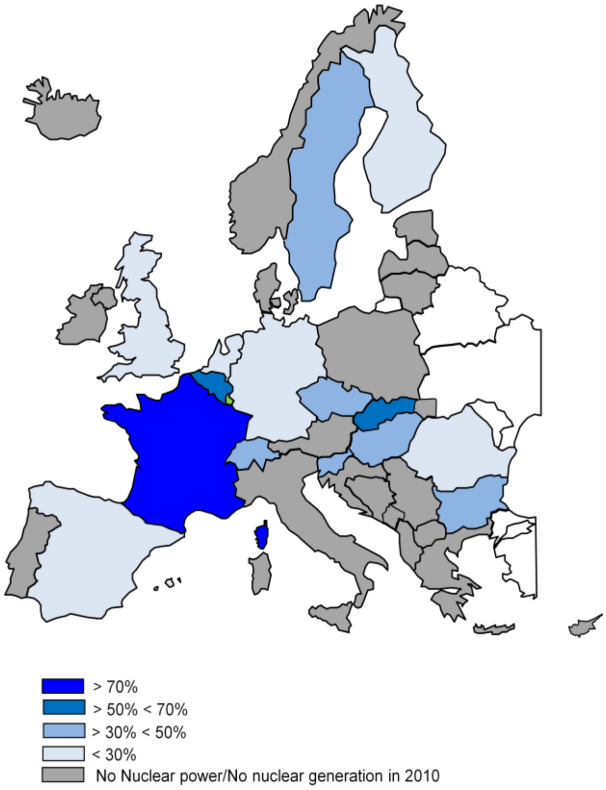


Figure 4.11: Comparison of ENTSO-E total nuclear generation for 2008, 2009 and 2010



Map 4.6: Share of nuclear generation in the total generation of each country in 2010.

The highest share of nuclear generation is observed in France (74% in 2010, following 75% in 2009 and 76% in 2008). As Lithuania had shut down its nuclear power plant in Ignalina (end of 2009), Slovakia came to second place in the nuclear power plants´ share in the national generation mix with 52%, followed by Belgium (51%). A comparison with 2008 and 2009 is shown in Figure 4.12.

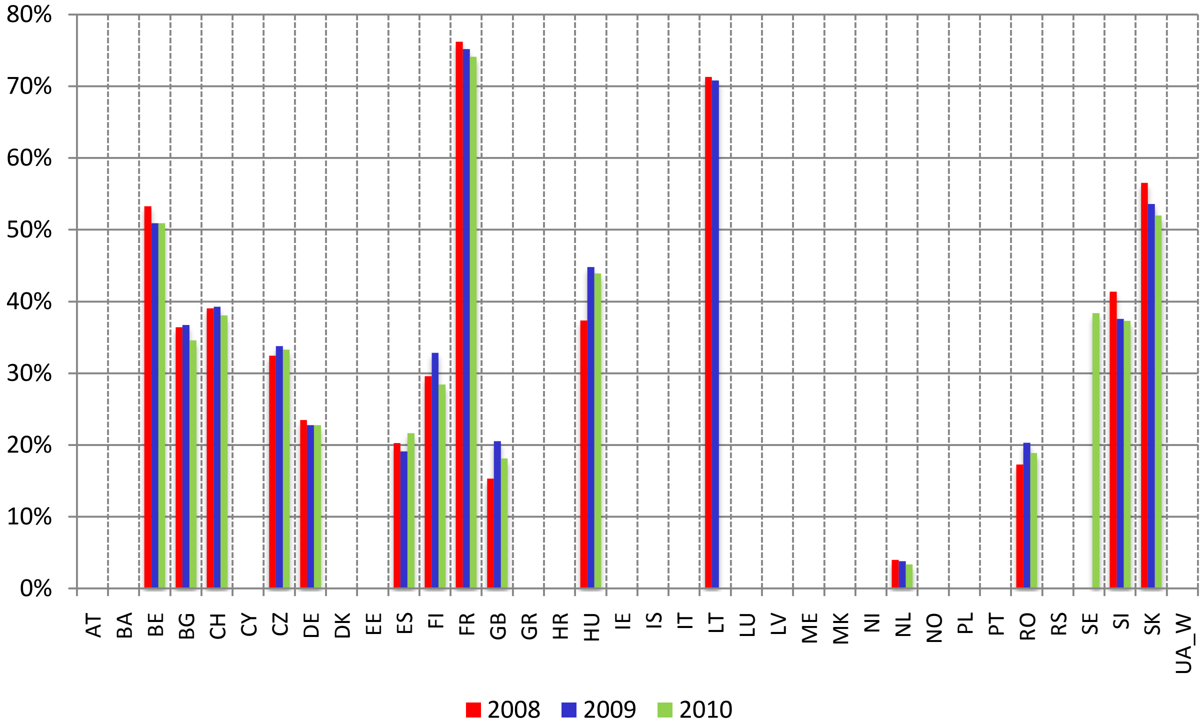


Figure 4.12: Comparison of the share of nuclear generation in the total generation of each country in 2008, 2009 and 2010

4.3.5. NON-RENEWABLE HYDRO POWER GENERATION

This category includes only hydro power generation that cannot be considered as renewable (i.e. predominantly pure pumped storage hydro power plants). The renewable part of hydro power plants generation is included in the RES category (see Chapter 3 on methodology and 4.3.3 on renewable energy sources generation). However there were also some countries that 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.

For countries that did not provide any data at all for the non-renewable hydro generation, this category was considered as zero.

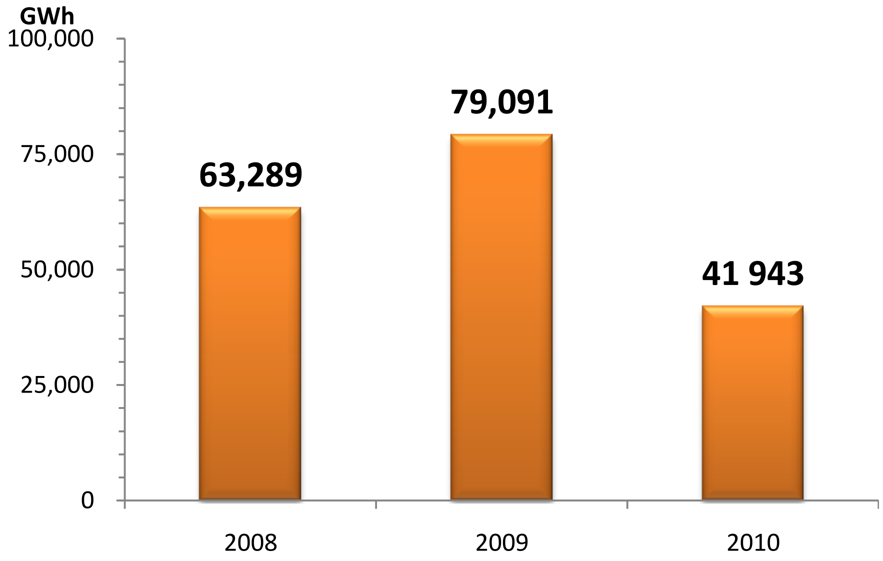


Figure 4.13: ENTSO-E non-renewable hydro power plants generation in 2008, 2009 and 2010

The generation in non-renewable hydro power plants was 37 TWh lower in 2010 than in 2009. It decreased by 47% (see Figure 4.13). The non-renewable hydro generation increased in Greece (66.7%) and Croatia (33.6%) for example. On the other hand, in Romania and Great Britain for example, this kind of generation decreased most significantly (35% and 10% respectively).

As a more comprehensive outcome, the comparison of total hydro generation in 2008, 2009 and 2010 is shown in Figure 4.14. In 2010 the total hydro power generation was 100 TWh higher than in the two previous years.

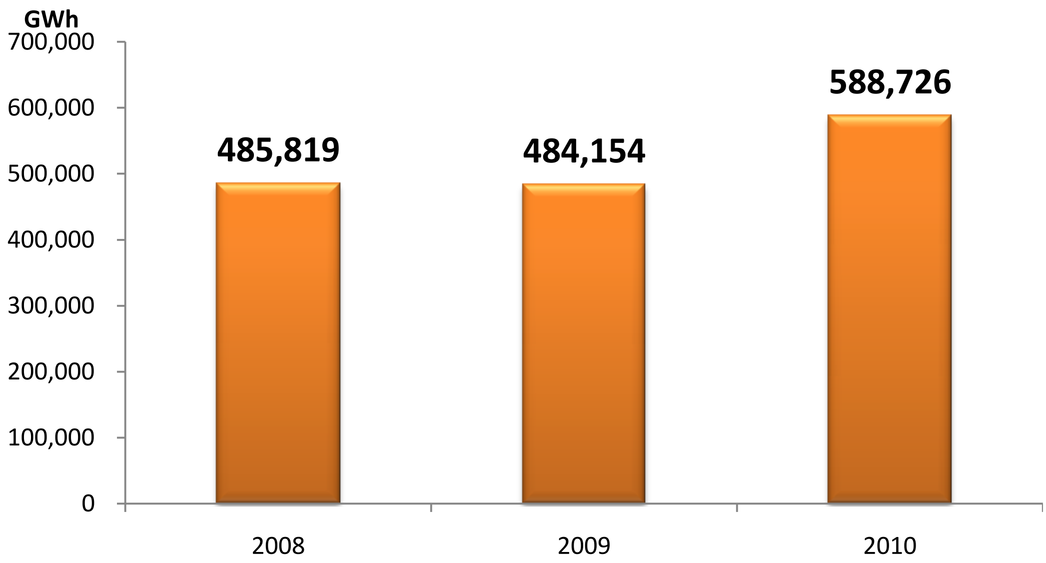


Figure 4.14: ENTSO-E Total Hydro Generation in 2008, 2009 and 2010

4.3.6. NATIONAL COMMENTS ON GENERATION

AT – Austria

No comments provided.

BA – Bosnia-Herzegovina

No comments provided.

BE – Belgium

The national net generation was 2.6% higher in 2010 compared to 2009. This increase in the net generation resulted from an increase in the nuclear generation (1.7% compared to 2009) and the fossil fuel generation (3.1% compared to 2009). These two fuel types accounted for almost 91% of the Belgian generation in 2010. Although, the output of wind turbines grew by 27% and the output of solar panels increased by 44% compared to 2009, they account only for 1.7% of the Belgian generation in 2010. The renewable energy sources (other than hydro) generation had the highest growth rate, namely 10%. In 2010 the output of renewable energy sources (including run-of-river) covered 7.8% of the Belgian consumption (including losses).

BG – Bulgaria

No comments provided.

CH – Switzerland

No comments provided.

CY – Cyprus

The first wind park was connected to the system from the end July 2010. The generated values given are from the pre-commissioning test period.

CZ – The Czech Republic

No comments provided.

DE – Germany

It has to be pointed out that due to the current legal rules German TSOs are not responsible for provision of investigations about national demand and generation. Furthermore market participants are not obliged to provide detailed information contributing to the calculation of a national power balance to the German TSOs. Hence a lot of the data required for the SAR are estimations and approximations gained from experiences in the past before the liberalization of the electricity.

Due to the methodology approx. 3 GW of installed pump storage capacity, which are integrated in the German market, are not included in the German data collection.

DK – Denmark

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

EE – Estonia

No comments provided.

ES – Spain

No comments provided.

FI – Finland

No comments provided.

FR – France

The French electricity generation rose by 6% in 2010. The generation by nuclear power plants grew by 4.6% (+ 17.9 TWh), whereas the generation by hydro-electric plants rose by 9.9% (+6.1 TWh), as a result of changes in the availability of water resources and the use of reservoirs compared with 2009. Wind generation totalled 9.6 TWh, up by 22% on the previous year (+1.7 TWh). Photovoltaic generation quadrupled compared with 2009 (+0.5 TWh) and generation from other renewable sources rose by 11% (+0.5 TWh). Generation by fossil fuel-fired power stations, which are used to complete the supply-demand balance, rose by 8.3 (+4.5 TWh).

With 5,600 MW of installed capacity in France at the end of 2010, wind generation is continuing to develop. In the space of five years, the amount of energy generated by wind farms has increased tenfold.

The number of PV installations connected to the network rose significantly in 2010, with a solar fleet now totalling 760 MW, more than four times the capacity installed at the end of 2009. Total energy generated from solar sources in 2010 is estimated at 0.6 TWh, almost four times more than 2009.

http://www.rte-france.com/uploads/media/pdf_zip/publications-annuelles/rte-be10-fr-02.pdf

GB – Great Britain

No comments provided.

GR – Greece

No comments provided.

HR – Croatia

The run-of-river power plants category also includes small HPPs.

HU – Hungary

No comments provided.

IE – Ireland

The amount of renewable generation capacity in Ireland increased in 2010, as more wind farms were built across the country. However this increase was not reflected in the energy figures, as wind speeds were lower than usual. The capacity factor for wind generation was 24% in 2010, compared to an average of over 30% for the previous five years.

Ireland is also seeing a move away from oil towards cleaner gas powered generation. 2010 saw the introduction of 880 MW of new gas CCGTs, and the closure of 220 MW of oil powered plant.

IS – Iceland

No comments provided.

IT – Italy

The net domestic generation allocated for consumptions registered a 2.5% increase. In particular, production from renewable sources like geothermal, wind and photovoltaic hugely increased in respect to 2009, by about +23.2%. For thermoelectric sources the estimated raise was +1.1% as far as provisional data on hydroelectric production a +0.6% was reported.

Data reported are provisional and related to April 2011.

LT – Lithuania

Since the decommissioning of the Ignalina nuclear power plant (PP) on 31st December 2009, 68% of the of the generation was supplied by fossil fuels power plants, which cover 68% of the NGC in Lithuania. Most fossil fuel power plants can burn several types of fuel, but they are actually fired only by gas (price influence). Wind energy has the biggest development potential in Lithuania – in 2010 the NGC increased by 45% compared to 2009.

LU – Luxembourg

Hydro generation increased in 2010 whereas the other generation levels remain stable compared to the previous year.

LV – Latvia

No comments provided.

ME – Montenegro

No comments provided.

MK – Former Yugoslavian Republic of Macedonia

No comments provided.

NI – Northern Ireland

No comments provided.

NL – The Netherlands

No comments provided.

NO – Norway

The production from pumped storage hydro power plants is estimated.

PL – Poland

The share of RES in total generation in 2010 presented in this report amounts to 3,4%. This share does not include energy from co-firing (biomass combustion in lignite/hard coal power stations) due to unavailability of the data in the gathering data time slot. According to the information from Polish Energy Regulatory Office, made available during SAR acceptation process and based of Guaranties of Origin issued to producers in 2010, the share of RES including co-firing amounts to 6,1%. This share will be higher when the Guaranties of Origin issued in 2011 are taken into account for 2010 generation. The biggest percentage change in generation (per fuel) comparing to 2009 was registered for the wind category, with a 75% increase, however, its share in total generation amounted to 1.3%. The energy production in Poland is still based on fossil fuels, which share in total generation in 2010 amounted to over 96% (including co-firing).

PT – Portugal

Hydro generation had its first wet year since 2003.

Thermal power generation, excluding cogeneration and other special status generators, supplied only about 33% of consumption, which is the lowest share of the last 30 years. About 17% of consumption was originated from wind power which had an increase of 20%.

RO – Romania

No comments provided.

RS – Republic of Serbia

No comments provided.

SE – Sweden

No comments provided.

SI – Slovenia

The national net generation was less than 1% lower than in 2009. Good hydrological conditions resulted in a high hydro production, hence a lower generation than expected from thermal units was observed. The figures in the tables consider 100% of generation in Krsko Nuclear power plant, although its ownership is equally divided between Slovenia and Croatia. Thus half of its generation is delivered to Croatia in accordance with the international agreement.

SK – Slovakia

2010 featured an increase of 18% in the generation of hydro power plants. The generation in June, August and September increased from 60% in 2009 to 90 per cent. The generation of hydro power plants was lower in only two months (March and July), and in the rest of the year it was significantly higher. The total generation increase compared to 2010 was about 6 per cent. More information can be found at

http://www.sepsas.sk/seps/dokumenty/RocenkySed/Rocenka_SED_2010.pdf (in English).

UA-W – Ukraine-West

No comments provided.

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 2009, so their exchange balance is not considered here.

The exchange balance of the whole ENTSO-E system increased from 2 522 GWh in 2009 to 5668 GWh in 2010, i.e. an increase of about 125%. This contrasts with the great reduction of about 73% observed from 2008 to 2009.

As in 2008 and 2009, ENTSO-E was a net[10] importing system in 2010. Both imports and exports were higher in 2010 than in 2009 (about 16% both). This contrasts with the situation observed from 2008 to 2009, where there was a decrease in imports (2%) and a slight increase in exports (0.03%). Next figures (Figure 4.15 and 4.16) show this situation.

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

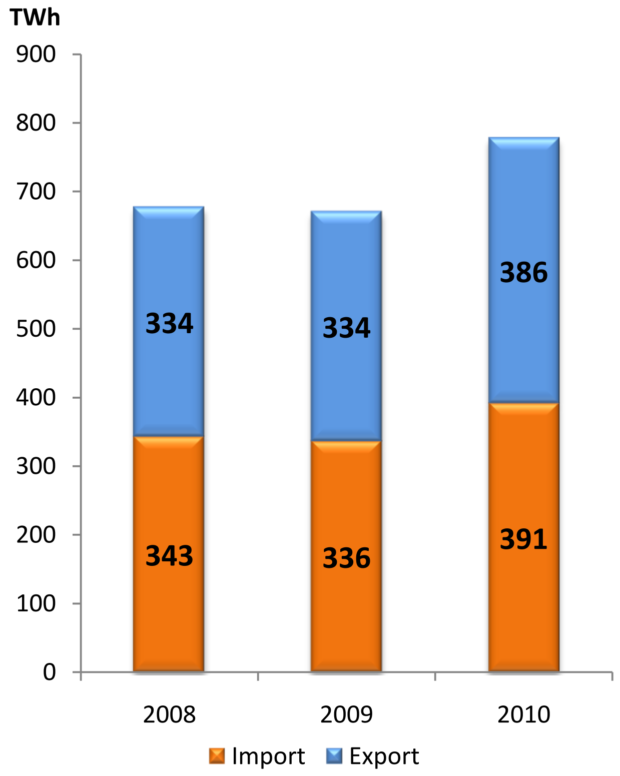


Figure 4.15 ENTSO-E Imports/Exports summary

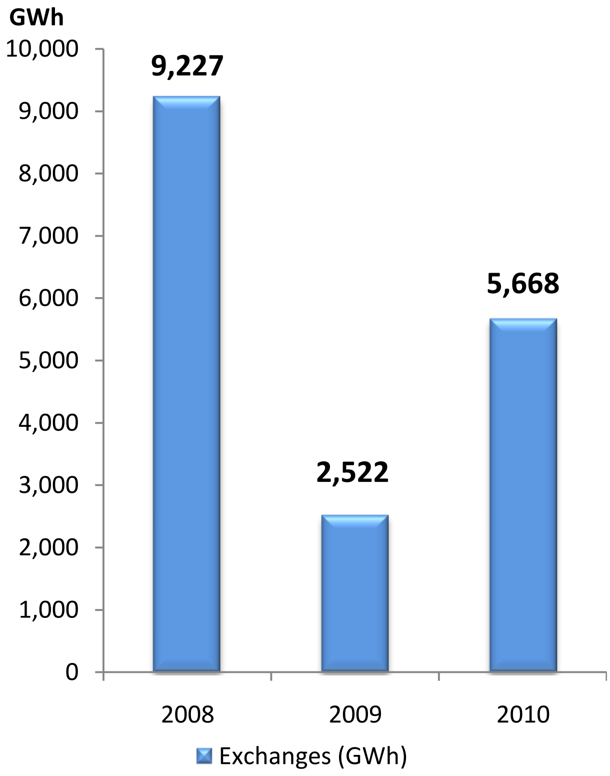


Figure 4.16 ENTSO-E Exchanges Balance summary

In 2010, the biggest net exporting countries were France (30.5 TWh), Germany (17 TWh), and the Czech Republic (14.9 TWh). Other net exporters were Spain (7.9 TWh), Bulgaria (7.7 TWh), Bosnia Herzegovina (3.8 TWh), Serbia (3.5 TWh), Estonia (3.3 TWh), Romania (2.9 TWh), Poland (1.35 TWh), Denmark (1.1 TWh), and the control area of Ukraine-West (1.2 TWh).

The main net importers were Italy (44.2 TWh) and Finland (10.5 TWh), followed by Norway (7.5 TWh), Lithuania (6 TWh), Greece (5.7 TWh), Hungary (5.2 TWh), Croatia (4.7 TWh), and Luxemburg (4.1 TWh). The rest of the countries showed only insignificant net imports (less than 3 TWh). The situation described above is a comparison among 2008, 2009, and 2010, and it is illustrated in Figure 4.17.

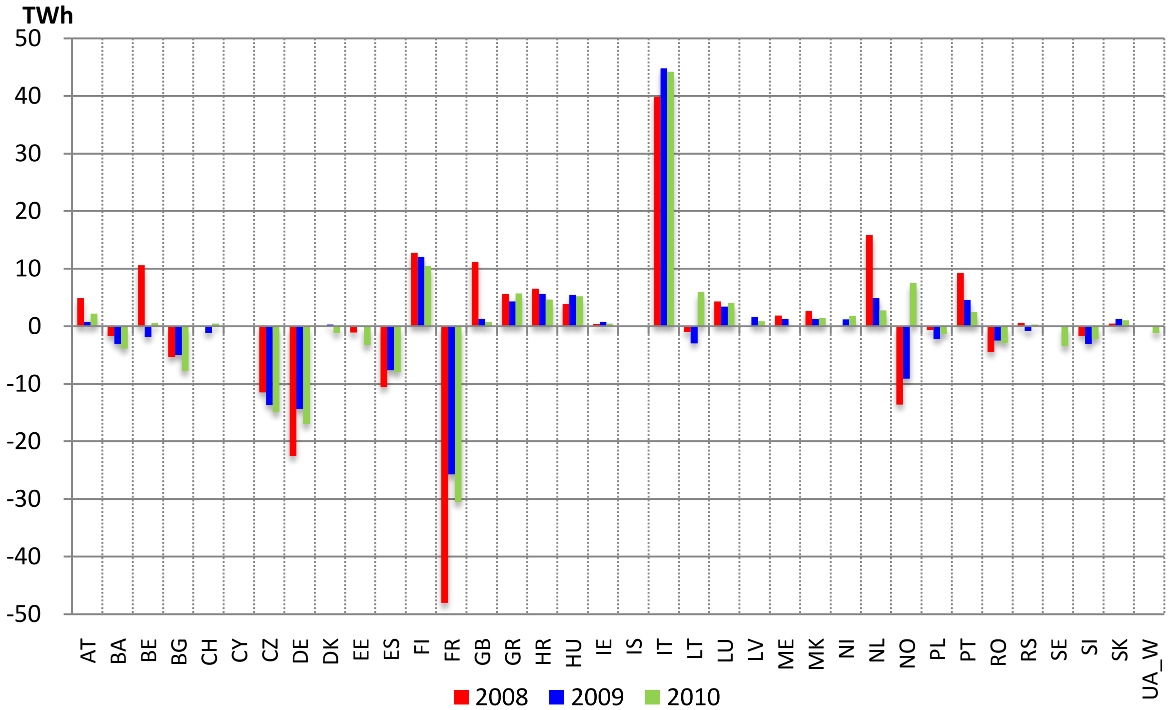
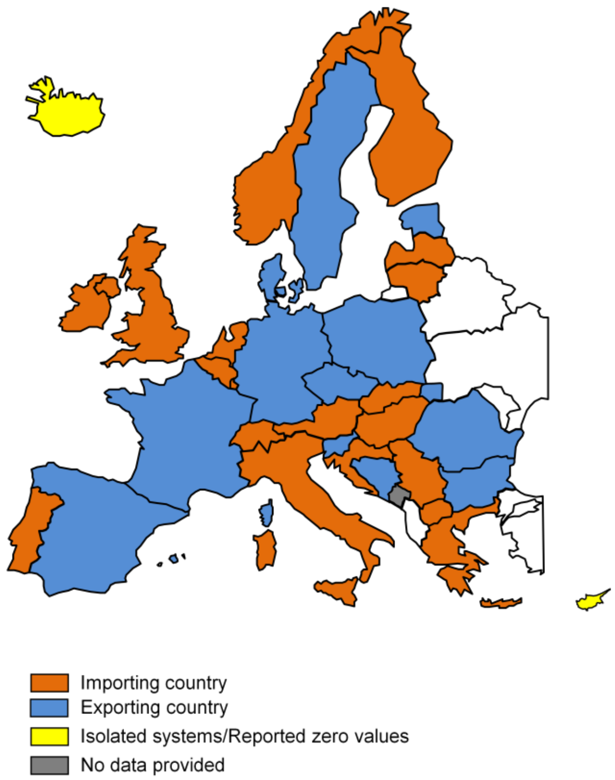


Figure 4.17: Comparison of exchanges balance for each country

The comparison of individual countries in 2010 is given on Map 4.7. For more detailed information about each country see the following section with the national comments (next Chapter 4.4.2).



Map 4.7: Net importing/exporting countries in 2010

4.4.2. NATIONAL COMMENTS ON EXCHANGES

AT – Austria

No comments provided.

BA – Bosnia-Herzegovina

No comments provided.

BE – Belgium

The physical imports increased by 31% in 2010 compared to 2009 and the physical exports went up by 5%. After being a net exporter for the first time since 1991 in 2009, Belgium again became a net importer in 2010. The national physical exchanges given in energy include the exchanges with France that do not transit on lines reported in the ENTSO-E publications "Provisional monthly values" or "Statistical Yearbook".

BG – Bulgaria

No comments provided.

CH – Switzerland

No comments provided.

CY – Cyprus

Cyprus is an isolated system.

CZ – The Czech Republic

No comments provided.

DE – Germany

No comments provided.

DK – Denmark

The exchanges data might differ slightly from the other statistics.

EE – Estonia

No comments provided.

ES – Spain

No comments provided.

FI – Finland

No comments provided.

FR – France

The balance of physical exchanges increased, after a historically low level in 2009.

In the area of contractual cross-border exchanges, the balance of exchanges was 29.5 TWh in 2010, a substantial rise of 19.0% compared with 2009. That balance represents the difference between exports (66.6 TWh) and imports (37.1 TWh).

The increase reflects the fluid nature of exchanges across the 46 electrical interconnectors linking France to its European neighbours.

Over the whole of 2010, there were 72 days on which France was a net contractual importer of electricity, compared with 57 in 2009. Conversely, the number of days containing at least one hourly interval with a net contractual import balance fell to 136 in 2010, down from 169 in 2009.

http://www.rte-france.com/uploads/media/pdf_zip/publications-annuelles/rte-be10-fr-02.pdf

GB – Great Britain

No comments provided.

GR – Greece

No comments provided.

HR – Croatia

No comments provided.

HU – Hungary

No comments provided.

IE – Ireland

Ireland remains a net importer of electricity with 2.9% of electricity demand met by imports. Ireland is currently only interconnected with the UK at Northern Ireland, with whom they operate a single electricity market (the SEM).

IS – Iceland

Iceland is an isolated system.

IT – Italy

Electricity balance between imports and exports with foreign countries decreased by 2.3% compared to 2009. In particular, electricity imports from foreign countries registered a decrease equal to 2.8%, while exports dropped significantly (-13.9%).

Data reported are provisional.

LT – Lithuania

Lithuania has enough capacity to cover peak load, but due to electricity price difference in neighbouring countries, Lithuania is an importing country.

LU – Luxembourg

No comments provided.

LV – Latvia

No comments provided.

ME – Montenegro

No comments provided.

MK – Former Yugoslavian Republic of Macedonia

No comments provided.

NI – Northern Ireland

No comments provided.

NL – The Netherlands

No comments provided.

NO – Norway

No comments provided.

PL – Poland

Poland is still an exporting country; however, the exchanges (net export) decreased by almost 40% compared to 2009 (import decreased by 14.7%, export decreased by 20%).

PT – Portugal

The import balance was the lowest since 2002, representing about 5% of the national demand.

RO – Romania

No comments provided.

RS – Republic of Serbia

No comments provided.

SE – Sweden

No comments provided.

SI – Slovenia

In 2010 Slovenian EPS was under the influence of high loop-flows towards Italy. In 2010 Slovenian EPS imported 8.6 TWh and exported 10.8 TWh of electrical energy. The amount of transits in 2010 represents 69% of the consumption. In order to control high loop-flows ELES installed PST on the 400 kV level in SS Divaca which started its test operation in December 2010. With PST in operation, ELES is able to appease commercial and physical flows and is able to provide regional support to the countries within the pentalateral agreement. In the future, ELES wishes to operate the PST as near to the neutral tap position as possible.

SK – Slovakia

The power system of Slovakia continued to be an import system in 2010. The volume of cross-border exchanges of transmitted electricity fell by 18.28% compared to 2009. The overall balance (imports) of cross-border exchanges also decreased compared to 2009 and imports from abroad provided 3.62% of Slovakia´s demand (4.79% in 2009).

Until November 30, 2010 pursuant to an agreement between SEPS, a.s. and ČEPS, a.s., free of charge intra-day allocation of capacities took place on the SEPS/ČEPS profile based on the acceptance of the entered requests for cross-border transmission and the "first come - first served" principle. As of December 1, 2010 the intraday capacity allocation procedure was implemented according to common agreement among ČEPS, a.s., PSEO, 50HzT, SEPS, a.s., TenneT, APG and MAVIR. Role of allocation office is fulfilled by ČEPS, a.s. Capacity is allocated on the common profiles of participating TSOs.

More information can be found at:

http://www.sepsas.sk/seps/dokumenty/RocenkySed/Rocenka_SED_2010.pdf (in English).

UA-W – Ukraine-West

No comments provided.

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 DATA SUMMARY

	2009	2010	Difference between 2010 and 2009	
			Absolute value	%
Net Generating Capacity	**839 233**	**895 610**	**56 377**	**7%**
Fossil Fuels	429 177	448 673	19 496	5%
Nuclear Power	126 713	132 234	5 521	4%
Total Non-renewable Hydro Power	77 316	66 488	-10 828	-14%
Renewable Energy (incl. renewable Hydro)	196 517	231 912	35 395	18%
Not identifiable energy sources	7 270	5 668	-1 602	-22%
Reliable Available Capacity	**610 772**	**658 511**	**47 739**	**8%**
Imports	39 461	40 053	592	1.5%
Exports	36 974	40 671	3 697	10%
Load	**428 097**	**521 247**	**93 150**	**22%**

Table 5.1: ENTSO-E Power Summary for December 2010 (MW)

5.2. LOAD

5.2.1. ENTSO-E OVERVIEW

The evolution of the load in 2008, 2009 and 2010 is depicted in Figure 5.1 below. For 2008 and 2009 the data for some countries are not represented at all or partially, whereas for 2010 each country provided the data. Therefore the difference in load between 2010 and 2009 is about 21% on average. The load of 2010 follows more or less the curves of 2008 and 2009.

In general, the ENTSO-E monthly peak load made a large increase in 2010 compared to the previous years. One of the reasons for this is the recovery after the financial and economic crisis. However, the main reason for the large increase seems to be a very cold winter in most of Europe in 2010, both at the beginning and the end of the year.

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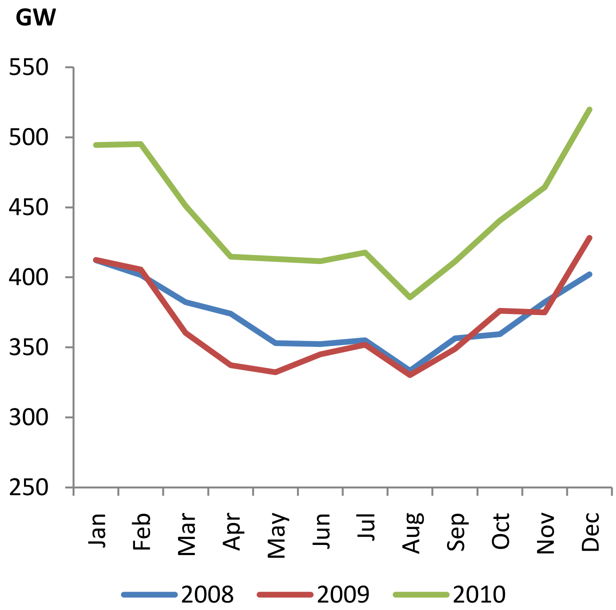


Figure 5.1: Load comparison between 2008, 2009 and 2010[11]

ENTSO-E Load Summary (GW)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	412	402	382	374	353	352	355	333	356	359	382	402
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

Table 5.2: Comparison of Load between 2008, 2009 and 2010

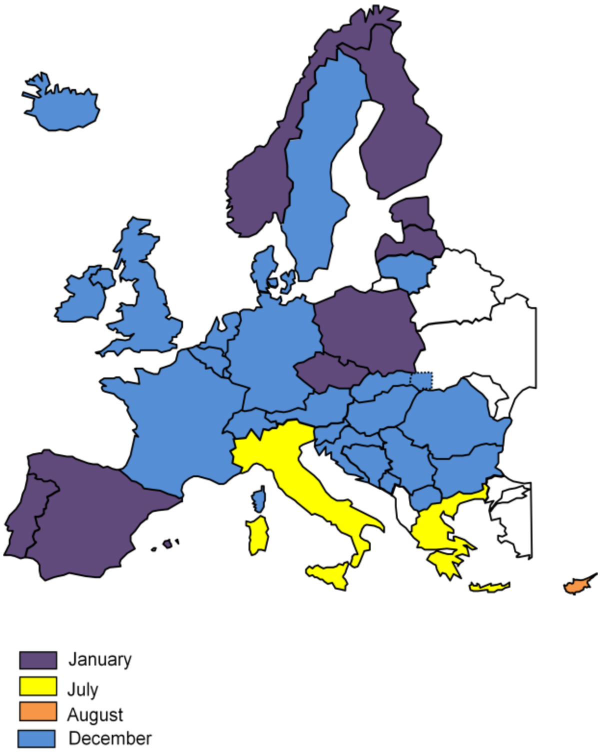
5.2.2. NATIONAL PEAK LOADS

The peak loads in the different countries were in general very high in 2010. Furthermore, almost all of the ENTSO-E countries had their peak loads in January or December. The exceptions were Italy and Greece with their peak load in July and Cyprus with the peak load in August. The main reason for this was the cold weather both at the beginning and the end of the year. As much as 13 of the ENTSO-E countries had an all-time high peak load in 2010, as shown on Map 5.2 and in Table 5.3. 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.

[11] The figures are influenced by a lack of information for years 2008 and 2009.

Country	Weekday	Calendar Day	Month	Time	Daily Average (°C)	Deviation from Normal (°C)	Peak Load (MW)	Compared to Last Year's %age	Day of Historic Peak Load	Year	Historic Peak Load (MW)	Deviation from Normal (°C)
AT	Wednesday	15	12	17:00	n.a.	n.a.	**10 755**	n.a.	Wed 16 Dec	2009	10 821	**n.a.**
BA	Friday	31	12	17:30	n.a.	n.a.	**2 173**	7.00	Fri 31 Dec	2010	2 173	**n.a.**
BE	Wednesday	1	12	17:45	-5.40	-8.50	**14 166**	2.37	Mon 17 Dec	2007	14 234	**-6**
BG	Tuesday	26	1	18:30	-10.60	-10.50	**7 270**	1.14	Wed 11 Jan	1989	8 332	**-6**
CH	Wednesday	15	12	19:15	-5.00	-8.00	**10 749**	4.76	Wed 15 Dec	2010	10 749	**-8**
CY	Tuesday	3	8	13:15	36.00	0.00	**1 148**	3.90	Fri 3 Sep	2010	1 148	**0**
CZ	Wednesday	27	1	17:00	-12.80	-12.50	**10 384**	1.15	Wed 25 Jan	2006	10 485	**-9**
DE	Wednesday	1	12	18:00	n.a.	n.a.	**79 900**	9.50	Wed 1 Dec	2010	79 900	**n.a.**
DK	Wednesday	1	12	18:00	n.a.	n.a.	**6 348**	1.00	Tue 24 Jan	2006	6 422	**n.a.**
EE	Thursday	28	1	16:45	-18.00	-13.00	**1 587**	4.64	Thu 28 Jan	2010	1 587	**-13**
ES	Tuesday	12	1	19:00	7.60	-1.00	**44 486**	0.00	Mon 17 Dec	2007	45 450	**-2**
FI	Thursday	28	1	7:00	n.a.	n.a.	**14 588**	3.20	Thu 8 Feb	2007	14 921	**n.a.**
FR	Wednesday	15	12	19:00	-1.00	-6.30	**96 710**	4.66	Wed 15 Dec	2010	96 170	**-6**
GB	Tuesday	7	12	18:30	-3.40	-9.70	**60 100**	1.59	Mon 17 Dec	2007	60 700	**-3**
GR	Thursday	15	7	12:00	32.00	10.00	**9 793**	0.33	Mon 23 Jul	2007	10 414	**5**
HR	Thursday	16	12	18:00	-4.00	n.a.	**3 121**	0.03	Thu 16 Dec	2010	3 121	**n.a.**
HU	Wednesday	1	12	16:45	-1.10	-3.40	**6 064**	1.11	Thu 29 Nov	2007	6 180	**-6**
IE	Tuesday	21	12	19:00	-5.00	-10.00	**5 090**	4.70	Tue 21 Dec	2010	5 090	**-10**
IS	Tuesday	21	12	21:00	-9.50	0.00	**2 010**	-4.30	Wed 23 Dec	2009	2 100	**0**
IT	Friday	16	7	12:00	28.10	2.00	**56 425**	8.78	Tue 18 Dec	2007	56 822	**3**
LT	Wednesday	22	12	16:00	-8.30	-5.00	**1 707**	0.35	Tue 10 Jan	1989	3 153	**n.a.**
LU	Thursday	2	12	19:00	-6.20	3.70	**1 107**	6.70	Thu 2 Dec	2010	1 107	**-4**
LV	Wednesday	27	1	17:00	-21.40	-9.90	**1 323**	-1.28	Wed 21 Dec	1988	1 997	**n.a.**
ME	Friday	17	12	18:00	n.a.	n.a.	**712**	n.a.	Wed 16 Dec	2009	n.a.	**n.a.**
MK	Saturday	18	12	15:00	-1.00	14.00	**1 627**	1.07	Sat 5 Jan	2008	1 604	**11**
NI	Wednesday	22	12	19:00	-3.60	-9.70	**1 777**	7.11	Wed 22 Dec	2010	1 777	**-10**
NL	Monday	13	12	17:30	-2.50	-6.00	**17 728**	1.00	Tue 15 Jan	2008	n.a.	**n.a.**
NO	Wednesday	6	1	8:00	-17.40	-14.00	**23 994**	9.00	Wed 6 Jan	2010	23 994	**-14**
PL	Tuesday	26	1	17:30	-16.20	-13.10	**23 583**	3.20	Tue 26 Jan	2010	23 583	**-13**
PT	Monday	11	1	19:15	6.20	-2.50	**9 403**	2.00	Mon 11 Jan	2010	9 403	**-3**
RO	Monday	13	12	17:00	-2.40	-0.60	**8 464**	2.60	Thu 23 Nov	1989	10 248	**n.a.**
RS	Friday	31	12	18:00	-8.40	10.60	**7 656**	2.79	Mon 21 Dec	2009	7 448	**6**
SE	Wednesday	22	12	17:30	n.a.	n.a.	**26 690**	6.82	Mon 5 Feb	2001	27 000	**n.a.**
SI	Thursday	16	12	18:00	-5.60	-5.60	**1 970**	1.80	Thu 26 Jan	2006	2 110	**1**
SK	Friday	17	12	17:00	-9.90	-7.60	**4 342**	5.10	Tue 12 Dec	1989	4 471	**n.a.**
UA_W	Thursday	16	12	18:00	-8.10	n.a.	**1 118**	10.90	Wed 5 Jan	2011	1 142	**n.a.**

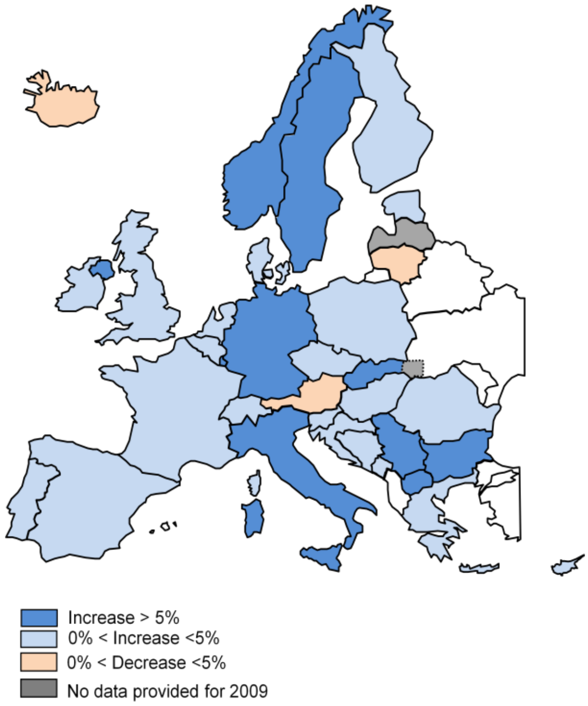
Table 5.3: National peak loads overview



Map 5.1: Month of Peak Load

Map 5.2: Countries with historical Peak Load in 2010

For almost all of the countries there was an increase in the peak load from 2009 to 2010. For most of the countries the increase was between 0% and 5%. However, for nine of the countries the increase was higher than 5% (see Map 5.3).



Map 3.3: Increase/decrease of Peak Load in 2010 compared to 2009

5.2.3. NATIONAL COMMENTS ON LOAD AND PEAK LOAD

AT – Austria

The peak load is not available. Therefore, the peak load on the third Wednesdays was taken.

BA – Bosnia-Herzegovina

No comments provided.

BE – Belgium

Although the mean temperature in January, February, November and December 2010 was below the average decennial temperature (2001-2010), the maximum Belgian peak load measured in December for 2010 remained below the maximum historic peak level measured on 17th December 2007. 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 webpage. Several load-shedding contracts with industrial customers are in force. The estimated contribution for 2010 is 261 MW. These contracts are part of the system services reserve and were activated eight times in 2010 (but not at reference points), namely 18th January, 23rd February, 29th April, 9th July, 24th November, 3rd December, 14th December and 18th December.

BG – Bulgaria

No comments provided.

CH – Switzerland

No comments provided.

CY – Cyprus

No comments provided.

CZ – The Czech Republic

No comments provided.

DE – Germany

No comments provided.

DK – Denmark

No comments provided.

EE – Estonia

The average temperature for the simultaneous peak load database was set at the average of the last 15 years.

ES – Spain

No comments provided.

FI – Finland

For peak load one hour’s average values have been used.

FR – France

New record highs for national power demand were set successively on 11 February with 93,080 MW, 14 December with 94,600 MW and finally 15 December with 96,710 MW.

Temperatures were 8.5°C below the seasonal norm in February, and 6.3°C below the norm in December.

The development of electric heating, and notably heat pumps, is increasing the sensitivity of demand to cold temperatures. The sensitivity of French electricity demand to temperatures is currently 2,300 MW per °C at certain times of the day. This means that for every 1°C drop in temperature, overall demand rises by the equivalent of twice the electricity consumption of the city of Marseilles.

http://www.rte-france.com/uploads/media/pdf_zip/publications-annuelles/rte-be10-fr-02.pdf

GB – Great Britain

No comments provided.

GR – Greece

A reduction of up to 200 MW in the annual peak load was recorded.

HR – Croatia

No comments provided.

HU – Hungary

The peak load is reported as a net value.

IE – Ireland

Ireland experienced a new record for peak load of 5090 MW in December 2010, when unusually cold temperatures were recorded.

IS – Iceland

No comments provided.

IT – Italy

In 2010, the highest electricity load on the national power system was equal to 56,425 MW, recorded on July 16 at 12:00 pm, higher by 8.8% compared to the 2009 peak (51,873 MW, June 17, 2008). The 2010 maximum load was just 397 MW below the absolute Italian maximum reached in 2007, but in the winter season (Dec.12th).

During the year, the monthly peak figures were essentially higher than those of the same months in the previous year, with some exceptions.

LT – Lithuania

Only precisely known year, when a historic instantaneous peak load occurred.

LU – Luxembourg

No comments provided.

LV – Latvia

No comments provided.

ME – Montenegro

No comments provided.

MK – Former Yugoslavian Republic of Macedonia

No comments provided.

NI – Northern Ireland

Extreme cold weather conditions experienced during November and December 2010.

NL – The Netherlands

No comments provided.

NO – Norway

No comments provided.

PL – Poland

During the 2009/2010 winter, the Polish TSO registered a historic peak load on 26 January 2010, mainly due to very low temperatures. The load at reference points (3rd Wednesday at 11 am) was higher in average by 4.1% compared to 2009.

PT – Portugal

The power demand on the public grid recorded an all-time high on 11th January at 9403 MW, 185 MW above the previous mark, set in 2009. The electricity demand recovered from the decline in the previous year, growing 4.7% (3.3% when corrected for the temperature effect and the number of working days).

RO – Romania

No comments provided.

RS – Republic of Serbia

No comments provided.

SE – Sweden

No comments provided.

SI – Slovenia

The annual peak load was observed in December at 18.00 CET. It was 1.8% higher than in 2009, and a 6.6% lower than the historic peak load in January 2006.

SK – Slovakia

The temperature deviation on 17th December 2010, when the annual peak load occurred, was calculated from the average temperature of the whole of December 2010 (-2.3 °C). The yearly peak load in 2010 was recorded at the end of January (4342 MW), a 5.1% (211 MW) higher compared to the 2009.

Load during 2010 was higher than in 2009, but it did not reach the levels from 2008 or 2007, i.e. before the worldwide economical and financial crisis. For more information refer also to the consumption comments in the paragraph 1.2.1. More information can be found at:

http://www.sepsas.sk/seps/dokumenty/RocenkySed/Rocenka_SED_2010.pdf (in English).

UA-W – Ukraine-West

No comments provided.

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5.3. GENERATING CAPACITY

5.3.1. ENTSO-E OVERVIEW

In 2010 the net generating capacity (NGC) of ENTSO-E was higher in every month compared to 2009 as not all of the countries provided their data for 2009.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NGC in 2009	821	822	824	825	827	830	833	834	834	835	836	839
NGC in 2010	869	869	869	872	876	876	878	881	882	886	892	896
Change in% between 2010 and 2009	**6%**	**6%**	**6%**	**6%**	**6%**	**6%**	**5%**	**6%**	**6%**	**6%**	**7%**	**7%**
Change in absolute value between 2010 and 2009	48	47	46	48	50	47	44	47	48	51	56	56

Table 5.4: Increase/decrease of NGC in whole ENTSO-E from 2009 to 2010 per month (GW)

The NGC in the ENTSO-E system increased in the whole of 2010 (see Table 5.4). The average growth of the NGC in each month of 2010 compared to 2009 was about 6%. The NGC changes are also shown in Figure 5.2. Whereas for 2010 each country provided the data, for 2008 and 2009 the data for some countries were fully or partially not available.

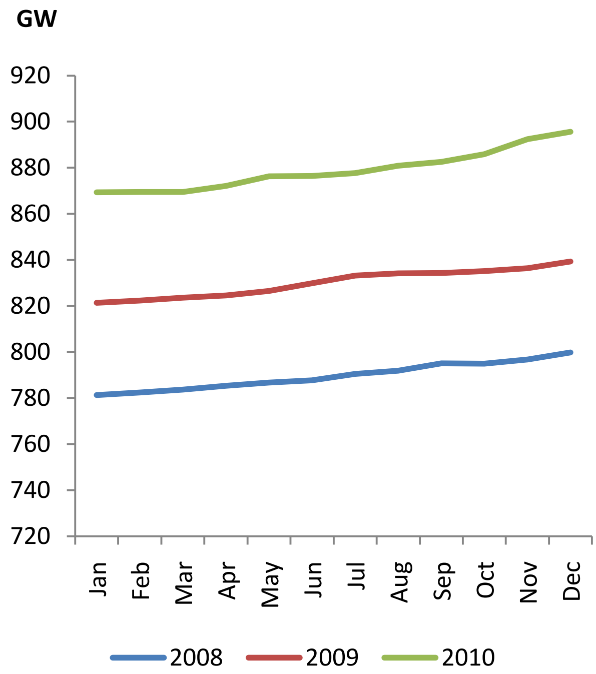

Figure 5.2: The evolution of the ENTSO-E NGC in 2008, 2009 and 2010[12]

The share of each individual primary source type as a percentage of the NGC in 2010 is presented in Figures 5.3 and 5.4. Crucial for the ENTSO-E generating capacity mix in 2010 were fossil fuels with 50%, followed by renewable energy sources with almost 26% (including renewable and run of river hydro power plants), nuclear power (15%) and hydro power plants considered as non renewable energy source (about 9%).

[12] The figures are influenced by a lack of information for years 2008 and 2009.

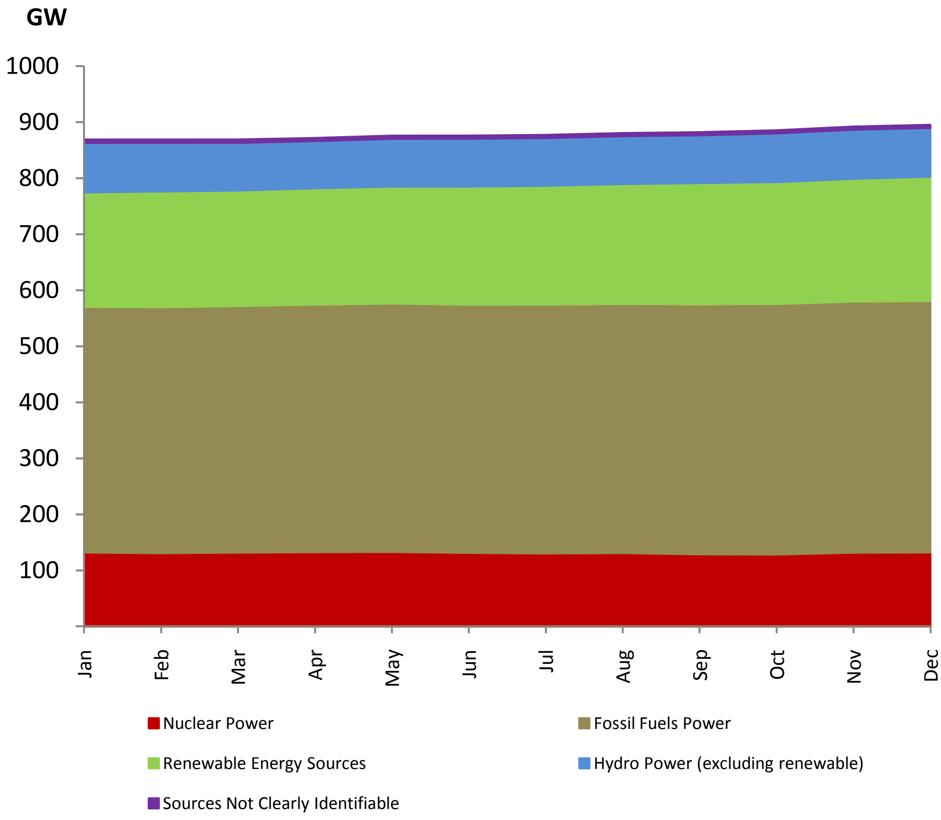

Figure 5.3: ENTSO-E generating capacity mix in 2010

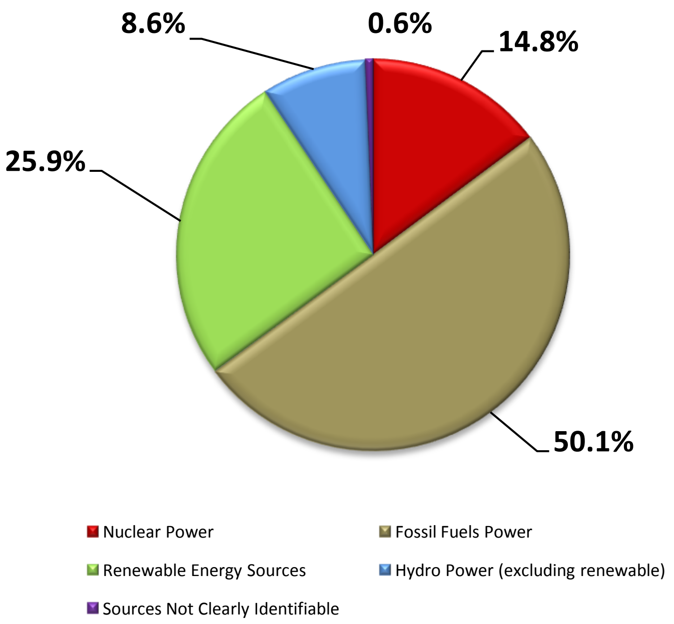

Figure 5.4: ENTSO-E generating capacity mix in December 2010 in %

5.3.2. FOSSIL FUELS

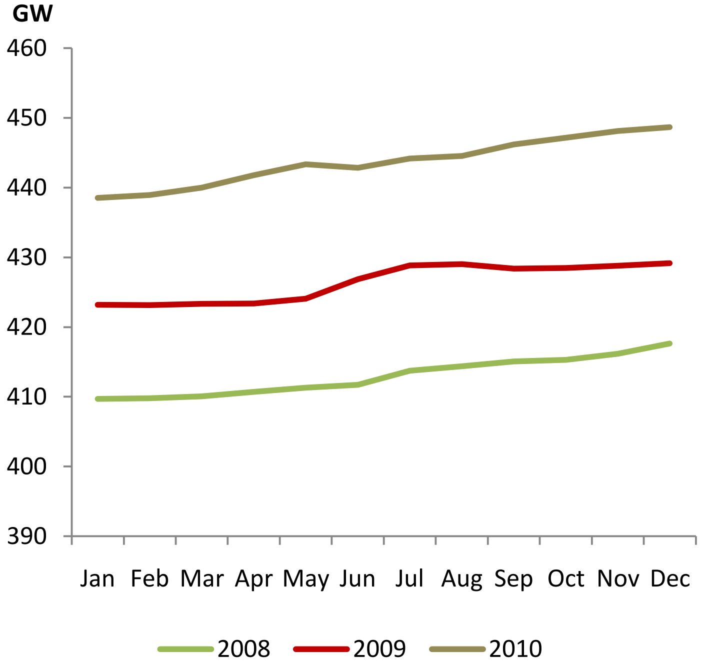

Figure 5.5: ENTSO-E Fossil Fuels generating capacity[13]

The fossil fuels generating capacity was growing the whole year 2010 with only one exception, between May and June (about 530 MW decrease). The total share of fossil fuels in the NGC in 2010 was almost 50%.

In 2010 the generating capacity of fossil fuels in ENTSO-E was on average 4% higher than in 2009 (considering the increase of fossil fuels month by month). For example, in December 2010 the generating capacity of fossil fuels in ENTSO-E was 4.5% higher than in December 2009. This increase in the fossil fuel generating capacity was also reported by some of the countries (e.g. Finland 18%, France 10%, Greece 13%, Ireland 14% and FYROM 28%).

The two most important categories of fossil fuels power plants were gas-fired units with a 40% share and hard coal units with a 27% share (see Figure 5.6 and Table 5.5 below).

The highest increase was recorded for lignite (about 10% for example, in Bulgaria and Romania) and gas-fired units (10% as well, caused mainly by an increase in France, Germany, Portugal, Greece, Croatia and Slovakia).

[13] The figures are influenced by a lack of information for years 2008 and 2009.

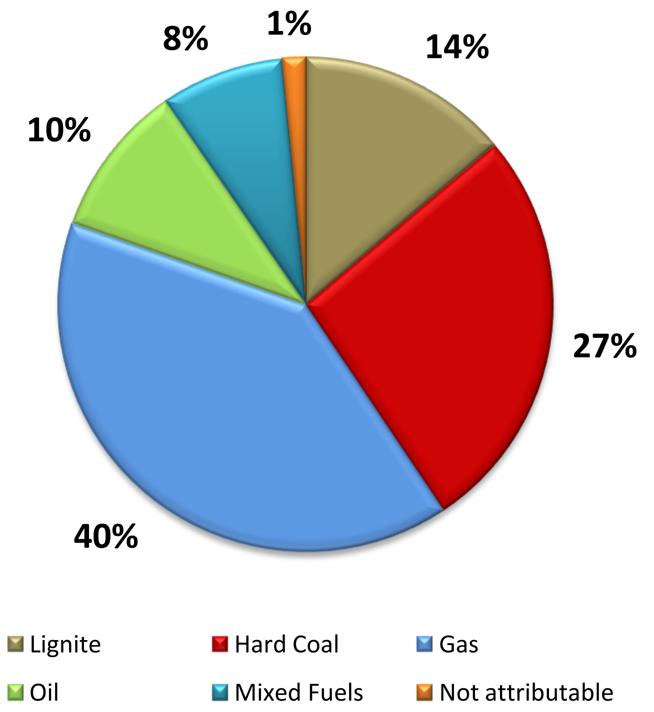

Figure 5.6: The share of the different fossil fuels in the generating fossil fuel capacity mix in December 2010

	December 2009	December 2010	Difference between 2010 and 2009	
			Absolute value	%
Fossil Fuels	429 177	448 673	19 496	5%
Lignite	56 044	61 716	5 672	10%
Hard Coal	116 849	120 032	3 183	3%
Gas	161 727	178 907	17 180	11%
Oil	42 888	45 372	2 484	6%
Mixed Fuels	34 573	35 706	1 133	3%
Not attributable Fossil Fuels	17 096	6 940	-10 156	-59%

Tab. 5.5: Overview of Fossil Fuels generating capacity mix in December 2009 and 2010 in MW

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. For more details see Chapter 3.4 System Adequacy Retrospect Data.

The total share of the RES as a percentage of the NGC was more than 24% for the whole of ENTSO-E in December 2010. The highest increase was stated for solar (92%) and wind (15%), followed by biomass (10%). Renewable HPP increased by about 27% jointly.

	December 2009	December 2010	Difference between 2010 and 2009	
			Absolute value	%
Renewable Energy Sources	196 517	231 912	35 395	18%
Wind	68 329	78 275	9 946	15%
Solar	13 587	26 060	12 473	92%

Biomass	10 440	11 521	1 081	10%
Run-of-river Power Plants	43 546	44 227	681	2%
Other Renewable Hydro Power Plants	55 346	69 323	13 977	25%

Table 5.6: Overview of RES generating capacity mix in December 2009 and 2010 (MW)[14]

Looking at Figure 5.7, about 49% of the RES generating capacity belonged to HPP, 34% to wind, solar had 12%, and biomass 5%.

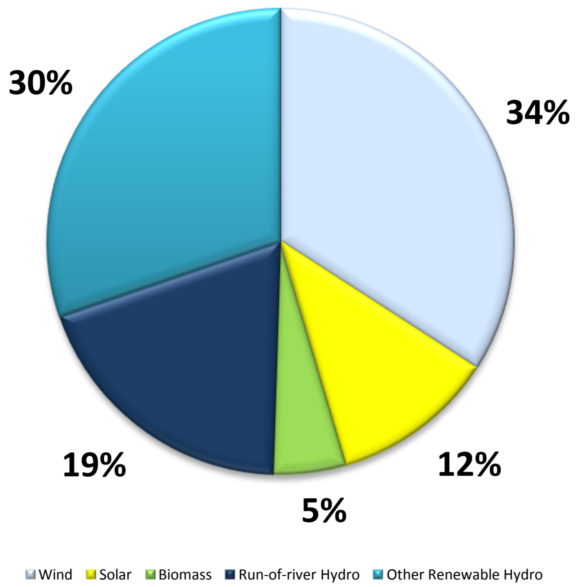

Figure 5.7: The share of the different RES categories in the RES generating capacity mix in December 2010

Considering only wind, solar and biomass as RES, the comparison between 2009 and 2010 is shown in Figures 5.8 and 5.9 below. The share of wind capacity took a major part of the total RES capacity and was at 70% in 2009 and 66% in 2010. In 2010 the share of installed wind capacity as part of the total RES decreased by 4% and the share of installed solar capacity increased by 8%. This indicates that solar technology is starting to become more and more popular among investors in RES capacity.

[14] The figures are influenced by a lack of information available to some TSOs, as well as for years 2008 and 2009.

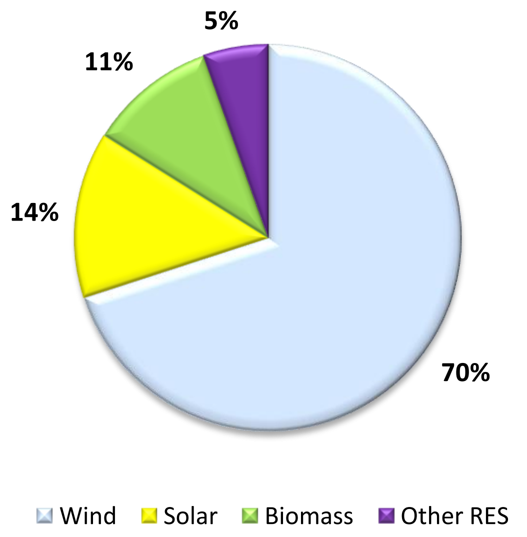

Figure 5.8: ENTSO-E RES generating capacity mix in December 2009

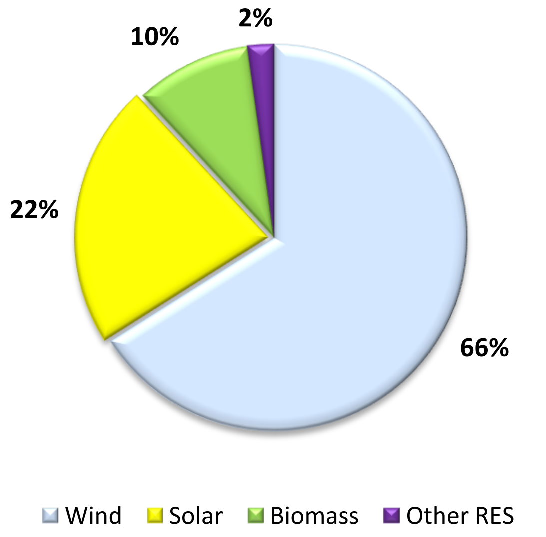

Figure 5.9: ENTSO-E RES generating capacity mix in December 2010

5.3.4. NUCLEAR POWER

During the year 2010 the nuclear generating capacity fluctuated. The evolution of the nuclear generating capacity in 2009 and 2010 is shown in Figure 5.10 below. It was mainly affected by capacity changes in Sweden.

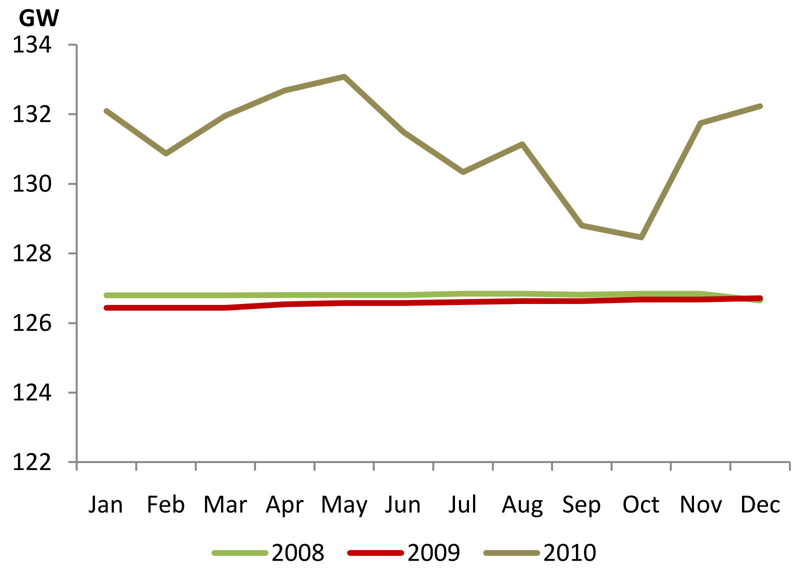

Figure 5.10: ENTSO-E Nuclear generating capacity in 2008, 2009 and 2010[15]

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 2010 is shown in Figure 5.11; the category "others" means countries with a share of less than 4%. France (48%) together with Germany (15%) made up 63% of the total ENTSO-E nuclear generating capacity. A similar situation was

[15] The figures are influenced by a lack of information for years 2008 and 2009.

reported in 2009 with almost the same numbers (66%).

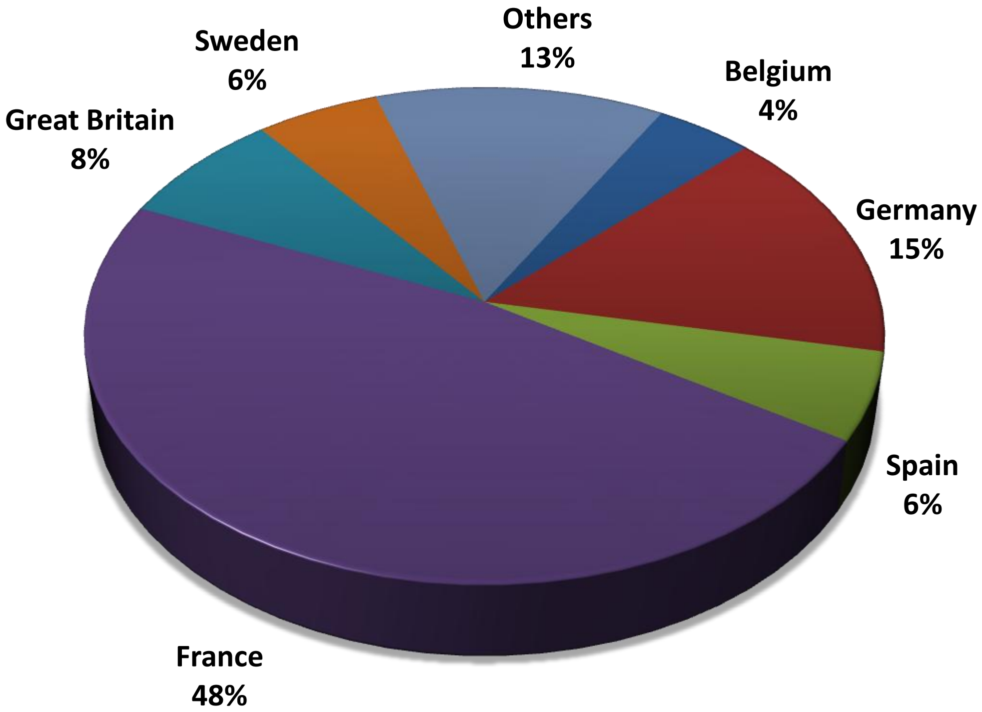

Figure 5.11: The share of nuclear generating capacity in the individual ENTSO-E countries as a part of the total installed nuclear capacity in ENTSO-E in 2010

5.3.5. NON-RENEWABLE HYDRO POWER

Unless otherwise stated, hydro power plants (HPP) generating capacity in this chapter is considered without the part considered as a renewable energy source (for more details see Chapter 3.4).

The evolution of the generating capacity of this kind of power plant is shown in Figure 5.12. It is clearly visible, that during 2010 significant changes or fluctuations were not recorded, except a fall of 1.5 GW in February.

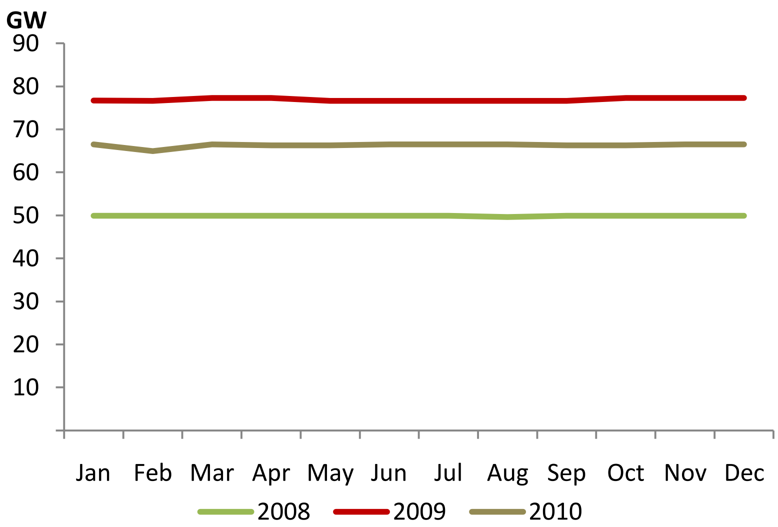

Figure 5.12: Non-renewable Hydro power plants generating

capacity in 2008, 2009, and 2010[16]

The evolution of the total hydro power plants generating capacity is shown in Figure 5.13.

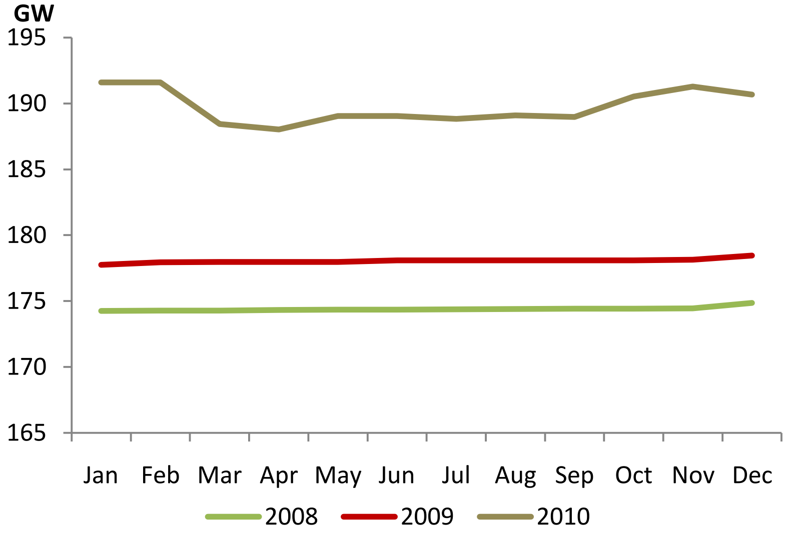

Figure 5.13: Total Hydro Power Plants generating capacity in 2008, 2009 and 2010[17]

The total HPP installed capacity recorded fluctuations during 2010, mainly due to the changes in Sweden, but also in Lithuania and Great Britain.

5.3.6. NATIONAL COMMENTS ON GENERATING CAPACITY

AT – Austria

No comments provided.

BA – Bosnia-Herzegovina

No comments provided.

BE – Belgium

Compared to December 2009, 1030 MW of additional capacity was connected to the grid in December 2010. Despite the decommissioning of some major central units (coal, gas and multi-fuel), the commissioning of thermal plants (mainly gas – 438 MW), onshore wind (85 MW), offshore wind (165 MW), biomass/waste-plants (13 MW) and CHP-gas-plants (158 MW) caused the total installed capacity to rise significantly. In some cases fossil fuel power stations burn a mixture of fossil fuels and RES.

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.

BG – Bulgaria

No comments provided.

[16,15] The figures are influenced by a lack of information for years 2008 and 2009.

CH – Switzerland

No comments provided.

CY – Cyprus

A new combustion engine of about 50 MW was put into operation in March 2010. An 82 MW wind farm was in a pre-commissioning test period from August 2010.

CZ – The Czech Republic

No comments provided.

DE – Germany

It has to be pointed out that, due to the current legal rules, German TSOs are not responsible for provision of investigations about national demand and generation. Furthermore market participants are not obliged to provide detailed information contributing to the calculation of a national power balance to the German TSOs. Hence a lot of the data required for the SAR are estimations and approximations gained from experiences in the past before the liberalization of the electricity.

Due to the methodology approx. 3 GW of installed pump storage capacity, which are integrated in the German market, are not included in the German data collection.

DK – Denmark

Some plants are mixed–fuel power plants, but the statistics available does not make use of the category.

EE – Estonia

No comments provided.

ES – Spain

No comments provided.

FI – Finland

No comments provided.

FR – France

At the end of 2010, the installed capacity of France’s generating fleet was 3,100 MW higher than at the end of 2009.

New facilities connected to the RTE network in 2010 included the 78 MW wind farm at Epizon in Haute-Marne, two CCGTs and two combustion turbines with a total rated capacity of approximately 1,260 MW, and thermal plants running on renewable fuels with a total capacity of 88 MW.

With 5,600 MW of installed capacity in metropolitan France at the end of 2010, wind generation is continuing to develop.

The number of PV installations connected to the network rose significantly in 2010, with a solar fleet now totalling 760 MW, more than four times the capacity installed at the end of 2009.

http://www.rte-france.com/uploads/media/pdf_zip/publications-annuelles/rte-be10-fr-02.pdf

GB – Great Britain

No comments provided.

GR – Greece

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No comments provided.

HR – Croatia

No comments provided.

HU – Hungary

No comments provided.

IE – Ireland

2010 saw the introduction of 880 MW of new gas CCGTs in Ireland, and the closure of 220 MW of oil powered plant. The level of installed wind generation also increased to 1,415 MW.

IS – Iceland

No comments provided.

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 increases by 3.6%, corresponding to 2.6 GW. Hydropower power plants have been quite stable.

Data reported are provisional.

LT – Lithuania

No comments provided.

LU – Luxembourg

No comments provided.

LV – Latvia

No comments provided.

ME – Montenegro

No comments provided.

MK – Former Yugoslavian Republic of Macedonia

No comments provided.

NI – Northern Ireland

Nine generating units (1 805 MW in total) are capable of running on mixed fuels. The data has identified which fuel type these have been run on in 2010 and this has been added into the appropriate fuel type category. RES includes small scale wind power plants, hydro power plants, and tidal power plants. The category non-identifiable is estimated.

NL – The Netherlands

No comments provided.

NO – Norway

No comments provided.

PL – Poland

During 2010, the generating capacity of wind doubled. However, the share in total generation

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capacity amounted to less than 4%.

PT – Portugal

In 2010 a new combined cycle power station with 2x 418.6 MW was commissioned.

The renewable generating capacity, mainly wind and photovoltaic, continued to increase. New wind power stations totalled about 350 MW. In 2010, about 17% of the electricity demand was supplied by wind power.

RO – Romania

No comments provided.

RS – Republic of Serbia

No comments provided.

SE – Sweden

No comments provided.

SI – Slovenia

In 2010, the Avce pump-storage hydro power plant on Soca river started its normal operation. This is the first pump-storage unit in Slovenian EPS, with 180MW installed capacity.

In the tables, mixed fuel category represents gas turbines which can also run on oil.

SK – Slovakia

The generating capacity in Slovakia increased in 2010. In total it was +679 MW (+9.6%) compared with 2009. The major reason of this increase is a new combined cycle power plant with an installed capacity of 430 MW (operated by company “E.ON Elektrárne Ltd.”). The power plant is located in the south-western part of Slovakia (near the village of Malženice). The power plant started commercial operation 1 January 2011 and is connected into the substation 400/220/110 kV Križovany at the voltage level of 400 kV. This power plant was in testing operation from October 2010.

Another increase of capacity was recorded due to new diesel engines located in three separate localities of the Slovak power system. The engines were built to provide fast tertiary reserves services with ability to reach power 96 MW at maximum within 3 minutes. They have been in the operation since 1 January 2010.

More information can be found at:

http://www.sepsas.sk/seps/dokumenty/RocenkySed/Rocenka_SED_2010.pdf (in English).

UA-W – Ukraine-West

No comments provided.

5.4. UNAVAILABLE CAPACITY

5.4.1. ENTSO-E OVERVIEW

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	210 697	216 674	232 967	260 722	276 758	272 793	271 201	284 881	279 334	273 526	256 095	228 461
2010	238 134	245 513	261 310	300 056	313 716	301 830	311 080	313 731	310 765	295 834	263 987	237 100

Table 5.7: ENTSO-E Unavailable Capacity overview

The structure of the unavailable capacity in 2010 is shown in Figure 3.14.

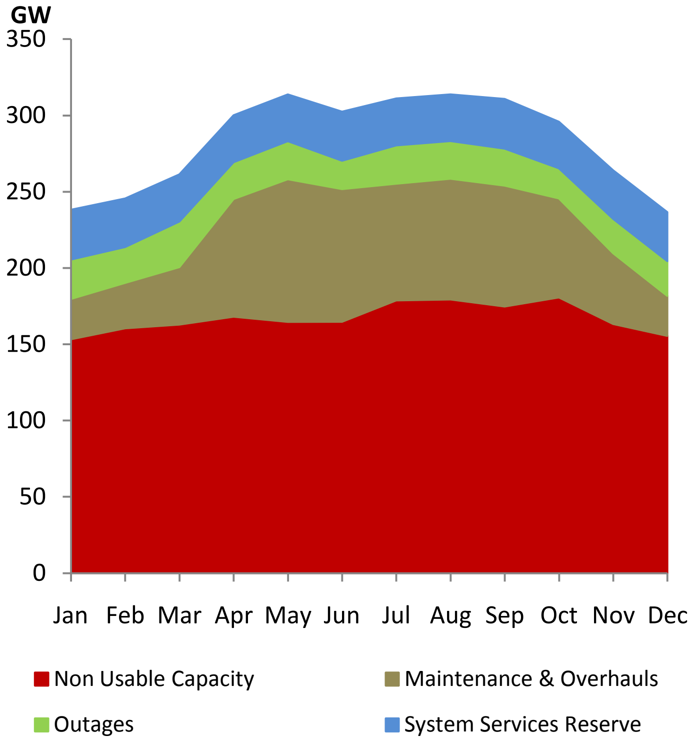


Figure 5.14: Unavailable Capacity overview for 2010

Most of the Unavailable Capacity was non-usable capacity, i.e. the capacity representing reductions of the NGC due to different causes. This was followed by maintenance and overhauls, system services reserve, and outages. The total amount of unavailable capacity was higher compared to the previous year in each month of 2010. The comparison between 2008, 2009, and 2010 is shown in Figure 5.15 below. It is visible, that even if the Unavailable Capacity took more of the NGC in 2010 than ever before (except for November and December, when in 2009 the situation was the opposite) the differences between 2010 and 2009 were only minor and they were between -1% (November and December) and 3%.

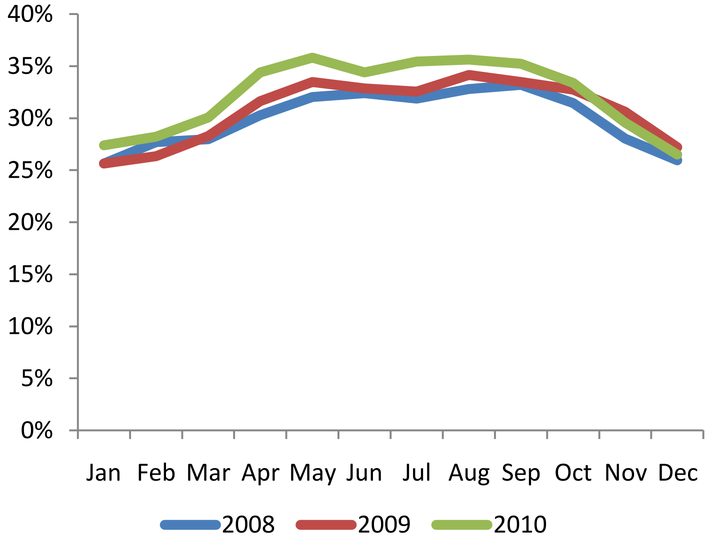


Figure 5.15: Comparison of Unavailable Capacity as a part of NGC in 2008, 2009 and 2010

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[18].

[18] https://www.entsoe.eu/resources/publications/system-development/sar-reports/

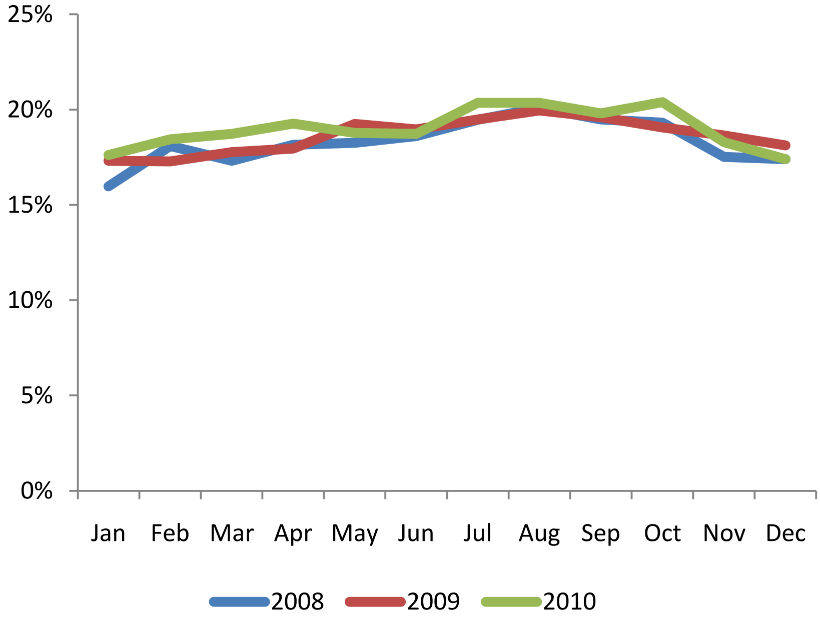


Figure 5.16: Comparison of Non-Usable Capacity as a part of NGC in 2008, 2009 and 2010

In Figure 5.16 the Non-Usable Capacity as a part of the NGC in 2008, 2009 and 2010 is shown. The lines are almost identical, however the values for 2010 are in fact higher than in previous years for almost every month (the exceptions are May, June, November and December).

5.4.3. SYSTEM SERVICES RESERVE

The system services reserve (SSR) is a part of the NGC that is required to compensate for real-time imbalances or to control the voltage, frequency, etc. (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.

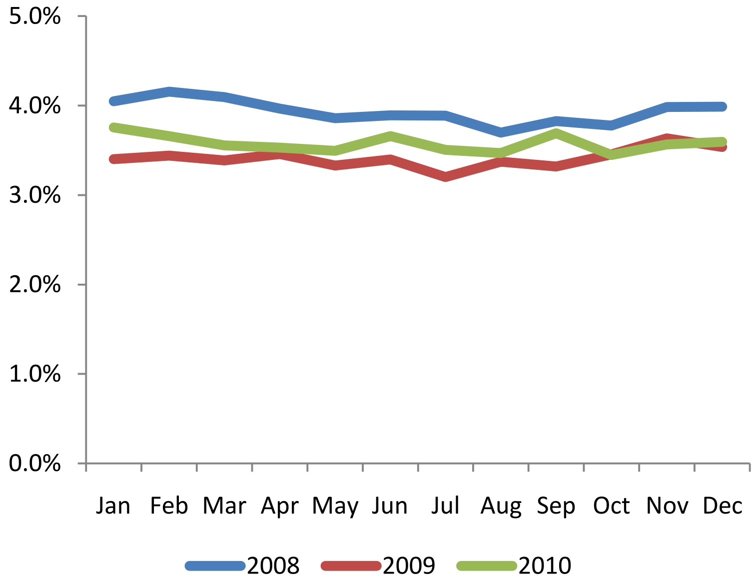


Figure 5.17: System Services Reserve as a part of NGC in 2008, 2009 and 2010

One can see from Figure 5.17 that SSR as a part of the NGC for 2010 is placed between 2008 and 2009, i.e., the SSR had a lower share of the NGC in 2010 than in 2008 (but higher than in 2009). It could be caused probably by the fact, that in 2010 the NGC value was much higher comparing to the 2008, and even if SSR in 2010 was higher as well, its share in NGC is less obvious.

The rest of Unavailable Capacity´s subcategories, i.e. outages and maintenance and overhauls, were higher in 2010 than in previous years. However, this and also all above mentioned statements are affected by the fact that not each TSO has provided the data for 2008 and 2009, whereas for 2010 they have.

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 that 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 2010. Minimum values were reported during the summer months (May, July and August, from 563 GW to 567 GW), when the Unavailable Capacity was at the highest levels. On the other hand, Figure 5.19 shows the share of the RAC as a percentage of the NGC in 2008, 2009 and 2010. One can see that the course of the lines in each reported year is very similar, and although in absolute values the RAC in each month of 2010 was slightly higher than in previous years, its share in the NGC was lower. This was probably caused by the fact that the NGC in 2010 was much higher compared to the previous years. The two exceptions were November and December, when the NGC and the RAC were the highest, and therefore the share of the RAC in the NGC was higher than in 2009.

The figures for 2008 were affected by the fact that not every TSO provided data for this year.

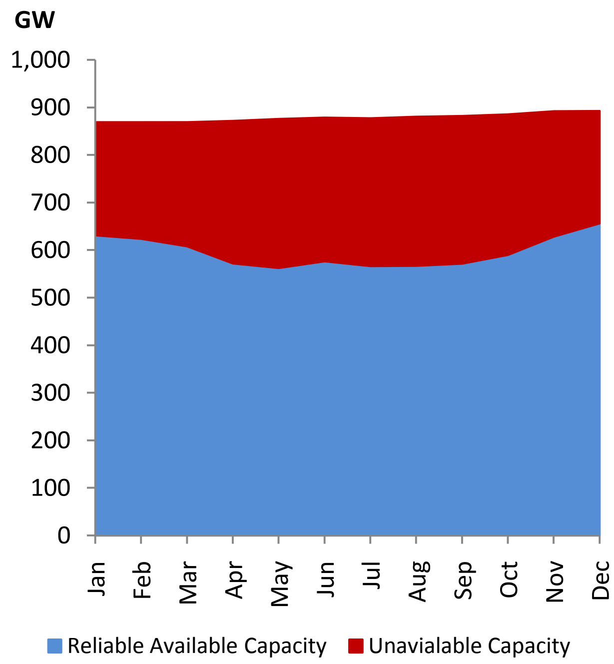


Figure 5.18: RAC as a part of NGC in absolute values for 2010

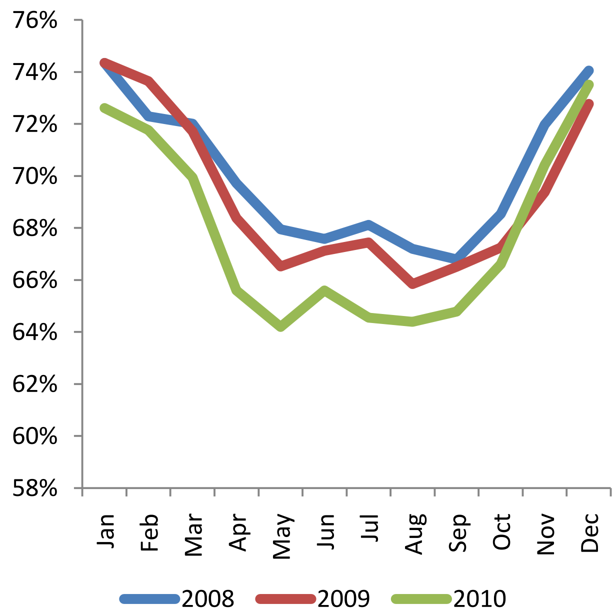


Figure 5.19: RAC as a part of NGC in 2008, 2009 and 2010

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 on a power system is the difference between the reliably available capacity and the load.

ENTSO-E OVERVIEW

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	168.652	163.935	181.983	173.616	181.593	180.052	183.381	198.712	174.603	185.493	191.231	190.248
2009	198.306	200.087	230.158	226.691	217.519	211.950	210.144	218.983	206.014	185.464	205.295	182.675
2010	136 769	128 787	157 214	157 356	149 486	164 304	148 970	181 476	160 458	149 591	164 133	137 264

Tab. 5.8: ENTSO-E Remaining Capacity overview (MW)

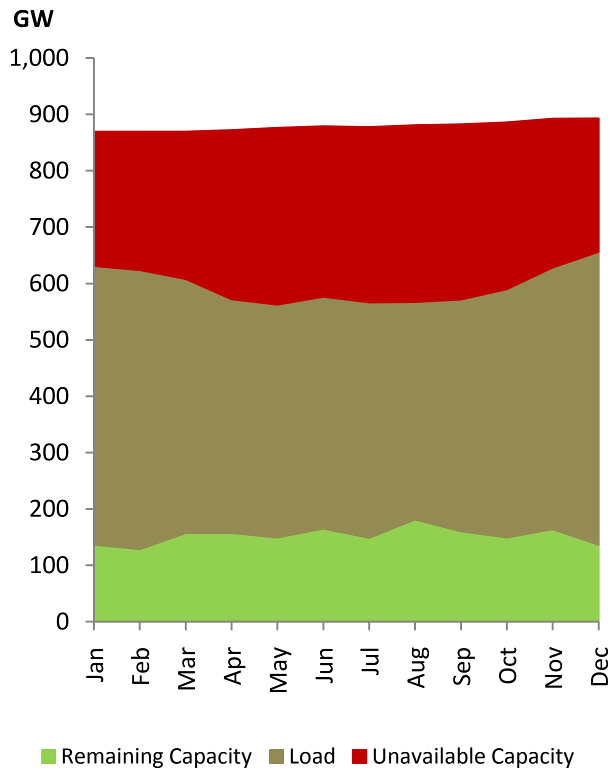


Figure 5.20: Remaining Capacity as a part of NGC in absolute values for 2010

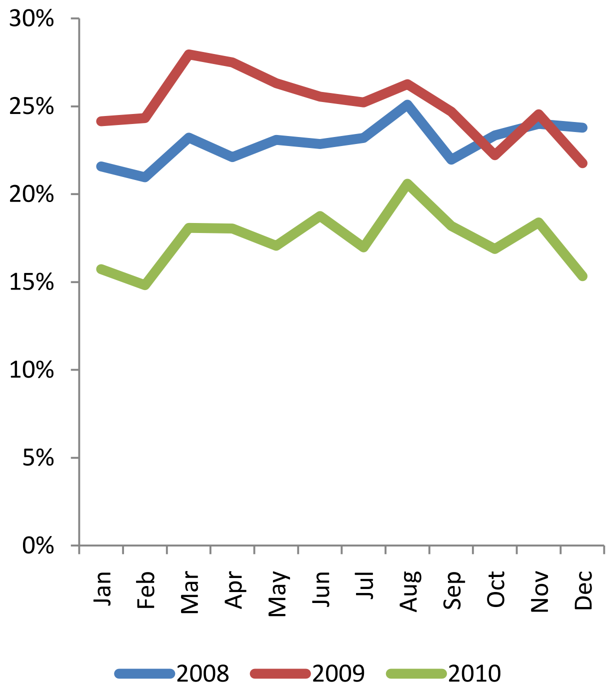
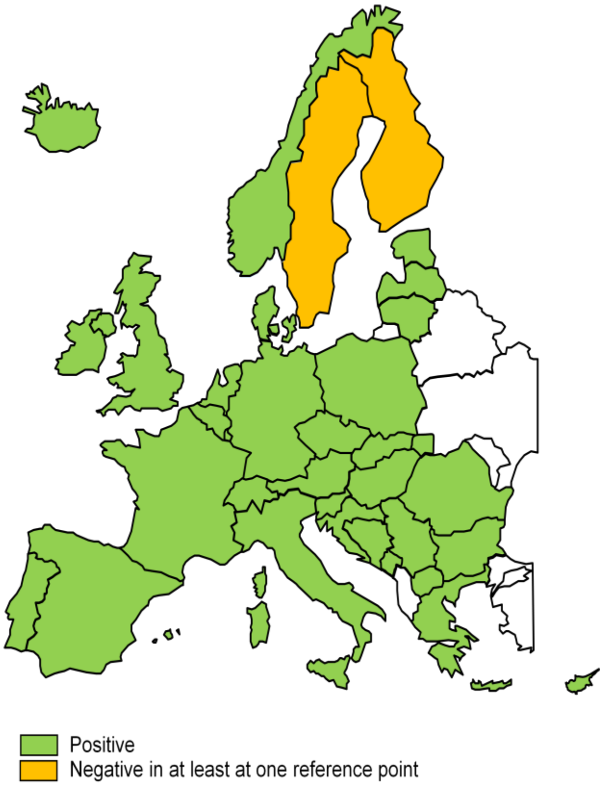


Figure 5.21: Remaining Capacity as a part of NGC in 2008, 2009 and 2010

Compared to 2009, remaining capacity was lower during the whole of 2010 (see Figure 5.21). The reasons for this might be twofold. Since both the unavailable capacities and load were on average higher in 2010 than 2009, the calculated remaining capacity ended up being lower.

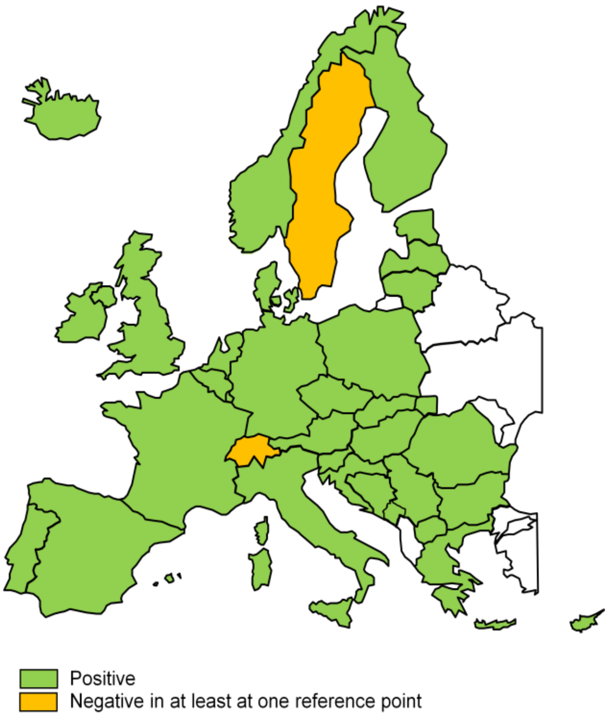
5.6.2. NATIONAL REMAINING CAPACITY

In the majority of the ENTSO-E countries the RC was positive during the whole year (without considering the influence of exchanges). Only Sweden and Finland reported negative RC. For Sweden it was reported for eight reference points (January to April, and September to December); for Finland it was reported for four reference points (January, February, August and December). This situation is shown on Map 5.4 where the countries with a number of reference points with a negative RC are highlighted.



Map 5.4: Reference points with negative RC in 2010 (w/o exchanges)

When looking at the exchanges (see Map 5.5), the situation was much better for Finland (no negative RC including exchanges). However, Sweden showed nine reference points with negative RC. The situation for the months and reference points mentioned previously was better (for September it was even positive), however it worsened, i.e. became negative, for May and June. Also, for Switzerland one reference point with negative RC was reported, namely December (due to the highest load of the year of 10.5 GW and high exports of 1797 MW).



Map 5.5: Reference points with negative RC in 2010 (including exchanges)

5.6.3. NATIONAL COMMENTS ON REMAINING CAPACITY

AT – Austria

No comments provided.

BA – Bosnia-Herzegovina

No comments provided.

BE – Belgium

The non-usable capacity is calculated on the basis of production profiles based on real measurements for the year under consideration. For this reason, the non-usable capacity values can differ significantly from one year to another. In 2010, the average monthly non-usable capacity at reference points was 80% higher than in 2009. The system services reserve consisted of 106 MW primary reserves, 798 MW minutes reserve and 252 MW other reserves. (137 MW secondary reserve and 400 MW tertiary reserve, 261 MW of the minutes reserve were load shedding contracts with industrial customers).The 252 MW 'Other reserves' was imposed in a contract by Elia on the generator with the biggest unit, but did not come within the operational responsibility of Elia. The origin of the imposition, although it came through the ARP contract, was the Grid Code: every ARP is responsible for its own balance. This reserve was included because it is a part of the system services reserve as determined by the ENTSO-E rules

In 2010 the Remaining Capacity excluding exchanges at the reference time was sufficient to reach an adequacy between generation and consumption in Belgium without having to rely on imports. The Remaining Capacity excluding exchanges at the reference time was lower than 5% of the net generation capacity only in December 2010.

BG – Bulgaria

No comments provided.

CH – Switzerland

No comments provided.

CY – Cyprus

No comments provided.

CZ – The Czech Republic

No comments provided.

DE – Germany

No comments provided.

DK – Denmark

No comments provided.

EE – Estonia

No comments provided.

ES – Spain

No comments provided.

FI – Finland

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

FR – France

In 2010, cold snaps did not result in tightness on the French power system and the supply-demand balance was maintained satisfactorily, in part thanks to the recent development of new generating capacities, both renewable and thermal, and the use of 46 cross border interconnectors. During the two-week cold snap of December 2010 (the weeks of 30 November and 13 December), import capacities (in balance of exchanges) were well below the maximum permissible physical value, of around 8,000 MW.

At 6.30 p.m. on 12 November 2010, a new wind generation record was set, with instantaneous power output of 4,200 MW, corresponding to a load factor (9) of 77%. That value beat the previous absolute maximum of 3,620 MW, recorded in February 2010. Over 2010 as a whole, the hourly load factor remained extremely variable, fluctuating between 0% and 79%, with an average value for the year of 22%, in line with the figure for 2009.

Ecowatt awareness initiative

In Brittany and the east of the PACA region, there was a real risk of an interruption in supply owing to structural weakness in the local network. Altogether, over the whole of 2010, Brittany was placed on «EcoWatt orange alert» for a total of seven days, and on «EcoWatt red alert» for a total of five days. Over 2010, the eastern part of the PACA region was placed on «orange alert» on 15 days.

http://www.ecowatt-bretagne.fr/

In PACA, the €85m of recent network investment by RTE have already proven their worth in improving the region’s security of supply: since December 2010, the investment has avoided one «red alert» day and nine days of «orange alerts». Nonetheless, this notable improvement does not entirely resolve the situation in the east of the PACA region, where the security of supply remains structurally fragile.

http://www.ecowatt-provence-azur.fr/

In both these regions, the EcoWatt awareness initiative was triggered to invite consumers to moderate their electricity use, particularly between the hours of 6 p.m. and 8 p.m. Over the winter 2009-2010, it is estimated that for each of these two regions, the EcoWatt appeals helped reduce demand by around 1.5% at peak times depending on the day of the week. That is equivalent to the consumption of 60,000 people, or equivalent to the electricity consumption of the towns of Lorient (56) and Saint-Raphael (83).

http://www.rte-france.com/uploads/media/pdf_zip/publications-annuelles/rte-be10-fr-02.pdf

GB – Great Britain

No comments provided.

GR – Greece

No comments provided.

HR – Croatia

No comments provided.

HU – Hungary

No comments provided.

IE – Ireland

Non-usable capacity figure is primarily due to wind generation not being at maximum availability. The reserve requirements for Ireland changed in March when a new gas CCGT became the largest unit on the system.

IS – Iceland

No comments provided.

IT – Italy

No comments provided.

LT – Lithuania

No comments provided.

LU – Luxembourg

Wind capacity not available to the TSO is considered as non-usable.

LV – Latvia

No comments provided.

ME – Montenegro

No comments provided.

MK – Former Yugoslavian Republic of Macedonia

No comments provided.

NI – Northern Ireland

No comments provided.

NL – The Netherlands

No comments provided.

NO – Norway

No comments provided.

PL – Poland

The Remaining Capacity was positive for all the analyzed reference points.

PT – Portugal

No comments provided.

RO – Romania

No comments provided.

RS – Republic of Serbia

No comments provided.

SE – Sweden

No comments provided.

SI – Slovenia

In 2010, the Remaining Capacity in Slovenia was positive during the whole year. No problems associated with the system adequacy were observed.

SK – Slovakia

The remaining capacity in Slovakia was positive during the whole of 2010 (including or excluding exchanges). No major problems were observed in this respect and the power system operation was thus safe and reliable.

UA-W – Ukraine-West

No comments provided

5.6.4. 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 analyzed 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 be monthly too, 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.

.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Remaining Capacity	136 769	128 787	157 214	157 356	149 486	164 304	148 970	181 476	160 458	149 591	164 133	137 264
Margin Against Monthly Peak Load	57 570	45 893	62 178	35 085	31 242	27 225	26 475	43 120	33 878	35 812	73 223	43 263
Remaining Margin	79 198	82 894	95 035	122 271	118 243	137 079	122 494	138 356	126 580	113 778	90 910	94 001

Tab. 5.9: ENTSO-E Remaining Margin overview for 2010 (MW)

During the whole of 2010 the amount of Remaining Margin was positive and higher than 5%. 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. Nonetheless, these values are much lower than in 2008 and 2009, as the MaMPL parameter was higher than in the previous monitored years by about 40% 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.

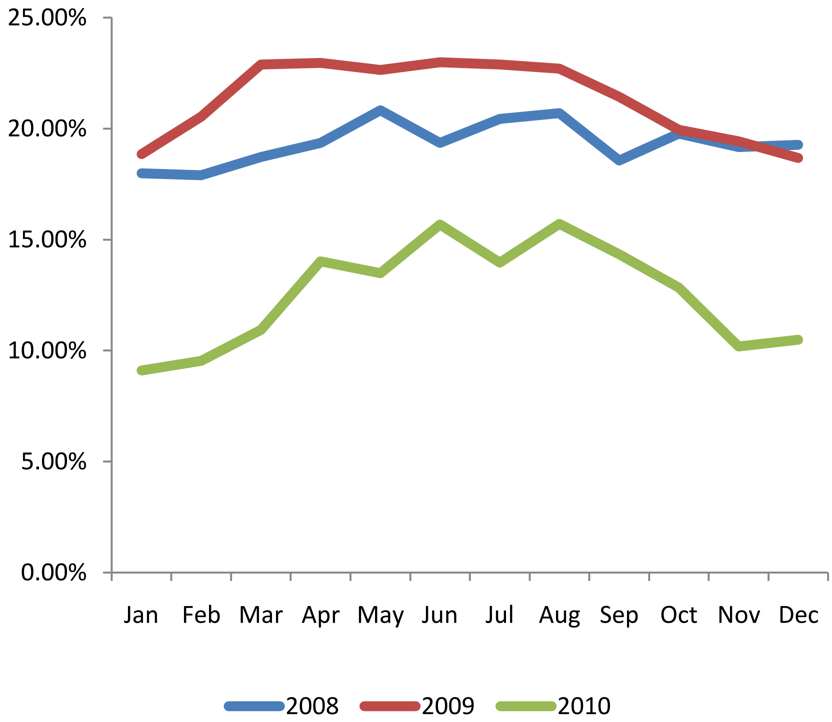


Figure 5.22: Remaining Margin as a part of NGC in 2008, 2009 and 2010

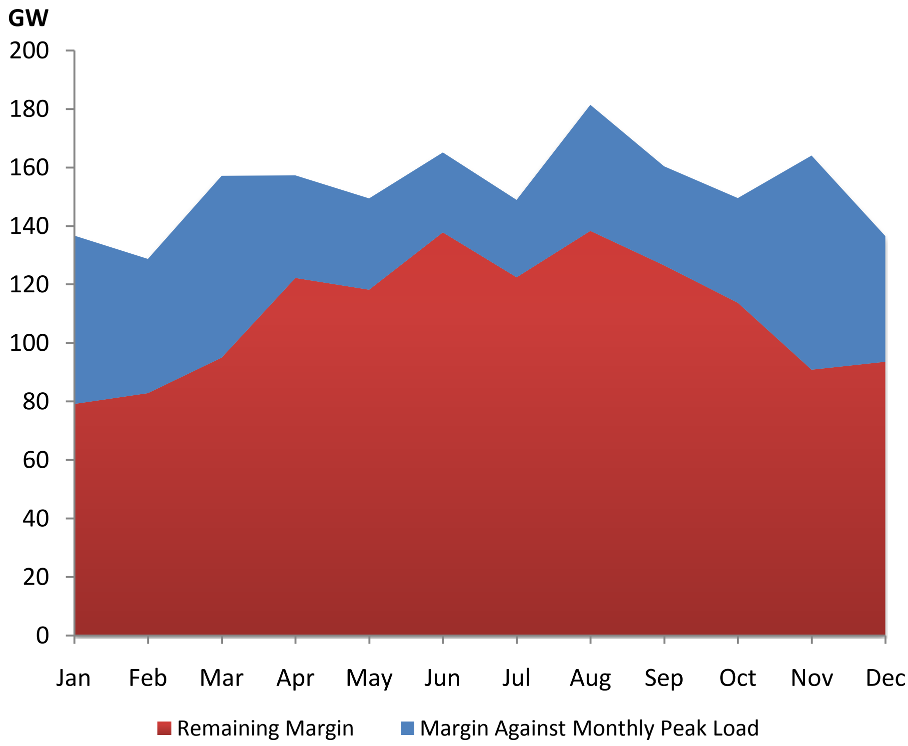


Figure 5.23: Remaining Margin plus Margin Against Monthly Peak Load in absolute values for 2010

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