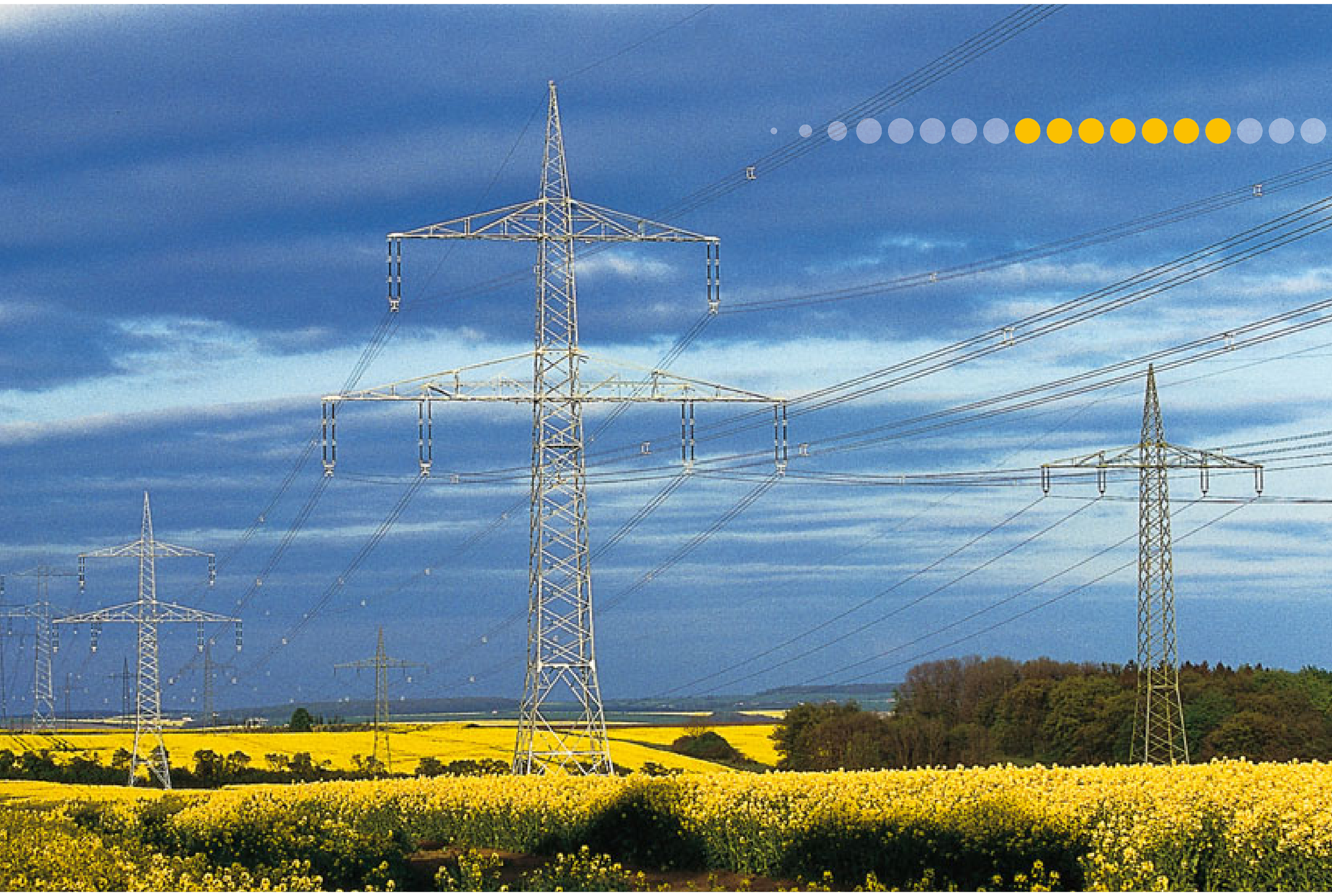


System Adequacy Forecast 2008 – 2020

union for the co-ordination of transmission of electricity

UCTE

System Adequacy Forecast

2008-2020

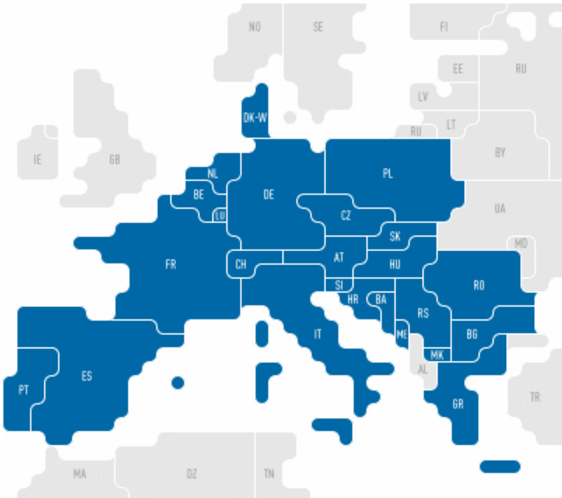
Table of content

List of Figures

List of Maps

List of Tables

Introduction to the UCTE



Map 1 UCTE Linking Up Europe

The "Union for the Co-ordination of Transmission of Electricity" (UCTE) is the association of transmission system operators in continental Europe, providing a reliable market base by efficient and secure electric "power highways".

50 years of joint activities laid the basis for a leading position in the world which the UCTE holds with respect to the quality of synchronous operation of interconnected power systems.

Through the networks of the UCTE, about 450 million people are supplied with electric energy; annual electricity consumption totals approx. 2500 TWh.

EXECUTIVE SUMMARY

Executive Summary

Generation adequacy of the UCTE system should not be at risk up to 2015. About 50 GW of additional capacities are required by 2020, but should be available provided announcements regarding new generations projects are confirmed. More detailed results and analyses are supplied below, after a short introduction to the methodology.

Aims and Methodology

This UCTE System Adequacy Forecast report aims at providing all players of the European power market with an overview of:

- Generation and demand in the UCTE system in 2008, 2010, 2013, 2015 and 2020,
- Generation Adequacy analysis for overall UCTE and for main regional blocks over 2008 – 2020,
- Role of transmission capacities.

The adequacy analysis is based on the comparison between available generation and load at three given reference time points of the year.

The difference between available generating capacity and load at reference time point is called "Remaining Capacity" (RC) calculated under normal conditions. To assess adequacy, Remaining Capacity is compared to a given "Adequacy Reference Margin" (ARM) accounting for unexpected events affecting load and generation. The ARM is calculated for each country and for overall UCTE in order to cover the increase of load from the reference time point to the peak load (called "margin against peak load"), and demand variations or longer term generation outages not covered by operational reserves.

For the global overview of adequacy at UCTE level, the ARM is calculated as 5% of UCTE total Net Generating Capacity plus the sum of individual margins against peak load.

In this calculation of ARM, two approximations have opposite effects: on one hand, the peak load of all countries are treated as if synchronous, on the other hand the exchange capacities between countries are considered as infinite. The resulting value is considered to be an acceptable margin to ensure a reasonably low risk of shortfall in UCTE.

The comparison used in this report to characterize the reliability of UCTE system is then, for each of the studied time points:

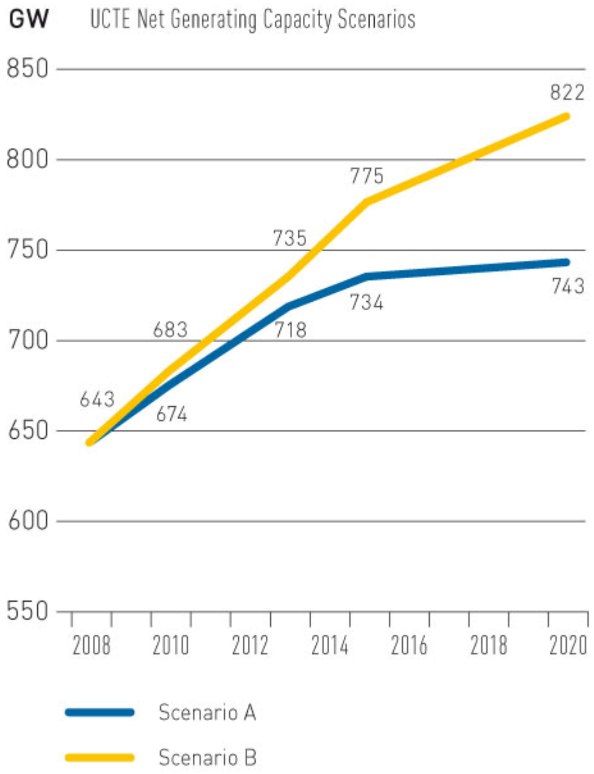
When Remaining Capacity is over or equal to Adequacy Reference Margin, it means that some generating capacity is likely to be available for export on the power system.

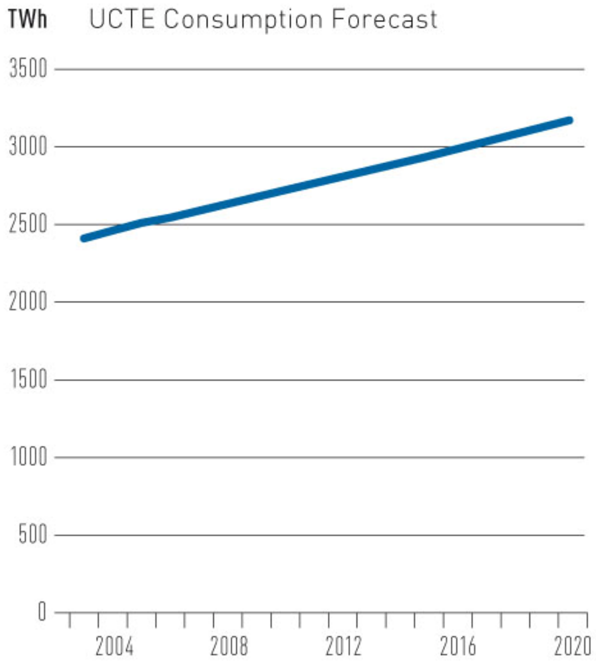
When Remaining Capacity is lower than Adequacy Reference Margin, it means that the power system is likely to have to rely on import flows when facing severe conditions.

The analysis of adequacy is carried over two scenarios of generating capacity evolution:

- **Conservative Scenario or Scenario A**: This scenario takes into account the commissioning of new power plants considered as sure and the shutdown of power plants expected during the study period.
- **Best Estimate Scenario or Scenario B**: This scenario takes into account the generation capacity evolution described in scenario A as well as future power plants whose commissioning can be considered as reasonably credible according to the information available to the TSOs.

UCTE Adequacy Forecast





In Conservative scenario A, Net Generating Capacity[1] in the whole UCTE will top in 2015 at about 730 GW. Indeed, most of the investments considered as firm and confirmed today should be operational before 2015.

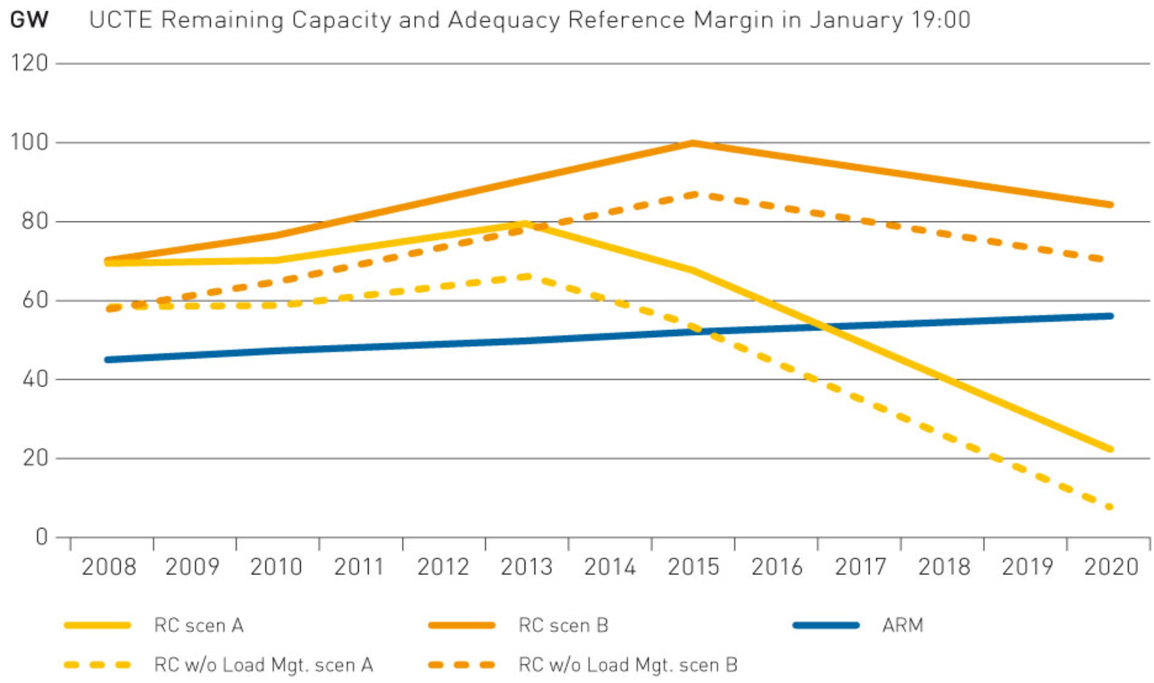
In Best Estimate scenario B, Net generating Capacity will continuously increase in the years to come to reach about 770 GW in 2015 and about 820 GW in 2020. Thus, further to the capacity already secured, extra capacity is forecasted: with +15 GW in five years time and up to +80 GW of in 2020. The expected average annual growth rate of generating capacity in the UCTE would be +2.7% up to 2015 and then +1.2% up to 2020.

On the other hand, based on national growth rate forecast and recorded national consumptions[2], UCTE consumption should reach 2700 TWh around 2010 with an average annual growth rate of +2.3% and exceed 3000 TWh around 2018 with an average annual growth rate of +1.2%.

UCTE synchronous load at reference point January 19:00 (under standard weather conditions) will continue to increase in the future but its annual growth rate should slow down from +2.1% up to 2010 (415 GW), then +1.8% up to 2015 (455 GW) and later +1.5% up to 2020 (490 GW). The same variations are expected for the other reference points January and July 11:00.

[1] Net Generating capacity sums up the maximum output of every power plant. About 70% of Net Generating capacity can be turned into Reliably Available Capacity (UCTE estimate see Chapter 2.3.1).

[2] UCTE estimates are based on the national consumptions in 2006 (source UCTE SAR 2006 report)



The comparison of Remaining Capacity and Adequacy Reference Margin shows that generation adequacy of the UCTE system should not be at risk up to 2015 in any generation scenario and at any reference point.

After 2015, additional investments in generating capacity are required to maintain the level of adequacy at an appropriate level.

Future investments in new generating capacity considered in Best Estimate scenario B look sufficient to maintain adequacy up to 2020 at the level of 2008.

Results in Conservative scenario A show that Remaining Capacity decreases as from 2013 ending about 30 GW below Adequacy Reference Margin in 2020. With 70% of Net Generating Capacity turning into Reliably Available Capacity (UCTE estimate, see Chapter 2.3.1), this is equivalent to a minimum requirement of about 50 GW of additional Net Generating Capacity by 2020. Some 60 GW of additional Reliable Available Capacity, i.e. about 90 GW of additional Net Generating Capacity, would even be necessary to maintain margins at the present level of 2008.

However, investments foreseen in Best Estimate scenario B appear sufficient to make the Remaining Capacity 30 GW above Adequacy Reference Margin in 2020, at the about the level experienced in 2008.

Regional Adequacy Forecast

The global vision of UCTE as a whole can be enhanced by a more detailed analysis of five regional blocks[3].

[3] The definitions of these regional blocks slightly changed compared to last year's report, mainly with the merging of Romania and Bulgaria with other South-Eastern Countries; and the merging of Slovenia and Croatia with Italy to form the Center-South Block. The present regional blocks do not match exactly the ERI clusters, as in the latter case, some countries belong to several ERI; whereas delineated borders between regional blocks with no overlapping are required to address transmission adequacy.

North Western Block

Austria, Belgium, France, Germany, Luxembourg, the Netherlands and Switzerland

Remaining Capacity excess to Adequacy Reference Margin should continuously increase in the next five years. This is quite a change compared to the previous SAF 2007-2020, which reported a stable Remaining Capacity up to 2010. It reflects a major increase of the forecast regarding generating capacity despite the decommissioning of existing facilities in the same time.

In the longer run, considering Conservative scenario A, more than 20 GW of additional Net Generating Capacity would be necessary before 2020 to keep adequacy as in 2008. Considering Best Estimate scenario B, the level of adequacy appears satisfactory up to 2020. Yet, if the level of adequacy should increase up to 2015, it then decreases later on.

North Eastern Block

Czech Republic, Hungary, Poland, Slovak Republic and Ukraine-West

The level of adequacy of the North Eastern block should be stable up to 2010, confirming the forecast in the previous SAF 2007-2020 report published early 2007.

Considering Conservative scenario A, about 30 GW of additional Net Generating Capacity would be necessary before 2020 to keep adequacy as in 2008. Considering Best Estimate scenario B, the level of adequacy looks satisfactory up to 2020, making the situation better than in the previous SAF 2007-2020. The most tensed period should be around 2013. Then, as additional nuclear capacity should be commissioned in Slovak Republic in 2015, Reliably Available Capacity would grow quicker than Load and the level of adequacy should remain satisfactory up to 2020.

South Eastern Block

Bosnia-Herzegovina, Bulgaria, FYROM, Greece, Montenegro, Romania and Republic of Serbia

Before 2010, South Eastern block is not expected to have the adequate level of adequacy. This is in line with the previous SAF 2007-2020 report published early 2007, but Romania and Bulgaria belong now to the block. After 2010, Remaining Capacity should increase much more than Load, with the commissioning of additional gas capacity by 2013 and nuclear capacity in Romania and Bulgaria before 2015.

Considering Conservative scenario A, adequacy should remain close to the minimum required level from 2008 up to 2020. Considering Best Estimate scenario B, the level of adequacy appears satisfactory from 2013 on.

Centre South Block

Italy, Slovenia and Croatia.

Adequacy should be achieved but is likely to rely on Load Management, especially in 2010.

Considering Conservative scenario A, about 10 GW of additional capacity would be necessary before 2020 to keep adequacy as in 2008. Considering Best Estimate scenario B, the level of adequacy appears satisfactory up to 2020.

South Western Block

Portugal and Spain

Remaining Capacity excess to Adequacy Reference Margin in the next five years is much higher than the previous SAF 2007-2020. It reflects a major increase of the forecast Net Generating Capacity in the medium term (+ 21 GW by 2013).

Yet, load grows at a rapid pace and foreseen investment in generation cannot prevent that after 2015, the situation looks constrained.

Considering Conservative scenario A, about 13 GW of additional Net Generating Capacity would be necessary before 2020 to meet the Adequacy Reference Margin requirement. In this respect, considering Best Estimate scenario B, less than 5 GW of additional Net Generating Capacity would be necessary in 2020.

1 METHODOLOGY SUMMARY

1 Methodology Summary

1.1 Introduction

The data and the methodology for system adequacy analysis used by UCTE in its System Adequacy Forecast (SAF) reports are described in details in the UCTE System Adequacy Methodology document downloadable on the UCTE web site.

System adequacy of a power system is the ability of a power system to supply the load in all the steady states in which the power system may exist considering standards conditions. System adequacy is analysed through generation adequacy and transmission adequacy.

The perimeter of the system adequacy analysis performed by UCTE is made of all the countries of the UCTE members minus the Denmark West associated member Energynet.dk and plus the Ukraine West TSO Ukrenergo. The differences between the UCTE perimeter and the actual geographical perimeter of the System Adequacy analysis are small enough to extend its results to the actual UCTE perimeter.

National data are collected by national correspondent for the reference points: third Wednesday of January at 11:00, third Wednesday of January 19:00 and third Wednesday of July at 11:00. Time horizons are 2008, 2010, 2013, 2015 and 2020. Calculations are made at that reference points of the time horizons. Any other results are approximated by linear interpolations.

Compared to previous reports, some regional blocks have been slightly updated to match with the most interconnected systems, as shown in Map 2:

- South Western[5] block is made of Portugal and Spain.
- North Western[6] block is made of Austria, Belgium, France, Germany, Luxembourg, the Netherlands and Switzerland.
- North Eastern[7] block is made of Czech Republic, Hungary, Poland, Slovak Republic and Ukraine-West.
- South Eastern[8] block is made of Bosnia-Herzegovina, Bulgaria, FYROM, Greece, Montenegro, Romania and Republic of Serbia.
- Centre South[9] block is made of Croatia, Italy and Slovenia.

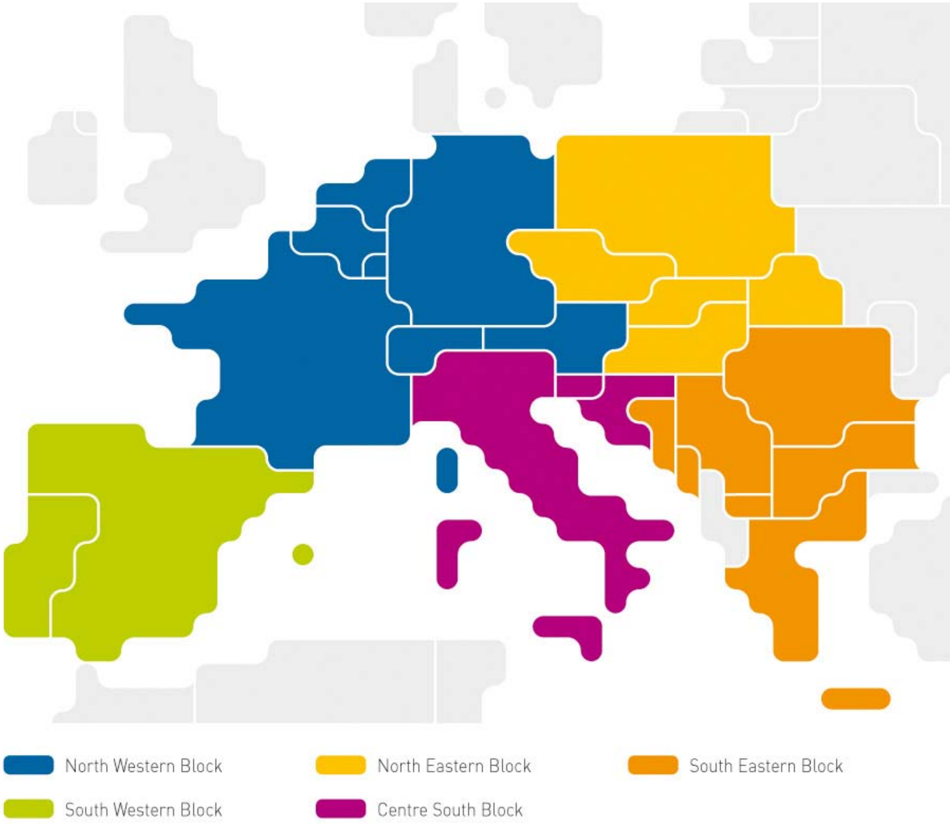
[5] South Western used to be named Spain + Portugal.

[6] In previous edition, Main-UCTE block was used and was made of countries in the North Western Block plus Bosnia-Herzegovina, Croatia and Slovenia.

[7] North Eastern block used to be named CENTREL.

[8] Bosnia-Herzegovina has joined the South Eastern block. Romania and Bulgaria used to be considered as a separate block.

[9] Italy used to be considered as a separate block.



Map 2 Regional Blocks for Adequacy Analysis

1.2 Generation Adequacy

1.2.1 Definitions

Generation adequacy of a power system is an assessment of the ability of the generation on the power system to match the consumption on the power system.

Generation adequacy is made at three levels: individual countries, 5 regional blocks and the whole UCTE. The analysis at regional level completes the overall UCTE-wide picture by taking account of major limitations in power flows within the whole synchronous area.

A UCTE SAF report is published at the beginning of each year (Y) with 3 kinds of forecast (time horizons):

- Starting point forecast on the same year following of publication (Y),
- Mid-term forecast on 5 years later than the year following the publication year (Y+5),
- Long-term forecast about 15 years ahead on the rounded mid decades and decades following the publishing date (e.g. 2010, 2015 and 2020 in the report to be published in 2008).

Power data collected for each country are synchronous at each reference point (date and time power data are collected for) and can thus be aggregated. In order to compare the evolutions of the results, similar reference points are specified for all time horizons and from one report to another. 3 annual reference points are defined in the forecast reports.

Load on a power system is the net (excluding consumption of power plants' auxiliaries, but including network losses) consumption 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.

Load Management (LM) is the potential deliberate load reduction available at peak load to balance the system and ensure reliability.

Only one long-term forecast scenario for load is referred to.

With respect to generation, UCTE has developed **2 long-term generation scenarios** to help assessing the range of uncertainty and evaluating the risk for the security of supply over the coming years. Generation data provided for each country follow these 2 generation scenarios:

- **Conservative Scenario or Scenario A**: this scenario takes into account the commissioning of new power plants considered as sure and the shutdown of power plants expected during the study period. It shows the evolution of the potential unbalances if no new investment decision were to be taken in the future and allows the identifications of the investments necessary to maintain the expected security of supply over the forecast period.
- **Best Estimate Scenario or Scenario B**: this scenario takes into account the generation capacity evolution described in scenario A as well as future power plants whose commissioning can be considered as reasonably credible according to the information available to the TSOs. It gives an estimation of potential future developments, provided that market signals give adequate incentives for investments.

Net Generating Capacity (NGC) of a power station is the maximum electrical net active power it can produce continuously throughout a long period of operation in normal conditions. NGC of a country is the sum of the individual NGC of all power stations connected to either the transmission grid or to the distribution grid.

Unavailable Capacity is the part of 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) on a power system is the difference between NGC and Unavailable Capacity.

Remaining Capacity (RC) on a power system is the difference between RAC and Load.

Margin Against Peak Load (MaPL) is the difference between load at the reference point and the peak load over the period the reference point is representative of. SAF MaPL is seasonal and is called Margin Against Seasonal Peak Load (MaSPL). A MaSPL is estimated for each one of the 3 reference points.

All the above definitions are illustrated in Fig. 1.

Fig. 1 **Generation Adequacy Analysis**

1.2.2 Assessment

Spare Capacity is the part of Net Generating Capacity which should be kept available at Reference Points to ensure the security of supply in most of the situations. Spare Capacity is supposed to cover a 1% risk of shortfall on a power system i.e. to guarantee the operation on 99% of the situations. UCTE studies concluded that Spare Capacity could be characterised in each individual country as 5% or 10% of NGC, depending on its system's features; and for a set of countries (regional blocks or whole UCTE) as 5% of NGC.

Adequacy Reference Margin (ARM) in an individual country is equal to Spare Capacity plus the related MaPL. ARM in a set of countries (regional blocks or whole UCTE) is estimated as the following sum:

(Sum of all individual MaPL values) + (Spare Capacity of the set of countries)

where Spare Capacity is estimated as 5% of NGC of the set of countries.

Generation adequacy is assessed for each individual country, for each regional block and for the whole UCTE. Generation Adequacy Forecast at Reference Point under Normal Conditions on power system is assessed at the reference points with the RC value.

When Remaining Capacity is positive, it means that some generating capacity is likely to be available on the power system under normal conditions.

When Remaining Capacity is negative, it means that the power system is likely to be short of generating capacity under normal conditions.

Seasonal Generation Adequacy Forecast in most of the situations is assessed through the seasonal extension of the Generation Adequacy Forecast on power system, by the comparison of the related RC and ARM.

When Remaining Capacity is over or equal to Adequacy Reference Margin, it means that some generating capacity is likely to be available for export on the power system.

When Remaining Capacity is lower than Adequacy Reference Margin, it means that the power system is likely to have to rely on import flows when facing severe conditions.

Simultaneous Interconnection Transmission Capacity (SITC) of a power system is the overall transmission capacity through its peripheral interconnection lines,. SITC are calculated according to the UCTE Transmission Development Plans. The SITC export value is called Export Capacity and may differ from the SITC import value, called Import Capacity. SITC values are potentially different at every reference points on every time horizons.

Transmission adequacy forecast aim at identifying potential congestions and potential need for developments of interconnection lines. In the present study it is limited to the assessment of security issues requirements and not the ones that may derive from market price differences.

Transmission adequacy forecast is assessed at the reference points with the comparison of RC, calculated under normal conditions, and SITC. It assesses the ability of a power system to transmit its own positive RC to its neighbouring power systems.

When Remaining Capacity is positive and lower than Export Capacity, it means that the generating capacity likely to be available on the power system can be exported *under normal conditions at reference point.*

When Remaining Capacity is negative and its absolute value is lower than Import Capacity, it means that all the necessary import flows to meet load can be imported *under normal conditions at reference point*.

Seasonal Transmission Adequacy Forecast in Most of the Situations is assessed through the seasonal extension of Transmission Adequacy Forecast. It assess the ability of power system to meet its ARM with the necessary support of import flows from its neighbouring power systems or the ability of a power system to export its positive RM to its neighbouring power systems, if necessary.

When Remaining Capacity minus Adequacy Reference Margin is positive and lower than Export Capacity, it means that all the generating capacity likely to be available on the power system can be exported *in most of the situations*.

When Remaining Capacity minus Adequacy Reference Margin is negative and its absolute value is lower Import Capacity, it means that all the necessary import flows to meet load can be imported *in most of the situations*.

2 POWER BALANCE FORECAST

2 Power Balance Forecast

2.1 UCTE Power Balance Tables

The figures in the two summary tables below are analysed in the next chapters.

Here below is the forecast of the power balance in the UCTE grid in Conservative scenario A.

GW		2008			2010			2013			2015			2020	
Scenario A	January		July	January		July	January		July	January		July	January		July
	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00
Nuclear Power	111.9	111.9	111.9	109.0	109.0	109.0	107.7	107.7	107.7	107.6	107.6	107.5	98.7	98.7	98.1
Fossil Fuels	332.8	332.8	335.1	345.7	345.7	350.2	367.8	367.8	369.2	369.4	369.4	370.5	362.3	362.3	363.1
Renewable Energy Sources (other than hydro)	62.1	62.1	65.2	80.9	80.9	84.3	101.4	101.4	103.8	113.4	113.4	115.4	135.2	135.1	137.1
Hydro power	136.1	136.1	136.1	137.8	137.8	138.4	140.5	140.5	140.6	143.3	143.3	143.5	146.5	146.5	146.6
Not Clearly Identifiable Energy Sources	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Net Generating Capacity	643.5	643.5	649.0	673.9	673.9	682.3	717.9	717.9	721.8	734.1	734.1	737.3	743.2	743.2	745.4
Unavailable Capacity	186.4	186.3	234.7	200.1	200.2	251.2	214.6	214.6	262.3	226.6	226.6	276.1	245.4	245.4	293.4
Reliably Available Capacity	457.1	457.2	414.3	473.8	473.7	431.1	503.2	503.3	459.5	507.5	507.5	461.2	497.8	497.7	452.0
Load	390.9	399.0	344.3	407.7	415.6	361.7	428.2	436.9	381.8	444.4	453.5	397.0	480.9	489.5	430.5
Load Management	11.5	11.5	8.9	11.5	11.5	9.5	12.1	12.1	10.1	12.8	12.8	10.8	13.2	13.6	11.6
Remaining Capacity	77.7	69.6	78.9	77.6	69.6	78.9	87.1	78.5	87.8	75.9	66.8	75.0	30.0	21.8	33.1
Spare Capacity	32.2	32.2	32.4	33.7	33.7	34.1	35.9	35.9	36.1	36.7	36.7	36.9	37.2	37.2	37.3
Margin Against Seasonal Peak Load	19.4	12.0	12.7	20.0	12.6	13.2	20.1	12.3	13.4	20.9	12.9	14.3	20.1	14.6	15.2
Adequacy Reference Margin	51.5	44.2	45.1	53.7	46.3	47.4	56.0	48.2	49.4	57.6	49.6	51.2	57.2	51.7	52.5

Tab. 1 UCTE Power Balance Forecast in Conservative Scenario A

Here below is the forecast of the power balance in the UCTE grid in Best Estimate scenario B.

GW		2008			2010			2013			2015			2020	
Scenario B	January		July	January		July	January		July	January		July	January		July
	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00
Nuclear Power	111.9	111.9	111.9	109.0	109.0	109.0	107.7	107.7	107.7	107.6	107.6	107.5	98.7	98.7	98.1
Fossil Fuels	332.8	332.8	335.1	349.3	349.3	353.0	374.5	374.5	376.5	395.5	395.5	397.0	415.3	415.3	417.7
Renewable Energy Sources (other than hydro)	62.1	62.1	65.2	82.4	82.4	85.8	107.3	107.3	109.9	122.6	122.6	124.9	154.2	154.2	156.5

Hydro power	136.1	136.1	136.2	138.9	138.9	139.4	142.4	142.4	142.6	146.5	146.5	146.7	150.7	150.7	151.4
Not Clearly Identifiable Energy Sources	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Net Generating Capacity	643.5	643.5	649.0	680.1	680.1	687.7	732.4	732.4	737.2	772.7	772.7	776.5	819.4	819.4	824.2
Unavailable Capacity	186.4	186.4	234.7	200.9	201.0	251.7	218.8	218.8	267.9	233.5	233.5	284.8	261.0	261.0	313.6
Reliably Available Capacity	457.1	457.1	414.3	479.1	479.0	436.0	513.6	513.7	469.3	539.2	539.3	491.7	558.4	558.4	510.6
Load	390.9	399.0	344.3	406.8	414.6	361.2	427.5	436.2	381.4	443.8	452.8	396.9	480.2	488.6	430.4
Load Management	11.5	11.5	8.9	11.5	11.5	9.5	12.2	12.2	10.2	12.8	12.8	10.8	13.3	13.8	11.8
Remaining Capacity	77.7	69.6	78.9	83.9	75.9	84.4	98.3	89.6	98.0	108.3	99.3	105.6	91.5	83.6	92.0
Spare Capacity	32.2	32.2	32.4	34.0	34.0	34.4	36.6	36.6	36.9	38.6	38.6	38.8	41.0	41.0	41.2
Margin Against Seasonal Peak Load	19.4	12.0	12.7	20.0	12.6	13.2	20.1	12.3	13.3	20.9	12.9	14.3	20.0	14.6	15.2
Adequacy Reference Margin	51.5	44.2	45.1	54.0	46.6	47.6	56.7	48.9	50.2	59.5	51.6	53.2	60.9	55.6	56.4

Tab. 2 UCTE Power Balance Forecast in Best Estimate Scenario B

2.2 Generating Capacity

Net Generating Capacity of a power station is the maximum electrical net active power it can produce continuously throughout a long period of operation in normal conditions.

2.2.1 Generation Scenarios

As mentioned in the methodology summary in Chapter 1.2, two forecast scenarios have been considered for generation capacity:

- **Conservative Scenario or Scenario A**: this scenario takes into account the generation capacity evolution described in scenario A as well as the commissioning of new power plants considered as sure and the shutdown of power plants expected during the study period.
- **Best Estimate Scenario or Scenario B**: this scenario takes into account future power plants whose commissioning can be considered as reasonably credible according to the information available to the TSOs.

The two forecasts for the Net Generating Capacity in the UCTE are shown in

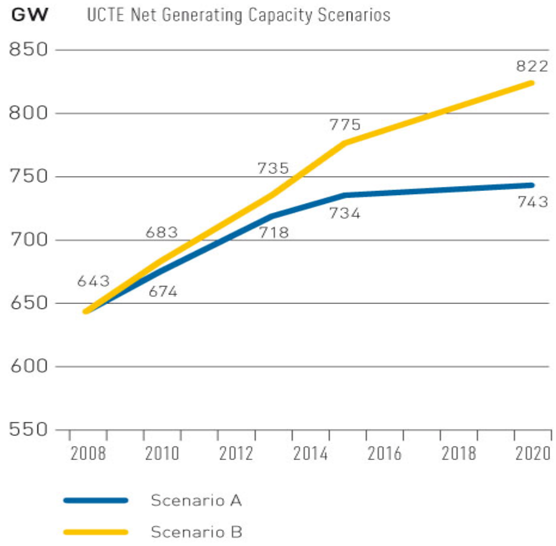
Fig. 2.

In Conservative scenario A, generating capacity in the whole UCTE will top in 2015 at about 730 GW. Indeed, most of the investments considered as firm and confirmed today should be operational before 2015.

In Best Estimate scenario B, generating capacity should continuously increase in the years to come to reach about 770 GW in 2015 and about 820 GW in 2020. Further to the capacity already secured, extra capacity is forecasted: with +15 GW in 2013 and up to +80 GW of in 2020. The expected average annual growth rate of generating capacity in the UCTE should be +2.7% up to 2015 and then +1.2% up to 2020.

If commissioning of new generating capacity is expected to exceed decommissioning all over the UCTE grid the growth rate of generating capacity is geographically contrasted as detailed in Map 3. Up to 2013, countries with the biggest growth rate of generating capacity should be FYROM with +15%, Greece and Portugal with +8% and finally the Netherlands and Montenegro with +6%. Smaller contributions should take place in Poland and Czech Republic with about +1%.

National comments are in Chapter 2.2.6.



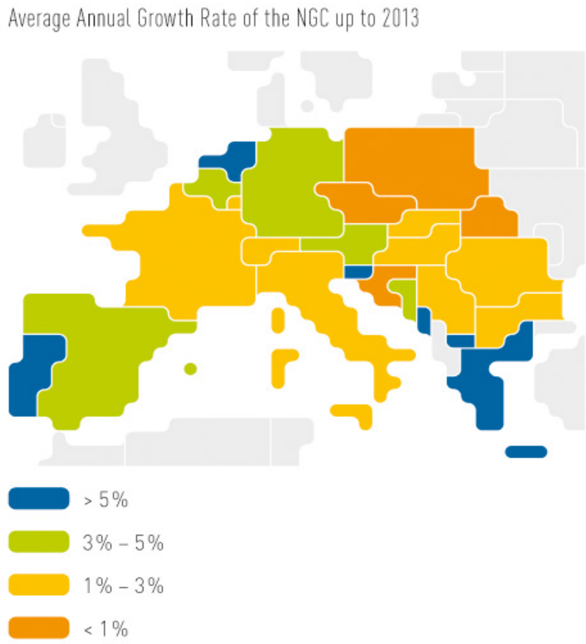


Fig. 2 **UCTE Generating Capacity Forecast in January in Scenarios A and B**

Map 3 **Average Annual Growth Rate of Generating Capacity up to January 2013 in Scenario B**

Considering Best Estimate scenario B, the first two major contributors to the UCTE generating capacity will remain Germany and France. Then, generating capacity in Spain will almost reach the one in Italy by 2013 and should exceed it from 2015.

Tab. 3 here below are displays the national forecasts in January for Net Generating Capacity in January in Best Estimate scenario B.

GW	2008	2010	2013	2015	2020
AT	18.6	19.8	21.4	21.5	21.5
BA	3.7	3.9	4.4	6.6	6.6
BE	17.1	19.5	20.8	21.1	19.5
BG	11.3	12.0	12.1	13.5	14.9
CH	17.6	18.9	19.0	19.9	20.7
CZ	16.0	16.2	16.7	17.7	18.4
DE	127.0	135.0	150.5	162.1	165.8
ES	82.8	88.7	98.9	105.5	122.0
FR	117.1	121.3	126.2	125.7	134.6
GR	12.3	14.2	17.0	19.0	21.0
HR	4.4	4.4	4.4	4.5	4.7
HU	8.3	8.7	9.2	10.2	11.1

IT	94.1	100.0	101.8	104.8	112.0
LU	1.7	1.7	1.9	1.9	2.0
ME	0.9	0.9	1.1	1.4	1.8
MK	1.4	1.7	2.5	2.5	2.5
NL	23.1	24.9	29.8	35.6	35.6
PL	32.7	34.4	34.2	34.5	37.1
PT	14.4	17.1	20.2	20.5	21.4
RO	18.5	18.8	20.4	22.0	22.7
RS	8.3	8.3	8.8	10.0	10.0
SI	2.7	3.1	3.5	3.7	5.2
SK	7.0	6.6	7.7	8.5	8.3
UA-W	2.5	2.5	2.5	2.5	2.5
UCTE	643.5	682.6	735.0	775.3	822.0

Tab. 3 National Generating Capacity Forecast in January in Scenario B

2.2.2 Capacity Mix

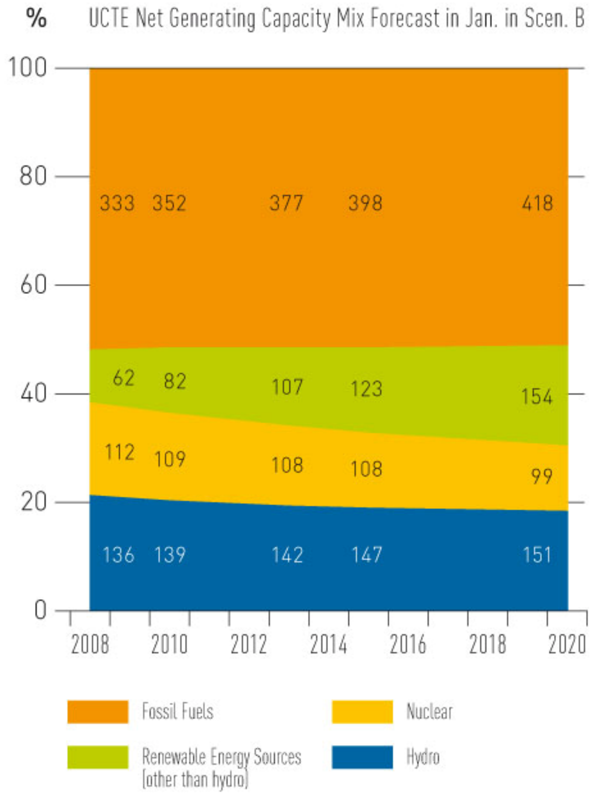
The most increasing type of generating capacities are those with Renewable Energy Sources as primary energy sources. Considering RES other then hydro, generating capacity is expected to double up to 123 GW by 2015 with only 62 GW in 2008, as shown in Fig. 3. The role of wind capacity is detailed in Chapter 2.2.4.

However, almost half of the generating capacity in the whole UCTE will remain fossil fuel based capacity like today. As shown in Fig. 4, this share is forecasted to be higher in the Best Estimate scenario B than in Conservative scenario A. This is an illustration of the current attraction of investors to fossil fuel and especially gas, detailed in Chapter 2.2.3.

Unlike what could have been expected, the major and stable share of fossil fuel in the generating capacity mix is not altered by the fast increasing role of renewable energy sources with +140% up to 2020[10], detailed in Chapter 2.2.4.

The reduction of nuclear power capacity mainly highlights the phase-out in Germany. See details in Chapter 2.2.5.

10 This increase of RES generating capacity must not be confused with an actual increase of generation as the average usage rate of RES capacity is less than 25% today (source: UCTE SAR 2006 report)



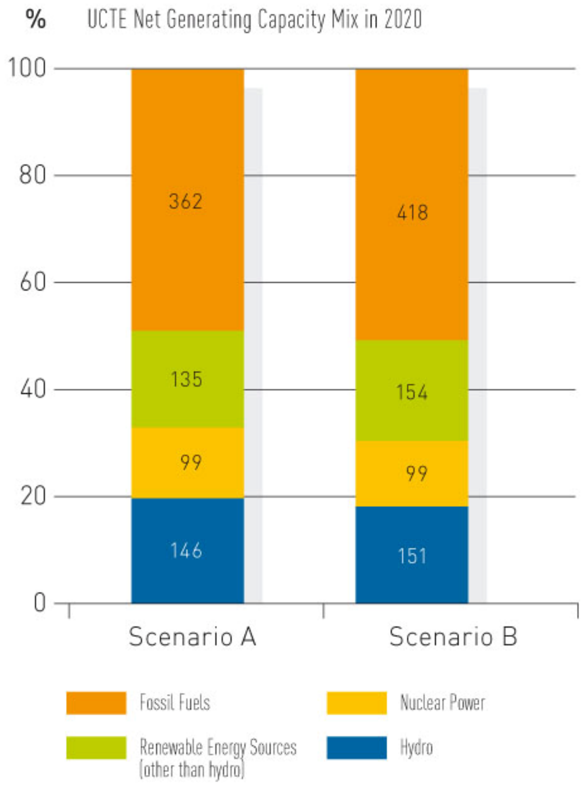


Fig. 3 **UCTE Generating Capacity Mix Forecast in January in Scenario B**

Fig. 4 **UCTE Generating Capacity Mix in January 2020 in Scenarios A and B**

Here below are summed up the UCTE forecasts for the different generating capacities in January according to the primary energy in Best Estimate scenario B.

GW	2008	2010	2013	2015	2020
Nuclear Power	111.9	109.0	107.7	107.6	98.7
Fossil Fuels	332.8	351.8	377.0	398.0	417.8
Renewable Energy Sources (other than hydro)	62.1	82.4	107.3	122.6	154.2
Hydro Power	136.1	138.9	142.5	146.5	150.8
Net Generating Capacity	643.5	682.6	735.0	775.3	822.0

Tab. 4 **UCTE Generating Capacity Mix Forecast in January in Scenario B**

Considering Best Estimate Scenario B in 2013, hydro power[11] and renewable energy sources will exceed 50% of the total generating capacity in Austria, Switzerland, Portugal, Bosnia-Herzegovina, Luxembourg, FYROM and Montenegro. See Fig. 5 for more details.

[11] Hydro power capacity can not be fully seen as renewable energy sources capacity because it also includes pumped storage.

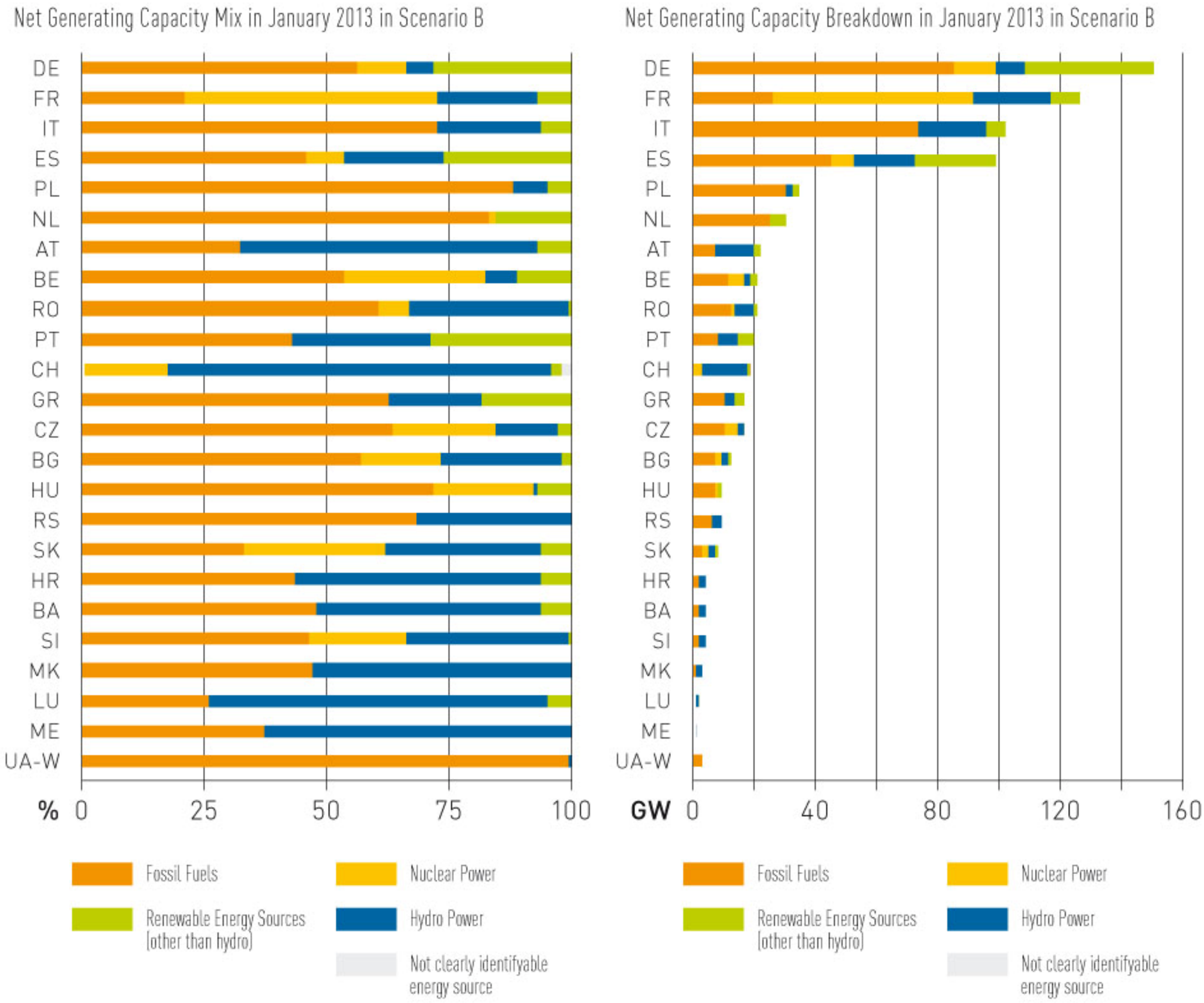


Fig. 5 **National Generating Capacity Mix in January 2013 in Scenario B**

Here below are displayed the national forecasts for generating capacity per primary energy sources in January 2013 in Best Estimates scenario B.

GW	Nuclear Power	Fossil Fuels	Renewable Energy Sources (other than hydro)	Hydro Power	Not Clearly Identifiable Energy Sources	Net Generating Capacity
DE	14.1	84.8	42.4	9.2	0.0	150.5
FR	64.9	26.1	9.5	25.7	0.0	126.2
IT	0.0	73.9	6.5	21.4	0.0	101.8
ES	7.5	45.2	26.2	20.0	0.0	98.9
PL	0.0	30.0	1.8	2.4	0.0	34.2
NL	0.5	24.7	4.6	0.0	0.0	29.8
AT	0.0	6.9	1.6	12.9	0.0	21.4
BE	5.9	11.2	2.3	1.4	0.0	20.8
RO	1.3	12.2	0.2	6.6	0.0	20.4
PT	0.0	8.6	5.9	5.7	0.0	20.2

CH	3.2	0.1	0.4	14.8	0.5	19.0
GR	0.0	10.6	3.2	3.2	0.0	17.0
CZ	3.5	10.6	0.5	2.1	0.0	16.7
BG	2.0	6.9	0.3	2.9	0.0	12.1
HU	1.9	6.6	0.7	0.1	0.0	9.2
RS	0.0	6.0	0.0	2.8	0.0	8.8
SK	2.2	2.5	0.5	2.5	0.0	7.7
HR	0.0	1.9	0.3	2.2	0.0	4.4
BA	0.0	2.1	0.3	2.0	0.0	4.4
SI	0.7	1.6	0.0	1.2	0.0	3.5
MK	0.0	1.2	0.0	1.3	0.0	2.5
LU	0.0	0.5	0.1	1.3	0.0	1.9
ME	0.0	0.4	0.0	0.7	0.0	1.1
UA-W	0.0	2.5	0.0	0.0	0.0	2.5
UCTE	107.7	377.0	107.3	142.5	0.5	735.0

Tab. 5 National Generating Capacity Mix in January 2013 in Scenario B

2.2.3 Fossil Fuels

Fossil fuel capacity in the UCTE is expected to expend with an average annual growth rate of +3% up to 2010 (see Tab. 4) according to Best Estimate scenario B.

Gas capacity is now the main and most extending fossil fuel capacity in use, and will increase its weight, as shown in Fig. 6. In Best Estimate scenario B, the annual growth rate is about +8% up to 2010, +5% up to 2013 and then +3% up to 2020 for gas fuelled generating capacity; gas capacity should represent in 2013 about 34% of the fossil fuel capacity and 18% of the total generating capacity.

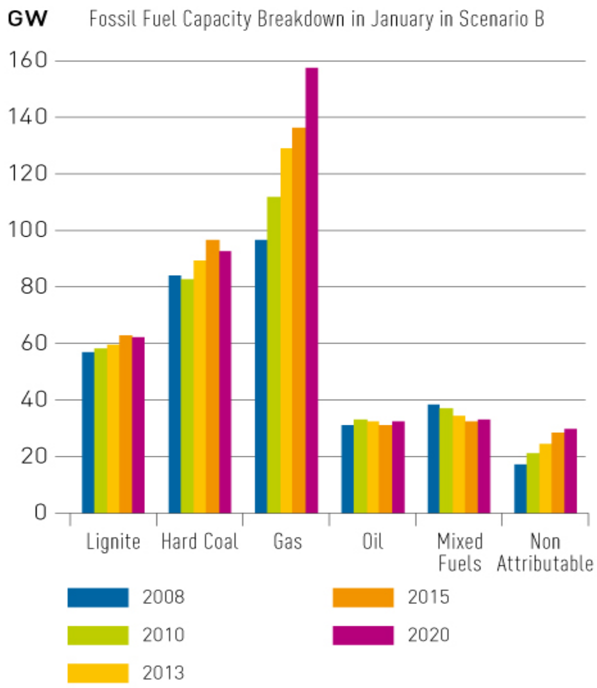
As shown in Fig. 7 and Map 4, Spain, Italy, the Netherlands and Germany have the most important gas power generating capacity. The Netherlands and Hungary have more than half of their generating capacity fuelled with gas, and Spain, Portugal and Greece more than a quarter.

Hard coal and lignite come second to gas. According to Best Estimate scenario B, hard coal and lignite generation capacities increase respectively of +2% and +3% from 2010 to 2015 before slightly declining with the shutdown of oldest power plants. Later developments of hard coal capacity by 2020 could depend on progress in the CO_2 capture and storage technology.

The share of oil is quite stable and no decline is foreseen.

There are several cases of thermal power plants able to burn several types of fossil fuels. The generating capacity of this category of power plants is quite stable over the period.

The growth of the Non Attributable fossil fuel capacity points out mainly the increasing difficulties TSOs are facing to identify the fuels burnt in the various plants connected to the national grid. The difficulties are greater with plants connected to the distribution grids.



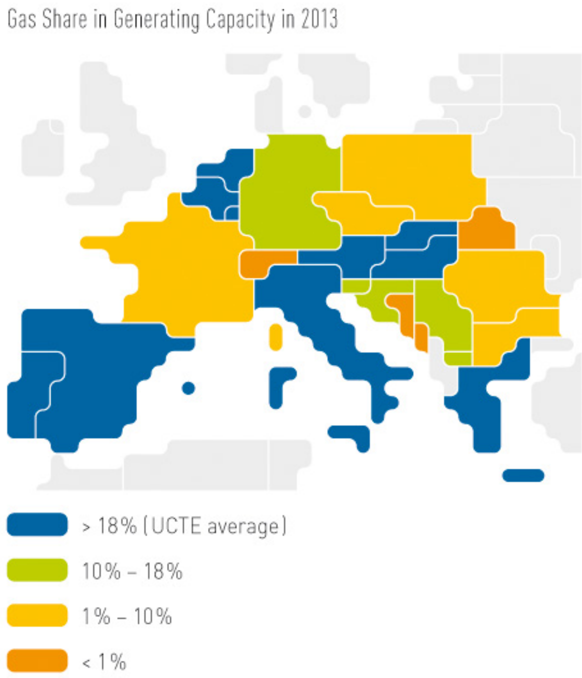


Fig. 6 **UCTE Fossil Fuel Capacity Breakdown Forecast in January in Scenario B**

Map 4 **Gas Share in the Generating Capacity in January 2013 in Scenario B**

Here below are displayed the UCTE forecasts for the different fossil fuel generating capacities in January in Best Estimate scenario B.

GW	2008	2010	2013	2015	2020
Lignite	57.0	57.9	59.2	62.9	61.9
Hard Coal	84.8	83.5	88.8	96.9	93.1
Gas	96.3	111.4	128.5	136.5	157.3
Oil	31.1	32.9	31.7	31.3	32.3
Mixed Fuels	38.4	36.9	34.2	32.3	33.5
Non Attributable	19.5	23.4	27.8	31.3	32.7
Total	332.8	351.8	377.0	398.0	417.8

Tab. 6 **UCTE Fossil Fuels Capacity Forecast in January in Scenario B**

Whereas Germany and Italy have similar fossil fuel capacity today, Germany will take the lead from 2013 on, according to Best Estimate scenario B. More details on national fossil fuel capacity are in Fig. 7.

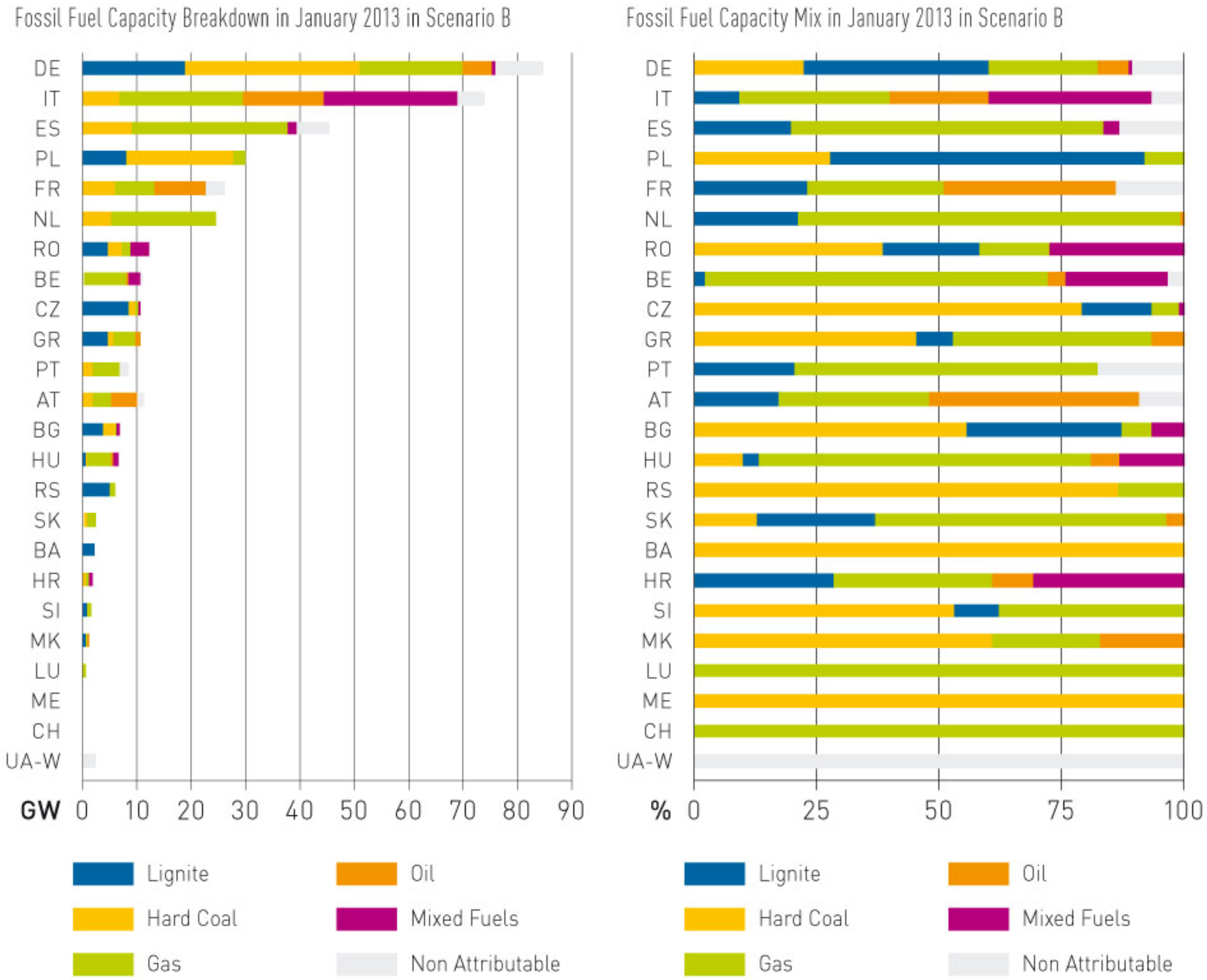


Fig. 7 National Fossil Fuel Capacity Mix in January 2013 in Scenario B

Here below are displayed the national forecasts for fossil fuel generating capacity in January in Best Estimate scenario B.

GW	2008	2010	2013	2015	2020
AT	5.5	5.7	6.9	6.9	6.9
BA	1.7	1.7	2.1	3.9	3.9
BE	8.6	10.3	11.2	11.5	11.6
BG	6.5	6.9	6.9	7.2	7.2
CH	0.1	0.1	0.1	0.2	1.0
CZ	10.1	10.1	10.6	11.3	11.9
DE	68.4	73.8	84.8	93.0	93.5
ES	42.0	42.4	45.2	46.4	51.7
FR	24.6	26.1	26.1	23.6	27.3
GR	8.3	9.3	10.6	11.9	13.1
HR	2.1	2.1	1.9	1.8	1.8
HU	6.1	6.1	6.6	7.6	8.1

IT	68.1	73.0	73.9	76.0	81.0
LU	0.5	0.5	0.5	0.5	0.5
ME	0.2	0.2	0.4	0.5	0.5
MK	0.9	1.2	1.2	1.2	1.2
NL	20.0	21.0	24.7	30.0	30.0
PL	30.0	30.7	30.0	29.9	32.4
PT	6.7	8.1	8.6	8.8	8.8
RO	10.9	11.0	12.2	11.8	11.3
RS	5.5	5.5	6.0	7.0	7.0
SI	1.2	1.3	1.6	1.8	2.2
SK	2.4	2.2	2.5	2.7	2.3
UA-W	2.5	2.5	2.5	2.5	2.5
UCTE	332.8	351.8	377.0	398.0	417.8

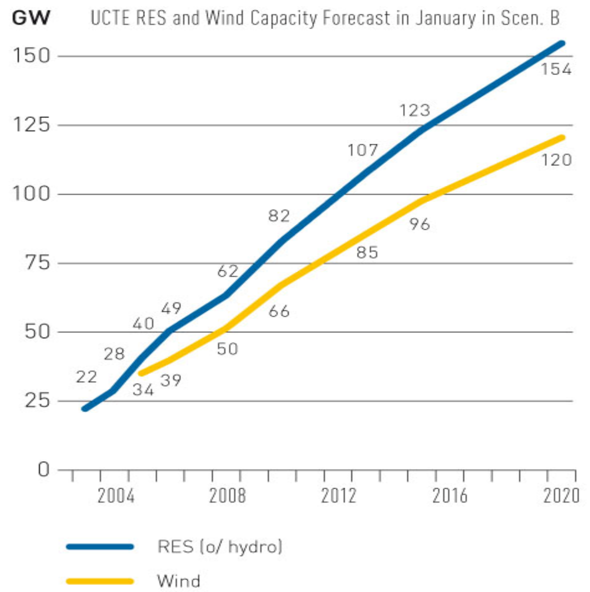
Tab. 7 National Fossil Fuel Capacity Forecast in January in Scenario B

2.2.4 Renewable Energy Sources

Generating capacity with Renewable Energy Sources (other than hydro) as primary energy should continue to increase at a solid but decelerating[12] pace.

In Best Estimate scenario B, the average annual growth rate for RES (other than hydro) capacity should be of about +12% up to 2010, then +7% up to 2015 and +5% up to 2020 (see Fig. 8). For the time being, the RES capacity forecast is mainly made of wind capacity. In Best Estimate scenario B, the average annual growth rate of wind capacity in the whole UCTE should be +14% up to 2013 with the greatest growth rates in Eastern Europe. The part of RES (o/ hydro) in the installed generating capacity in the whole UCTE should reach 15% in 2013 in Best Estimate scenario B.

The biggest growth rates should be in Portugal, Germany and Spain. See Map 5 for more national details.



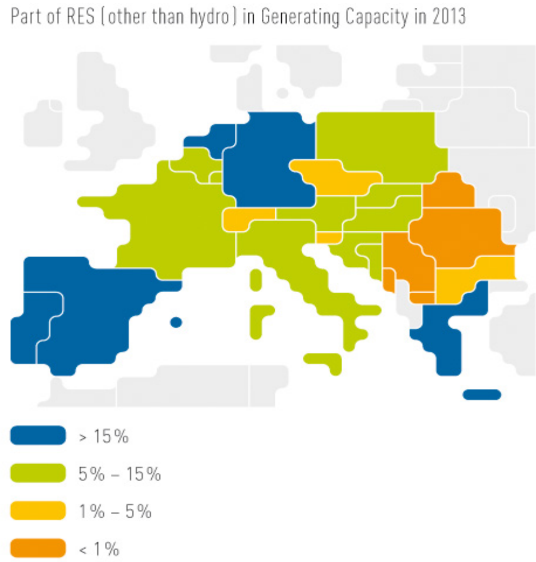


Fig. 8 UCTE RES (o/ hydro) Generating Capacity

Map 5 RES (o/ hydro) Share in National Generating

[12] RES capacity growth rate was +23% in 2006 and +44% in 2005 (source UCTE SAR 2006 report)

Forecast in January in Scenario B

Capacity in January 2013 in Scenario B

Here below are displayed the national forecasts Renewable Energy Sources (other than hydro) generating capacity in January for in Best Estimate scenario B.

GW	2008	2010	2013	2015	2020
DE	29.2	34.6	42.4	48.0	58.7
ES	14.3	19.6	26.2	30.6	40.3
IT	4.9	5.8	6.5	7.3	9.0
FR	3.5	6.2	9.5	11.5	18.5
PT	2.7	4.0	5.9	6.0	6.0
NL	2.6	3.3	4.6	5.1	5.1
AT	1.3	1.6	1.6	1.6	1.6
BE	1.3	1.9	2.3	2.3	2.4
GR	0.8	1.7	3.2	3.8	4.5
PL	0.4	1.3	1.8	2.2	2.3
HU	0.4	0.6	0.7	0.7	0.8
CZ	0.3	0.5	0.5	0.8	0.9
CH	0.3	0.3	0.4	0.4	0.4
HR	0.1	0.2	0.3	0.4	0.6
LU	0.1	0.1	0.1	0.1	0.1
SK	0.0	0.3	0.5	0.6	0.8
BG	0.0	0.2	0.3	0.4	0.8
RO	0.0	0.1	0.2	0.5	1.0
BA	0.0	0.2	0.3	0.3	0.3
SI	0.0	0.0	0.0	0.0	0.1
ME	0.0	0.0	0.0	0.0	0.0
MK	0.0	0.0	0.0	0.0	0.0
RS	0.0	0.0	0.0	0.0	0.0
UA-W	0.0	0.0	0.0	0.0	0.0
UCTE	62.1	82.4	107.3	122.6	154.2

Tab. 8 National RES (o/ hydro) Capacity Forecast in January in Scenario B

2.2.5 Nuclear Power

Nuclear Capacity in the UCTE should slightly decrease (see Tab. 4) from 112 GW in 2008 to 99 GW in 2020 reflecting mainly the nuclear phase-out in Germany (at 32 years old) and later in Belgium (at 40 years old). Yet the evolution of nuclear generating capacity is geographically contrasted with nuclear capacity increasing in the East and being stable in most of the other countries, as shown in **Map 6**.

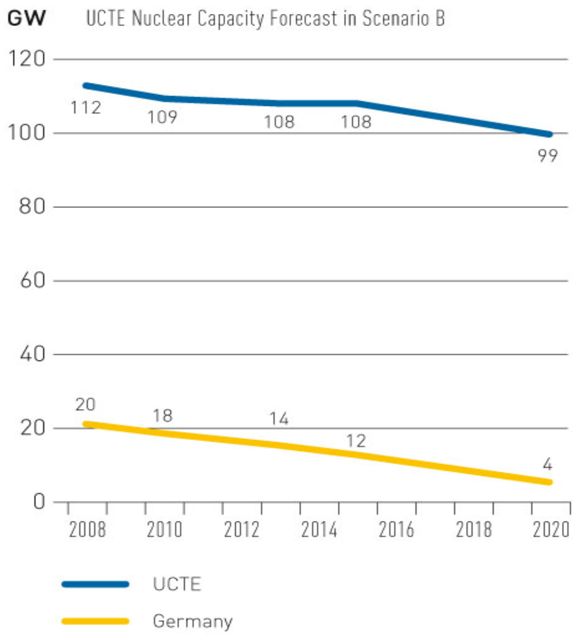
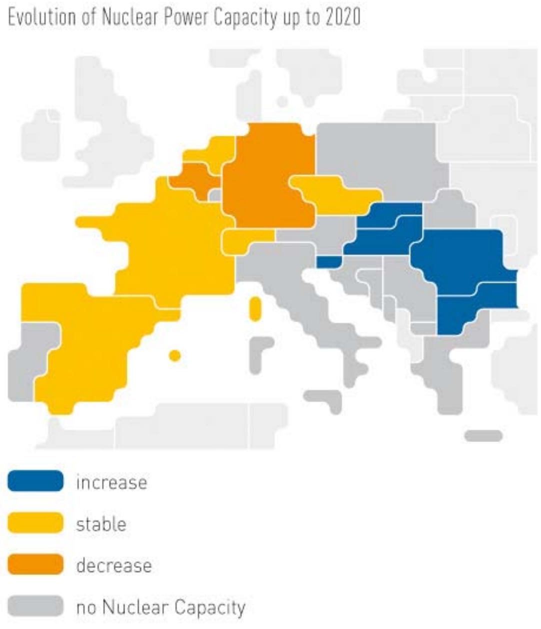


Fig. 9 UCTE Nuclear Capacity Forecast in Scenario B



Map 6 Nuclear Capacity Evolution up to 2020 in Scenario B

Here below are displayed the national nuclear generating capacity in January in Best Estimate scenario B.

GW	2008	2010	2013	2015	2020
FR	63.3	63.3	64.9	64.9	63.1
DE	20.3	17.5	14.1	11.9	4.4
ES	7.5	7.5	7.5	7.5	7.5
BE	5.8	5.9	5.9	5.9	4.1
CZ	3.5	3.5	3.5	3.5	3.5
CH	3.2	3.2	3.2	3.2	3.2
SK	2.1	1.7	2.2	2.6	2.6
BG	2.0	2.0	2.0	3.0	4.0
HU	1.8	1.9	1.9	1.9	1.9
RO	1.3	1.3	1.3	1.9	2.6
SI	0.7	0.7	0.7	0.7	1.3
NL	0.5	0.5	0.5	0.5	0.5
UCTE	111.9	109.0	107.7	107.6	98.7

Tab. 9 Nuclear Capacity Forecast in January in Scenario B

2.2.6 National Comments on Generating Capacity Forecast

BA Bosnia-Herzegovina

Structure of the generation capacities is: 49% thermal capacities, and 51% hydropower capacities.

In 2006, as well as in the past years there was not commissioned any new generation facility on the transmission network. First new power plant should be commissioned on the transmission network on 2010. It is HPP Mostarsko blato, 2x30 MW, and also it is expected that some wind capacities would be commissioned in the period 2010-2014. There are a lot of applications for commissioning of the new generation facilities after 2010, but with big uncertainty of realization.

BE Belgium

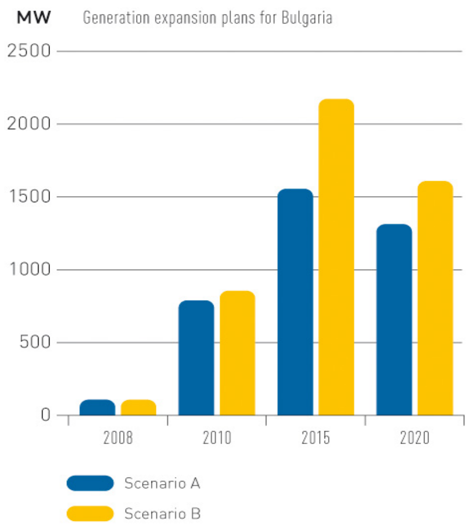
For the additional installed generating capacity of centralized power stations, the additional net generation capacity taken into account in scenario A is calculated using information from specific confirmed projects that have been announced to the TSO. The increase in decentralized generating capacity is a combination of short-term prospects based on information from specific projects announced to the TSO and DSO's and a long-term objective for 2020 taken from the CREG's Indicative Production Plan 2005-2014 (publication date : January 2005 – http://www.creg.be/pdf/Propositions/C388FR.pdf). The long-term objective for 2020 includes the increase in decentralized generating capacity given for the period 2005-2019 in the Indicative Production Plan 2005-2014. No additional hypothesis was made on the evolution of the decentralized generation capacity between 2019 and 2020 to calculate the target level of decentralized installed generating capacity for 2020.

The additional net generating capacity considered in scenario B differs from scenario A because projects involving centralized power stations which are not decided but estimated as probably by the TSO are also added.

The Elia grid is limited to a voltage level of 30 kV or higher. Fossil-fuel power stations connected to a voltage of below 30 kV are classified as non-attributable fossil-fuel power stations.

In some cases fossil fuel power stations burn a mixture of fossil fuels and renewable energy sources. The installed generation capacity of this type of units is allocated to the different fuels proportionally to the importance of each energy source in the used fuel combination. In 2008, the installed generation capacity of this type of units totaled 1886 MW. An application of the above explained allocation rule, resulted in the following spilt: 1728 MW of fossil fuel power stations and 158 MW of installed generating capacity of renewable energy sources.

BG Bulgaria



CZ Czech Republic

Slim decrease of NGC about 400 MW is observed in 2008 and 2010. It is caused by ongoing reconstruction program of some 200 MW lignite units. During the reconstruction the capacity of these units won't be calculated in the NGC. This reconstruction program should be finished probably in 2014.

CEPS doesn't have detailed information about commissioning / shutdown programs of the main producers after 2015. Other shutdowns of the coal units as mentioned in the table above are prepared for the period after 2015. The old units could be replaced by the new ones without significant impact on generating capacity.

DE Germany

The increase in renewables-based generating capacity during the period from 2008-2020 is expected to be more than 30 GW. The major part should be wind power. The consensus achieved about the remaining life of nuclear power stations leads to a strong decrease in the capacity of nuclear power plants and is visible in this forecast. The increase in thermal conventional capacity is mostly based on hard coal and gas fired power plants. Some generating capacity of regional and municipal companies which is not known in detail has been assigned to the category "non attributable".

The balance between commissioning and shutdown of the estimated variation of the generating capacity is shownin the material provided for scenarios A and B. Information about individual power stations is not indicated. There are no confirmed data available about shutdowns.

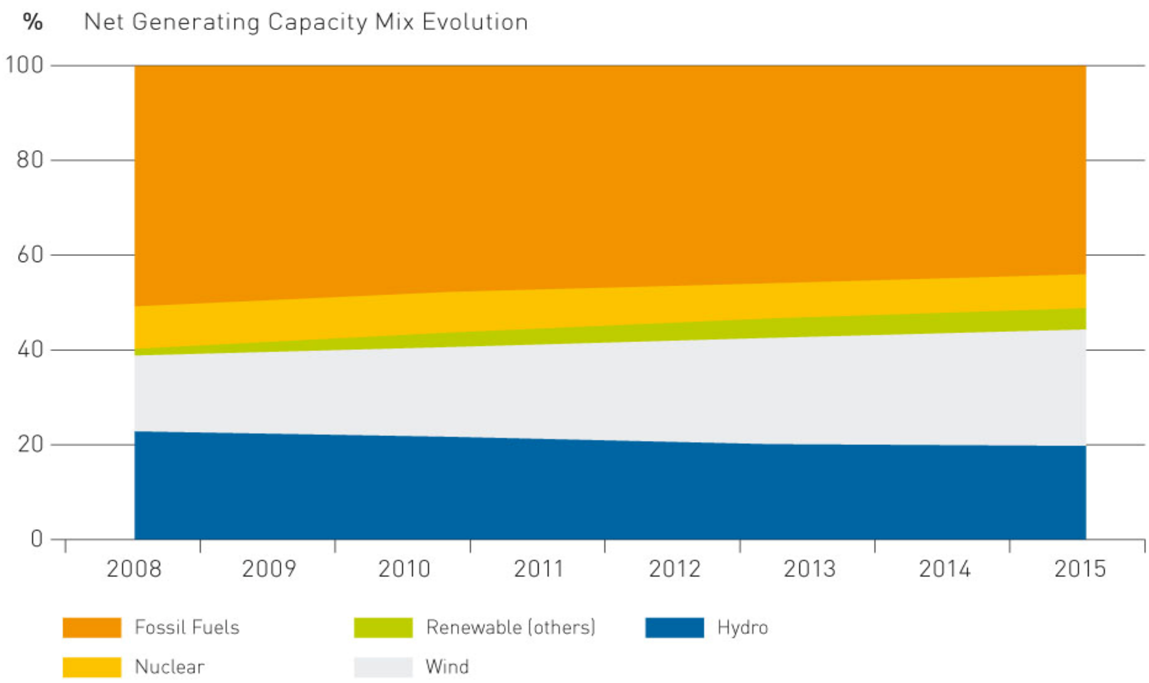
Some generating capacity of regional and municipal companies which is not known in detail has been assigned to the category "non attributable".

ES Spain

Generation expansion planning is mainly based on the commissioning of new CCGT (combined cycle gas turbines) and wind plants.

Generation investments have been already decided until year 2015, because of that the only difference between Scenarios A and B refers to year 2020.

Enclosed figure shows the evolution of capacity mix between 2008 and 2015.



The role of renewable energy sources will reach almost 50% in 2015. At the moment renewable capacity represent about 40% of generating capacity in Spain. The weight of nuclear will slightly decrease from 9% in 2008 to 7% in 2015.

At the moment there are 9 new CCGT units under construction that represent a volume of 4.000 MW to be commissioned before 2010. Additional 8.000 MW should be in commercial operation by 2015.

In the other hand, before 2016, the application of LCP Directive will rise to the decommissioning of 16 old thermal plants representing a capacity of 4.500 MW.

FR France

In the last two years, a large number of new generation facilities projects appeared. Applications submitted to RTE for connection to the Public Transmission System since the beginning of 2005, and for which RTE's proposed solution was accepted by the generator concerned, represent a volume of over 13,000 MW.

Most of these projects are for Combined Cycle Gas Turbines (CCGT): 22 units, with a cumulative capacity of almost 10,000 MW. Four of these (1,700 MW), on which construction work began before 1st June 2007, should be commissioned between 2009 and 2010. For the others, lacking the necessary planning permissions or any irrevocable decision to green-light the project, RTE cannot currently be certain that they should be carried through to completion. This is especially true in view of the fact that the political or economic context could influence decisions on whether to build the facilities in France or other countries. However, given the current state of progress of authorization and planning procedures, RTE believes it is highly likely that at least three additional CCGTs should be commissioned in 2010 and 2011.

Concerning nuclear power, the construction of a new EPR reactor has begun at the Flamanville site. It is expected to be commissioned in 2012, and will provide 1,600 MW of capacity.

Open Cycle Gas Turbines (OCGTs) are also under construction in the greater Paris region, for a total installed capacity of 500 MW. They should be commissioned by the end of 2007 and 2008. Others are planned for Brittany, and should be commissioned in 2010. The panoply of peak facilities installed in France will also be completed in 2007 and 2008 by the re-commissioning of three fuel-oil units (2,000 MW) which were mothballed during the 1990s.

Projects concerning coal-fired units also have a connection to the PTS. However, there are still significant uncertainties regarding their completion (local acceptance, CO_2 capture and storage, etc.).

Renewables also began to soar, with 1400 MW of wind power at the beginning of 2007, but face technical and environmental constraints. The best estimate forecast is 5 GW in 2010, 10 GW in 2015 and 17 GW in 2020.

Conversely, the decommissioning of existing conventional thermal plants, mainly under the application of the LCP Directive, are inevitable: around fifteen units, mainly coal-fired plants, representing a capacity of 4,400 MW, will see their operation reduced to 20,000 hours from 1st January 2008, and will have to be decommissioned by 31 December 2015 at the latest. The operation of other conventional thermal units may be continued beyond 2020.

(Source: RTE, Generation Adequacy Report, 2007 edition)

GR Greece

Currently, there are two mechanisms considering new generation in the Greek system: the market-driven mechanism and through tenders by HTSO to ensure adequacy. The values presented here for years after 2008 are indicative.

Considering renewable energy sources, new legislation has given strong motivation for the installation of photovoltaic systems (a target of 500 MW for year 2010 has been set).

IT Italy

An increase higher than 10000 MW for conventional thermal plants is expected up to 2010 and over than 2000 MW of wind power as well.

LU Luxembourg

Scenario A

The main pump storage power plant in Luxembourg should be enlarged by a new 200 MW unit. Target date for commissioning is 2012. A new wind park of 4x2 MW is planed to become operational in 2008. Some other small cogeneration units are under construction and will reach a total NGC of 6 MW.

Scenario B

A new wind park of 7x2MW may be commissioned in 2009.

ME Montenegro

According to the National development strategy, following years should be used mainly for utilization of non-used hydro-potential. First project, whose realisation will start very soon, is installation of additional unit in the existing Hydro Power Station Perucica. This will increase maximal power of the station for approximately 30 MW. This project should be finished by the 2010. In parallel, extension of existing thermal production should be prepared (TPP Pljevlja 2). Rest of the increase of generating capacities are connected to several scenarios of hydro-production utilization. No decommissioning of power units is planed for the period 2008-2020.

MK Former Yugoslav Republic of Macedonia

Wind Energy -measuring campaign in cooperation with Norwegian Government:

Technical parameters:

-number of potential location - 20

-average wind speed 6.7-8.4m/s

-installed capacity per location 25-33MW

Number per location 10-15

Generation per location - 100GWh

NL The Netherlands

After the year 2008, large-scale production will increase significantly. Currently energy suppliers are establishing in the Netherlands. The Netherlands has a number of advantages, including: excellent supply routes over sea for fuels, such as coal, a high quality gas and electricity network, a relative high availability of cooling- water and substantial supply of gas. Next is the advantage of the relative high number of interconnection capacity and an attractive business climate. Up to 2014 a relative high quantity of approximately 13 Gigawatt (GW) in relation to new buildings for large-scale production capacity has been registered. At present the Netherlands has a total production capacity of 20 GW. More than half of the new building projects (7 GW) will probably be completed before the year 2011. This means that in 2011 there should be an export potential of 3,7 GW. After this year the potential will possibly further grow up to 8,1 GW in 2014. As it is uncertain whether all projects will indeed be realised, a separate calculation has been made to determine the supply guarantee if not all new building plans should be developed. From the analysis it has become clear that even if only 25% of all intended projects should be developed, the supply guarantee for the Dutch production park will not be lower than the level in the preceding years.

As there are excellent coal terminals in coastal harbours in the Netherlands, building of coal-fired plants is very attractive for international operating generating companies. For that reason in scenario B more than 50% of the new to build capacity is coal-fired.

PL Poland

In the beginning of the year 2008 there is a small increase of the NGC planned as the result of replacing the old units with the new ones. During the year 2009 there is a commissioning of the new unit expected with the maximum output capacity amounted 430 MW. At the same time some shutdowns should be necessary as the result of the environmental constrains.

The last commissioning of the main power stations confirmed by Polish TSO is planned at the end of year 2010.

For the scenario “A” there is no commissionings after the year 2010.

Changes (Commissionings and Shutdowns) of capacity presented in Scenario B are according to Development Plan accepted by Polish Regulatory Office in December 2006. The added capacity (in general) is the result of calculations taking into account the Reserve Margin value.

PT Portugal

In the next 3-4 years according to governmental plans/objectives we expect the commissioning of new gas turbine power stations totalizing 3600 MW, while all the fuel-oil and gas oil units should be decommissioned.

On the other hand we expect by 2012 about 5000 MW installed in wind power stations, which will represent at that moment almost 25% of the Portuguese generating capacity.

In hydro production important reinforcements are in progress in 3 power stations totalizing 690 MW, 240 of them mixed pump-storage. Until 2020 we expect another 1400 MW in new power stations, all with mixed pump-storage.

Non Attributable Fossil Fuels refers to co-generators using not completely identified fuels (about 60% natural gas, 40% fuel oil).

RO Romania

The latest Romanian Energy Strategy carried out by Ministry of Economy and Finance considers the commissioning of two new nuclear units (of 648 MW each) and a pumped storage HPP (of total installed capacity of 1000 MW) that should be put in operation until 2015.

The generating capacity on lignite will remain almost constant (by rehabilitations/shutdown/ new units commissioning) in order to maintain the mining level of the domestic lignite resources at the level of 30 mil tons annually.

Also it is envisaged that more hydro power plants should be commissioned during 2008-2015 period, totalizing 335 MW in Scenario A. Supplementary in Scenario B this hydro capacity may increase with 334 MW installed in other hydro power plants.

The main reason for the unit shutdowns is the exceeded life time. In certain cases the involved producers did not decide to install new units yet.

RS Republic of Serbia

Changes in generation capacity of Serbia would have occurred not before year 2013. It is expected increase of 1750 MW till year 2020.

Both scenarios are the same in case of Serbia.

It is planed that four existing units in power plant Kolubara A should be replaced with the new one, building of new gas plant Novi Sad 2 and additional generator in Bajna Basta till the year 2013, altogether 530MW.

In period 2013 – 2015 one more unit should be added in Novi Sad 2 and it is expected operating of new hydro power plant Buk Bijela. Additional 1220MW in Serbian system.

SI Slovenia

3 out of 5 coal units in thermal plant Sostanj and 1 coal unit in Trbovlje are near the end of life time and will be replaced with new gas units in the next 8 to 10 years. In 2011 new 550 MW coal unit TES 6 comes in operation and at the end of the forecast new nuclear unit in Krsko. Hydro power is increased due to construction of hydro units on lower part of river Sava and two pump storage units. Other renewable energy sources, with the exception of wind are not expected.

SK Slovak Republic

Both scenarios take into account decommissioning of the second unit of NPP Jaslovské Bohunice (410 MW) at the end of 2008. It is due to the commitment of Slovakia from accession negotiations into the EU. The first unit of the same capacity was decommissioned at the end of 2006. Both scenarios also take into account decommissioning of another units in thermal conventional power plants because of emission limits and life span of units in the period from 2010 to 2020.

Both scenarios show temporary decrease of generating capacities in 2010 (- 7%) when no new capacities are foreseen.

In scenario A, only two new units (2x440 MW) of NPP Mochovce are expected. Therefore in 2013 generating capacities will reach the volume from 2008 and keep it until 2020.

In scenario B, in addition to new units (2x400 MW) of NPP Mochovce (as in scenario A), another new units of conventional thermal power plants and combined cycle power plants are foreseen. For that reason periods 2013, 2015, 2020 shows outstanding increase of capacities in scenario B (from 700 to 1500 MW more as in 2008).

UA-W Ukraine-West

Power station working in “Burshtyn island” use mainly hard coal.

2.3 Reliably Available Capacity

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

Unavailable Capacity is the part of Net Generating Capacity that is not reliably available to power plant operators due to limitations of the output power of power plants.

2.3.1 Unavailable Capacity

Considering Best Estimate scenario B (see Fig. 10), while Net Generating Capacity is increasing of 92 GW up to 2013, about 64% of that additional generating capacity (i.e. 58 GW) will end up in additional Reliably Available Capacity.

Actually, as shown in Fig. 11, when generating capacity is expected to increase by 14%, Unavailable Capacity increases by 18%. The main reason is the increasing role of wind power in generating capacity. UCTE SAR 2006 report estimates the average usage rate of wind power generation to about 25% based on energy output in 2006. Regarding power availability at reference points, a large part of the wind power capacity is likely to be unavailable because of its stochastic nature and is therefore counted as Non-Usable Capacity.

Yet, about 70% of the Net Generating Capacity is true Reliably Available Capacity as illustrated for Best Estimate scenario B in Fig. 10. That figure remains quite stable up to 2020.

Maintenance and Overhauls as well as Outages and System Services Reserve should remain globally stable in the whole UCTE[13].

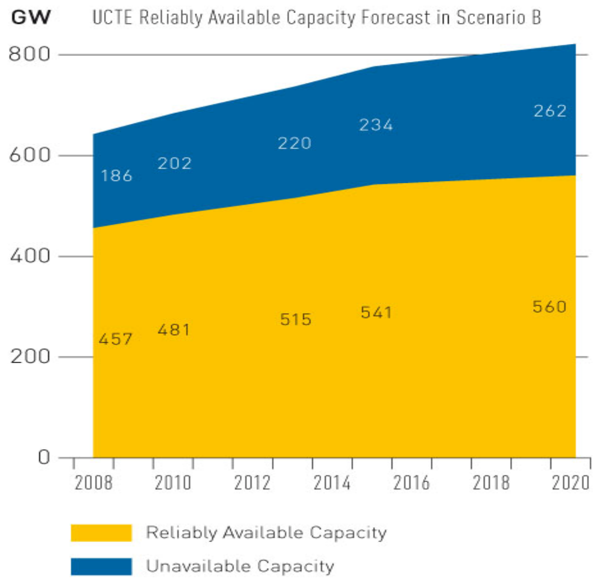


Fig. 10 **UCTE Reliably Available Capacity Forecast in Scenario B**

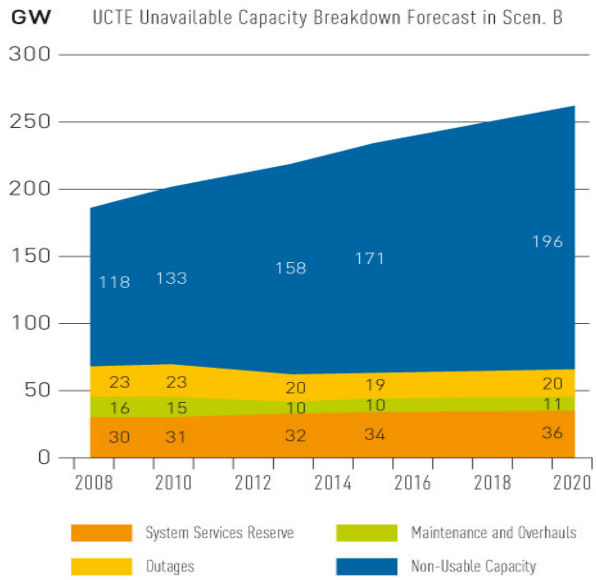


Fig. 11 **UCTE Unavailable Capacity Breakdown Forecast in Scenario B**

Here below are the UCTE forecasts for Reliable Available Capacity breakdown in January 11:00 in Best Estimate scenario B.

[13] The slightly decreasing level of Maintenance, Overhauls and Outages by 2013 in Fig. 11 is not significant as in the material provided for this long term analysis, some of these capacities become sorted as Non-Usable Capacity.

GW	2008	2010	2013	2015	2020
Net Generating Capacity	643.5	682.6	735.0	775.3	822.0
Non-Usable Capacity	117.9	132.5	157.7	170.8	195.9
Maintenance and Overhauls	16.0	15.4	9.9	10.5	10.7
Outages	22.6	23.1	19.7	19.4	19.7
System Services Reserve	29.9	30.7	32.4	33.7	35.5
Reliable Available Capacity	457.1	480.8	515.4	541.0	560.2

Tab. 10 UCTE Reliably Available Capacity Breakdown Forecast in January 11:00 in Scenario B

As an example of the impact wind power capacity on Reliably Available Capacity Germany, with the biggest Net Generating Capacity, is only second to France with respect to Reliably Available Capacity.

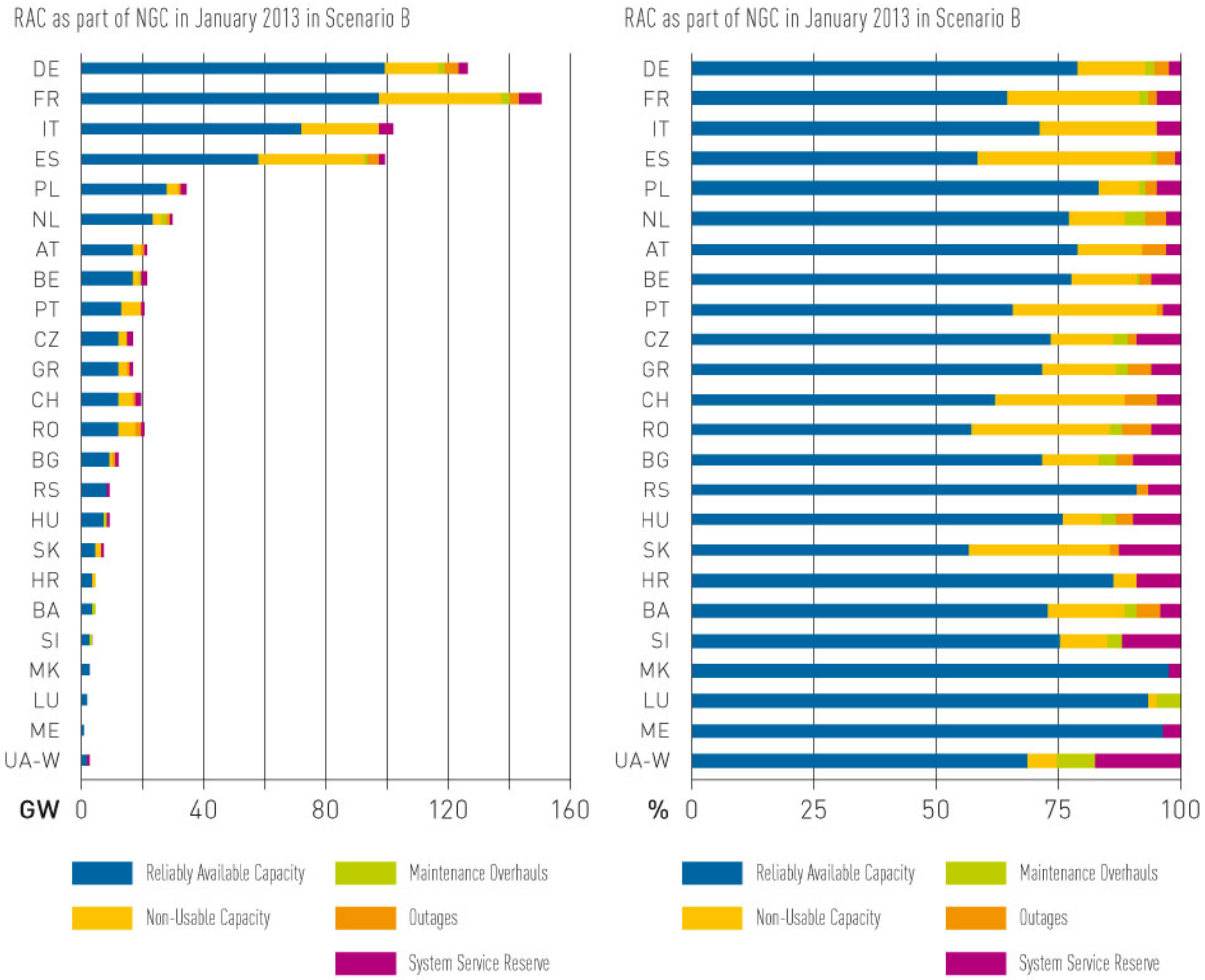


Fig. 12 National Reliably Available Capacity and Unavailable Capacity Breakdown in January 2013 11:00 in Scenario B

Here below are the national forecasts for Reliable Capacity in Best Estimate scenario B.

GW	Net Generating Capacity	Non-Usable Capacity	Maintenance and Overhauls	Outages	System Services Reserve	Reliably Available Capacity
FR	126.2	17.8	2.0	4.3	3.0	99.1
DE	150.5	41.0	2.3	3.2	7.3	96.7
IT	101.8	24.5	0.0	0.0	5.1	72.2
ES	98.9	35.4	1.0	3.6	1.5	57.4
PL	34.2	3.0	0.3	0.8	1.8	28.3
NL	29.8	3.3	1.4	1.1	1.0	23.0
AT	21.4	2.9	0.0	1.0	0.7	16.8
BE	20.8	2.7	0.1	0.5	1.3	16.2
PT	20.2	5.9	0.0	0.2	0.8	13.3
CZ	16.7	2.2	0.5	0.3	1.5	12.2
GR	17.0	2.6	0.4	0.9	1.0	12.2
CH	19.0	5.0	0.0	1.2	1.0	11.8
RO	20.4	5.7	0.6	1.2	1.2	11.6
BG	12.1	1.4	0.5	0.4	1.2	8.7
RS	8.8	0.0	0.0	0.2	0.6	8.0
HU	9.2	0.7	0.3	0.4	0.9	7.0
SK	7.7	2.2	0.0	0.1	1.0	4.3
HR	4.4	0.2	0.0	0.0	0.4	3.8
BA	4.4	0.7	0.1	0.2	0.2	3.2
SI	3.5	0.4	0.1	0.0	0.4	2.6
MK	2.5	0.0	0.0	0.0	0.1	2.4
LU	1.9	0.0	0.1	0.0	0.0	1.8
ME	1.1	0.0	0.0	0.0	0.0	1.1
UA-W	2.5	0.2	0.2	0.0	0.5	1.7
UCTE	735.0	157.7	9.9	19.7	32.4	515.4

Tab. 11 National Reliably Available Capacity Breakdown Forecast in January 2013 in Scenario B

2.3.2 National Comments on Reliably Available Capacity Forecast

BE Belgium

Unavailable capacity will increase over the period 2008-2020 mainly due to a rise in the number of wind farms, biomass power stations and CHPs included in the net generating capacity. This trend will lead to an increase in the volume of non-usable capacity. The higher net generating capacity of windmills in the period under consideration will also result in a rise in the volume of the system services reserve.

CH Switzerland

In winter we consider that the following capacities are not usable (the values in the parenthesis refer to the year 2008):

75% of the run of river hydroelectric power plant’s capacity (2.78 GW)

10% of the capacity of the reservoir hydroelectric power plants (0.79 GW)

20% of the mixed pump storage hydroelectric power plant’s capacity (0.38 GW)

20% of the pure pump storage hydroelectric power plant’s capacity (0 GW)

5% of the nuclear power plant’s capacity (0.16 GW)

5% of the large fossil fuel thermal power plant’s capacity (0 GW)

5% of the small conventional thermal power plant's capacity (which doesn't necessarily uses fossil fuels; installed capacity in 2008 as of 0.4 GW) – mostly cogeneration of heat and electricity (0.02 GW)

100% of renewable energy sources (0.3 GW)

100% of other plants - mostly industrial plant's capacity amounting to about 0.2 GM in 2008

In summer we consider that the following capacities are not usable (the values in the parenthesis refer to the year 2008):

35% of the run of river hydroelectric power plant's capacity (1.3 GW)

100% of the small conventional thermal power plant's capacity (which doesn't necessarily uses fossil fuels; installed capacity in 2008 as of 0.4 GW) – mostly cogeneration of heat and electricity

100% of renewable energy sources (0.3 GW)

100% of other plants - mostly industrial plant's capacity amounting to about 0.2 GM in 2008

CZ Czech Republic

Pumped storage 0,5 GW

Storage Hydro 0,4 GW (limited by hydrological conditions)

Run-of-river 0,1 GW (limited by hydrological conditions)

Wind 0,3 GW (This value will rise up to 0,8 in 2015 by the reason of constructing of the new wind units.)

Fossil Fuels 0,7 GW (Of which 0,2 GW are unavailable due to heating and approximately 0,5 GW is the unavailability of small fossil fuels units where CEPS doesn't have detailed information about the reasons of the unavailability.)

DE Germany

A large part of the generating capacity of wind-energy plants needs to be considered as "non-usable" or "unavailable" capacity owing to the stochastic nature of wind energy availability.

Generally, it has to be noted that power station operators consider data on "non-usable capacity" to be sensitive information in terms of competition; for this reason, detailed information of this kind is not made available to system operators. The data used for the power balance forecast are values estimated on the basis of pragmatic values obtained prior to the liberalisation of the German electricity market.

ES Spain

Generation capacity will increase about 50% until year 2020, however non usable capacity will increase about 100% in the same period, due mainly to the increasing role of wind power in generation capacity.

The most important assumptions taken into account for the calculation of non usable in the forecast are the following:

- Thermal forced outage rate: available thermal capacity with probability of 95% has been considered
- Dry hydro conditions: significant non usable hydro capacity resulting from lack of water in the reservoirs
- Wind conditions: available wind capacity with probability of 90% has been considered.

FR France

About 75% of the wind capacity is considered as unavailable under standard conditions and is therefore part of the Unavailable Capacity.

50% of the new EPR 1.6 GW capacity in Flamanville has been considered as unavailable in 2013, during its test procedure following its commissioning. Full capacity has been considered in 2015 and 2020.

IT Italy

Main reasons for unavailable capacity are:

· Unintentional temporary limitation (transmission constrain, environment constrain, etc.)

· Limitation of the primary energy source (for example the last period of time has been very mild and scarce of rain with impact on the use of hydro power station)

LU Luxembourg

The overhaul of the machines in the pump storage power plant is going on and we can assume that 100MW will not be available during some month of the following years.

In 2009, four units of in total 400 MW will temporarily not be available during the construction of the new unit.

As every year, the maintenance of the main thermal power plant is scheduled during some weeks in the first month of the year.

Any other non-usable capacity may be caused by lack of wind or limitation of water.

MK Former Yugoslav Republic of Macedonia

The demand of energy is lower in summer, so all maintenance and overhauls of the TPP are scheduled in summer.

NL The Netherlands

The non-usable capacity in thermal plants has mainly two components: heat production in combined heat/power plants during the winter period and cooling water restrictions on occasion in summertime. For waste burning plants it's lack of waste during 25% of time. For wind power units the average production over the year at full power is nearby 25% of the capacity.

PL Poland

The main reasons of unavailable capacity are:

- technological limitation of production in combined heat and power plants (during summer season);
- restrictions due to cooling water temperature in some of thermal power plants (during summer season);
- limitations due to transmission network congestion during high temperature (during summer season);
- average factor of unavailability of wind generation, which amounts 75%.
- heat production in combined heat and power plants (during winter season).

PT Portugal

Wind Energy - We consider a constant limitation of production due to the lack of wind in all seasons based on average historical values (73%).

Hydroelectric energy (large power stations) – We consider power limitation due to reduction of maximum head height and water availability (in January 21%, and in July 37%).

Hydroelectric energy (small independent producers) – We consider historical values (in January 40%, and in July 90%).

Thermal renewable and co-generators (small independent producers) – We consider historical values, a reduction of 34% of the installed capacity for renewable and 40% for co-generators.

RO Romania

Non-usable capacity includes:

- Temporary limitation of capacity in hydroelectric power stations;
- Lack of wind in wind power stations during certain seasons;
- Limitation of electrical capacity direct related to the heat extraction needed, in the combined heat and power plants;
- High temperatures of the cooling agent in thermal power plants;
- Use of coal with low calorific power;
- Other temporary limitations

Maintenance and overhaul program:

Based on the correspondent standards related to annual planned maintenance period for each category of generating units, it is scheduled a program of maintenance/overhauls to be carried out mainly during off-peak periods.

Outages :

The equivalent outage rates for the stations is determined taking into account the units unavailability probability due to equipment failure, based on multi- annual statistics.

RS Republic of Serbia

Some units in TPP Kosovo A located in Kosovo and Metohija region (which is currently under UNMIK control) are frequently unavailable because their lifetime has almost expired.

Maintenance and overhauls are not performed in winter period. That's the reason why unavailable capacity is bigger in July.

System Services Reserve will remain the same, because value of the biggest unit in the system won't be changed.

SI Slovenia

Unavailable capacity varies mainly due to maintenance of thermal and reconstruction of some hydro units on river Drava and upper river Sava. Non-usable capacity mainly presents poor hydrology.

SK Slovak Republic

Significant part of unavailable capacity is non-usable capacity that consists in hydro power stations due to hydrological conditions and hydraulicity. Heating plants have also impact - discontinuance of heating in summer. Maintenance and overhauls of units are foreseen in summer period.

2.4 Load

Load on a power system is the net consumption corresponding to the hourly average active power absorbed by all installations connected to the transmission grid or to the distribution grid, excluding the pumps of the pumped-storage stations.

"Net" means that the consumption of power plants' auxiliaries is excluded from the Load, but network losses are included in the Load.

All load and consumption forecasts are made under standard weather conditions.

2.4.1 Consumption Growth Rate

Based on national growth rate forecast and recorded national consumptions[14], UCTE consumption is expected to reach 2700 TWh by 2010 and exceed 3000 TWh by 2017 (see Fig. 13) with an average annual growth rate of +1.5%.

Consumption thus continues to increase all over UCTE. The biggest growth rates are expected in eastern and southern UCTE and especially Poland, Romania and Greece, as shown in Map 7 and Tab. 12.

National comments are in Chapter 2.4.5.

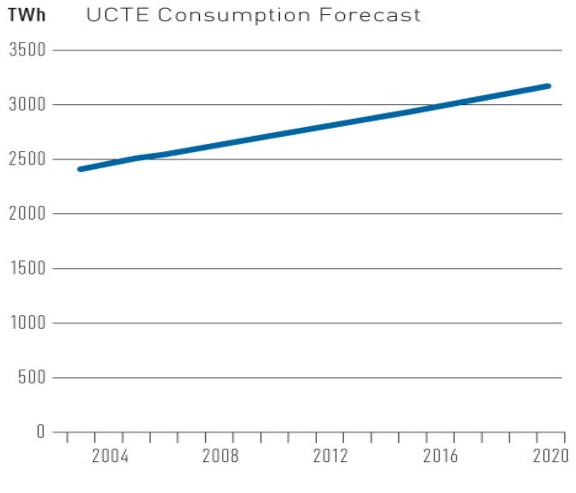
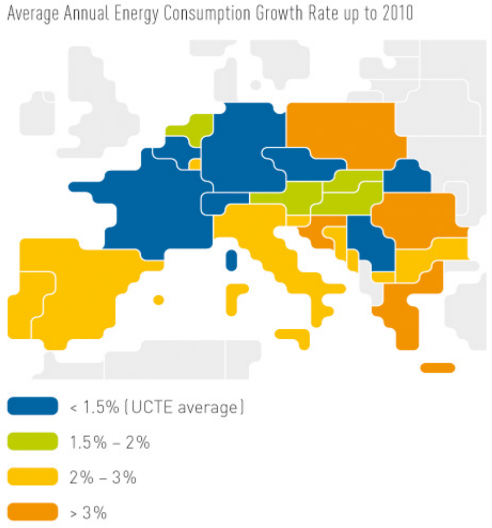


Fig. 13 UCTE Consumption Forecast



Map 7 Average Annual Consumption Growth Rate up to 2010

Here below are the national forecasts for average annual growth rate of energy consumption.

[14] UCTE estimates are based on the national consumptions in 2006 (source UCTE SAR 2006 report)

%	2008-2010	2010-2015	2015-2020
AT	2.0	2.0	2.0
BA	2.5	2.0	1.8
BE	1.4	0.9	0.8
BG	3.0	5.5	6.0
CH	1.4	0.8	0.8
CZ	1.3	1.2	0.8
DE	0.5	0.3	0.7
ES	3.0	2.5	2.0
FR	1.3	1.0	1.0
GR	3.5	3.0	2.5
HR			
HU	2.0	2.0	2.0
IT	2.1	2.1	2.1
LU	2.7	2.5	2.5
ME	3.0	2.0	2.0
MK			
NL	2.0	2.0	2.0
PL	3.2	1.9	1.9
PT	3.0	3.1	3.3
RO	3.2	2.8	2.8
RS	1.4	1.4	1.4
SI	2.5	2.3	2.0
SK	1.8	1.6	1.5
UA-W	1.0	1.1	1.1
UCTE	1.4	1.6	1.6

Tab. 12 Average Annual Consumption Growth Rate Forecast

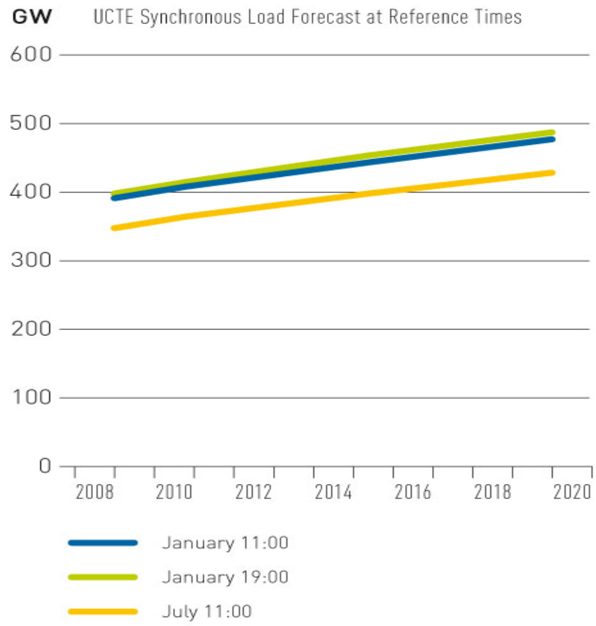
2.4.2 Load at Reference Points

Reference points are the few dates and times, power data are collected for. Reference points are characteristic enough of the whole studied period to limit the data to be collected to the ones at the reference points.

As shown in Fig. 14, UCTE synchronous load at reference point January 19:00 (under standard weather conditions) will continue to increase in the future but its growth rate should slow down from +2.1% up to 2010, then +1.8 up to 2015 and later +1.5% up to 2020. The same variations are expected for the other reference points January and July 11:00. Similar evolutions are forecasted between winter and summer for the whole UCTE.

Load at reference point January 19:00 (under standard weather conditions) should increase faster than total consumption (+2.3%) up to 2010 and then slower (+1.2%), illustrating the increasing effect of load management measures and some price elasticity effect.

The South of Europe should experience the most dramatic load growth rate, higher than +3%, as shown in Map 8 for January 11:00. Highest rates are expected in the following countries: FYROM with +6.3%, Italy with +4.3%, Romania with +4.1%, Spain and Greece with +3.6% and Portugal with +3.3 %.



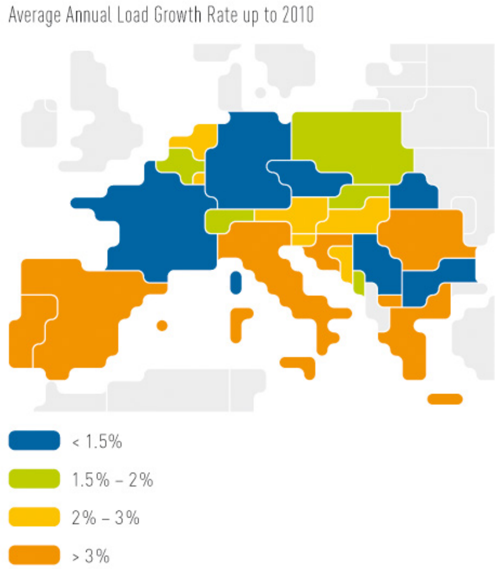


Fig. 14 UCTE Load Forecast

Map 8 Average Annual Load Growth Rate up to 2010 in January 11:00

Here below are displayed the national forecasts for Load at reference points.

	2008			2010			2013			2015			2020		
GW	January		July	January		July	January		July	January		July	January		July
	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00
AT	9.1	8.9	7.8	9.4	9.3	8.1	10.0	9.9	8.6	10.4	10.3	9.0	11.5	11.3	9.9
BA	1.9	2.1	1.7	2.0	2.2	1.8	2.1	2.3	1.9	2.2	2.4	2.0	2.4	2.7	2.2
BE	12.5	13.2	10.9	12.9	13.6	11.3	13.2	13.9	11.5	13.5	14.2	11.7	14.0	14.8	12.2
BG	6.3	6.8	4.0	6.5	7.0	4.2	6.7	7.2	4.3	6.8	7.3	4.4	7.2	7.4	4.6
CH	10.0	9.5	8.1	10.3	9.8	8.4	10.5	10.0	8.6	10.7	10.2	8.7	11.1	10.6	9.0
CZ	10.1	10.3	7.5	10.2	10.4	7.6	10.9	11.1	8.1	11.2	11.5	8.4	11.8	12.1	8.9
DE	75.0	75.4	67.4	76.1	76.4	68.7	75.5	76.3	68.3	76.6	77.7	69.8	79.2	79.8	71.9
ES	42.7	44.7	42.2	45.9	47.9	45.3	51.3	53.3	50.7	55.1	57.1	55.1	61.0	63.0	62.0
FR	80.0	81.8	59.0	81.7	83.5	60.2	83.4	84.9	62.0	85.3	86.6	63.3	89.9	90.9	66.3
GR	8.1	8.4	9.6	8.6	9.0	10.2	9.5	9.8	11.0	10.0	10.4	11.5	11.3	11.8	12.9
HR	3.1	2.9	2.4	3.4	3.3	2.7	3.5	3.5	3.5	4.3	4.1	3.4	5.5	5.3	4.3
HU	5.7	5.8	5.4	5.9	6.0	5.6	6.3	6.4	5.9	6.5	6.6	6.1	7.2	7.3	6.8
IT	54.9	55.2	56.9	59.8	59.9	62.4	65.6	65.8	67.2	68.7	68.9	70.3	76.9	76.9	77.8
LU	0.9	0.8	0.9	1.1	0.9	1.0	1.1	0.9	1.1	1.2	1.0	1.1	1.3	1.0	1.2
ME	0.7	0.7	0.5	0.7	0.8	0.6	0.7	0.8	0.6	0.8	0.8	0.6	0.9	0.9	0.7
MK	1.5	1.6	1.0	1.6	1.7	1.0	1.7	1.8	1.1	1.8	2.0	1.2	1.9	2.3	1.4
NL	17.6	17.4	16.6	18.3	18.1	17.3	19.5	19.3	18.5	20.2	20.0	19.2	22.3	22.1	21.3
PL	21.1	22.2	18.3	22.0	23.0	19.8	23.3	24.4	21.0	24.1	25.3	21.8	26.1	27.4	23.6
PT	8.1	8.6	7.3	8.6	9.2	7.8	9.5	10.1	8.6	10.1	10.8	9.1	11.9	12.7	10.7
RO	8.1	8.6	7.0	8.8	9.3	7.8	9.6	10.2	8.6	10.3	10.9	9.1	12.0	12.7	10.6
RS	6.6	6.9	3.9	6.7	7.0	4.1	6.9	7.3	4.5	7.0	7.4	4.6	7.4	7.9	5.0
SI	2.2	2.2	2.0	2.3	2.3	2.1	2.4	2.4	2.2	2.5	2.5	2.4	2.7	2.8	2.6
SK	3.8	3.9	3.2	4.0	4.1	3.3	4.1	4.3	3.5	4.3	4.4	3.6	4.6	4.7	3.9
UA-W	1.0	1.0	0.6	1.0	1.1	0.6	1.0	1.1	0.7	1.0	1.1	0.7	1.1	1.2	0.7
UCTE	390.9	399.0	344.3	407.7	415.6	361.7	428.2	436.9	381.8	444.4	453.5	397.0	480.9	489.5	430.5

Tab. 13 National Load Forecast

2.4.3 Load Management

Load Management is made of the load reduction measures intentionally used by any market player and which might help balancing the system when stressed out. As shown in Fig. 15, potential load reduction due to Load Management is about 12 GW in January 2008 and should increase in the future. About 2 GW more potential reduction is reported in winter than in summer, but only in France. The current development of Load Management is illustrated by the large increase on forecast values compared to the previous SAF 2007-2020 report (see Fig. 16).

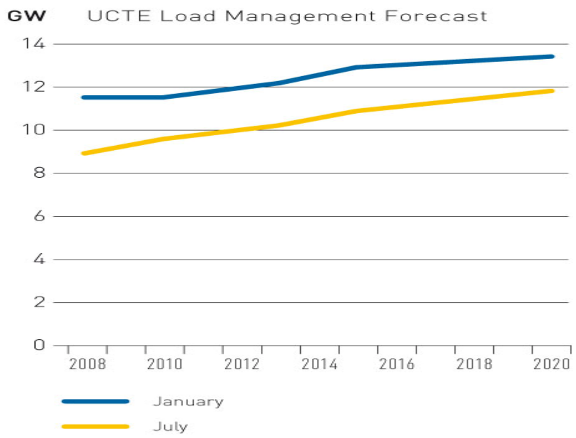


Fig. 15 UCTE Load Management Forecast

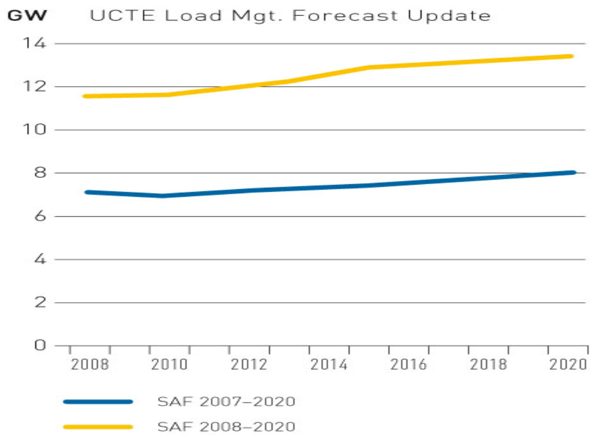


Fig. 16 UCTE Load Management Forecast Update

Here below are the national forecasts for Load Management in January 11:00 in Best Estimate scenario B.

GW	2008	2010	2013	2015	2020
IT	4.00	4.00	4.00	4.00	4.00
FR	3.60	3.00	3.00	3.00	3.00
ES	2.00	2.30	2.50	2.70	3.00
NL	1.00	1.00	1.10	1.25	1.50
GR	0.40	0.60	0.80	1.00	1.30
DE	0.20	0.30	0.40	0.50	0.05
BE	0.20	0.20	0.20	0.20	0.20
HU	0.00	0.05	0.08	0.10	0.20
ME	0.03	0.03	0.05	0.05	0.05
LU	0.02	0.02	0.02	0.02	0.02
UCTE	11.45	11.50	12.15	12.82	13.32

Tab. 14 National Load Management Forecast in January 11:00 in Scenario B

2.4.4 Margin Against Peak Load

Margin Against Peak Load is the difference between the Load at the reference point and the peak load over the period the reference point is representative of.

Margin Against Peak Load is used to extend analysis from a reference point to seasons the reference point is representative of.

Margin Against Peak Load and Load in January are representative of Winter. Margin Against Peak Load and Load in July are representative of Summer.

Margin Against Peak Load is used in the calculation of Adequacy Reference Margin (see Chapter 3.3).

2.4.5 National Comments on Load Forecast

BE Belgium

Up to 2010, the average annual energy consumption growth is a combination of the Belgian Federal Planning Bureau long-term energy prospects [PRIMES model - see "Long term energy and emissions' projections for Belgium with the PRIMES model. Addressed to the Commission Energy 2030", Federal Planning Bureau, September 2006] and the short-term prospects of the grid development department of Elia (drawn up as part of the Elia 2008 investment programme).

From 2011, the average annual energy consumption growth is solely based on the Belgian Federal Planning Bureau long-term energy prospects (PRIMES model).

Several load-shedding contacts with industrial customers are in force. The contractual capacity is about 800 MW. The estimated contribution is 200 MW, taking into account statistical availability, estimated at 25%. These contracts are part of the system services reserve.

Margin against seasonal peak load is the difference between the seasonal peak load and the load at a given moment. Future values of the margin against seasonal peak load are deduced from the difference between the forecasted values of respectively the seasonal peak load and the load at a given moment.

BG Bulgaria

The annual electricity consumption forecast has been made on the basis of the expected economic development of the country after becoming a member of the EU.

No DSM measures have been planned up to now.

CH Switzerland

No Load Management measures possible in Switzerland.

Margin Against Seasonal Peak Load is given under normal whether conditions. An additional load increase which can be observed during very cold winters is considered under the Spare Capacity.

DE Germany

The implementation of energy saving measures and the increase in technological efficiency, respectively, will lead only to a moderate growth in electricity demand in Germany.

Load Management: not relevant or no measures implemented in Germany.

ES Spain

Load forecast has been built taking into account medium and long term projections of economic growth rate (GDP) and population, as well as the impact of energy efficiency policies and Load Management: reduction of peak load growth and changes in the load duration curve.

FR France

Two major developments have been observed since 2005, when the previous demand forecasts were established.

The first concerns the drop in electricity demand by heavy industry, which fell by 3.5% in 2005 and a further 0.8% in 2006. There has also been a significant reduction in consumption in the energy sector.

The second development is the reinforcement of actions to promote energy efficiency. The new French legislation and the European Commission new action plan set down concrete objectives that also affect the electricity sector. Strengthening of building energy regulation, tax credits granted to equipment that is energy-efficient or uses renewable energy, measures to promote labelling, Energy Savings Certificates, tend to achieve these objectives.

This context is accentuating the trend begun two decades ago, of a change in electricity demand growth. The average annual growth rate currently varies between 1 and 2%, in climate-adjusted data, and energy intensity for electricity is dropping.

In this context, demand grows by 1.3 % per year until 2010, and 1.0% over the following decade, in the new baseline scenario used for the *[French]* Generation Adequacy Report [*2007 and UCTE System Adequacy Forecast 2007-2020]*, leading to annual energy demand of 534 TWh by the year 2020 in France (excluding Corsica).

In the baseline scenario, growth in electricity demand is mainly driven by the tertiary sector (+2.3% per year until 2010), with a weaker contribution by the industrial sector (+0.7% per year). Growth in the residential sector, which remains dynamic due to demographic effects and the development of specific uses for electricity, is tempered by the effects of DSM.

Electricity demand in industry is projected to grow at slower pace than in 2005: the difference is 5 TWh in 2010 (to which must be added the reduction in the energy sector), and 17 TWh in 2020. For the tertiary and residential sectors, the forecasts are rather stable: DSM compensates for an upward revision in demographic forecasts.

RTE estimates that the effect of the *[Load Management]* measures taken into account in the baseline scenario will save approximately 35 TWh per year by 2020.

(Source: RTE, Generation Adequacy Report, 2007 edition)

GR Greece

Types of Load Management measures:

- Industrial customers participate in a peak shaving scheme (new legislation since 2006).
- Irrigation rescheduling

IT Italy

For a better estimation of the power we need to cover future demand. The energy consumption forecast growth index has been built considering the major evolution scenario.

Type of Load Management measure: A special customer power supply contracts for an automatic load shedding in emergency situations.

LU Luxembourg

During the last five years we noticed an average annual growth of the load of about 2,7%. We assume that the stable economic situation and the growth of the population by emigration will result in a more or less similar growth of the load for the next years.

Existing contracts with some small cogeneration units and legal issues allow us to start or to stop production during peak load. Modulation of the charging period of storage heating during the night is also possible. The value of DSM power can reach up to 5% of the national load.

ME Montenegro

It is assumed that no major industrial consumers will appear during the period 2008-2020. Growth of the consumption directly depends on the households consumption forecast.

Load Management is based on the bilateral contract with steal mills. It is also expected that Load Management potential can be increased if becomes necessary in next years, due to the structure of rest of the industrial consumption.

MK Former Yugoslav Republic of Macedonia

The growth of the load should be calculated according to the increasing of the consumption of the industry, Also big influence in the increasing of the load will have air conditioning in the summer period.

Load Management is upon the agreements with big consumers and Distribution Company. According to these agreements, they can decrease or increase their consumption, to balance the System, and ensure reliability when the system is stressed out.

NL The Netherlands

The average annual energy consumption growth is in line with the expected economic growth in the Netherlands for the period after 2006.

Investigations by the Ministry of Economic Affairs of the Netherlands show that there's a load management potential of 1000-1500 MW directly related to market prices. In the figures it's supposed that this capacity will grow gradually over the period until 2020. There are no specific tariffs to make this capacity available. Within the bid-system for reserve and regulation power of TenneT TSO BV part of this market potential can be used.

PL Poland

A quite big increase of the load has been observed in Poland recently. The main reasons for this increase can be confirmed as follows:

- the changes of the climatic conditions: strong winters and unexpected hot summers which cause the intensive use of air-conditioning.
- high economic growth which caused the increase of demand for energy;

Polish TSO forecasts the upkeep of this trend and the growth of the load for years 2008-2010 at the level of:

- 2% during the winter;
- 4,2% during the summer.

For the next years the average yearly growth is the range of 1,9%

For the years 2008-2020 the load management is not considered.

Statistically (last 5 years), in Poland during the winter, the daily peak load takes place at 17:15, for summer it is 13:15. The average difference between the load at the reference time and the seasonal peak load amounts at about:

For January, 3rd Wednesday, 11:00 – 2,6 GW;

For January, 3rd Wednesday, 19:00 – 1,6 GW;

For July, 3rd Wednesday, 11:00 – 0,8 GW.

For Poland the representative season for winter are months: December, January and February. For summer it is June, July and August.

PT Portugal

The energy consumption forecast is based on our estimations allowing for the compliance of the Directive 2006/32/CE.

The load forecast follows the energy consumption forecast attending to the present relationship between peak load and consumption.

In this study we did not consider any load management measures.

RO Romania

The load forecast was assessed on the base scenario related to the evolution of the main social and macroeconomic indicators (as GDP, population growth) concerning development of Romania in the 2008 – 2020 period.

There is a regulatory frame regarding the load reduction, but in despite of this there is not any solicitation to license the consumers yet.

SI Slovenia

Load forecast is based on economic development forecast. Increase of air-condition units in the summer and DSM is taken into consideration.

SK Slovak Republic

The growth of economy is expected taking into account decreasing of energy severity in compliance with Slovak and EU energy policy. The energy savings can be reached mostly by controlled projects, such as DSM. The energy market may have some impact on energy savings too.

3 GENERATION ADEQUACY ANALYSIS

3 Generation Adequacy Analysis

Remaining Capacity on a power system is the difference between Reliably Available Capacity and Load. Remaining Capacity is the part of Net Generating Capacity left on the system to cover any unexpected load variation and unplanned outages at a Reference Point.

Generation Adequacy at reference points is assessed by the comparison of Remaining Capacity and Adequacy Reference Margin, as introduced in the methodology summary in Chapter 1.2.2.

3.1 Remaining Capacity

3.1.1 Whole UCTE

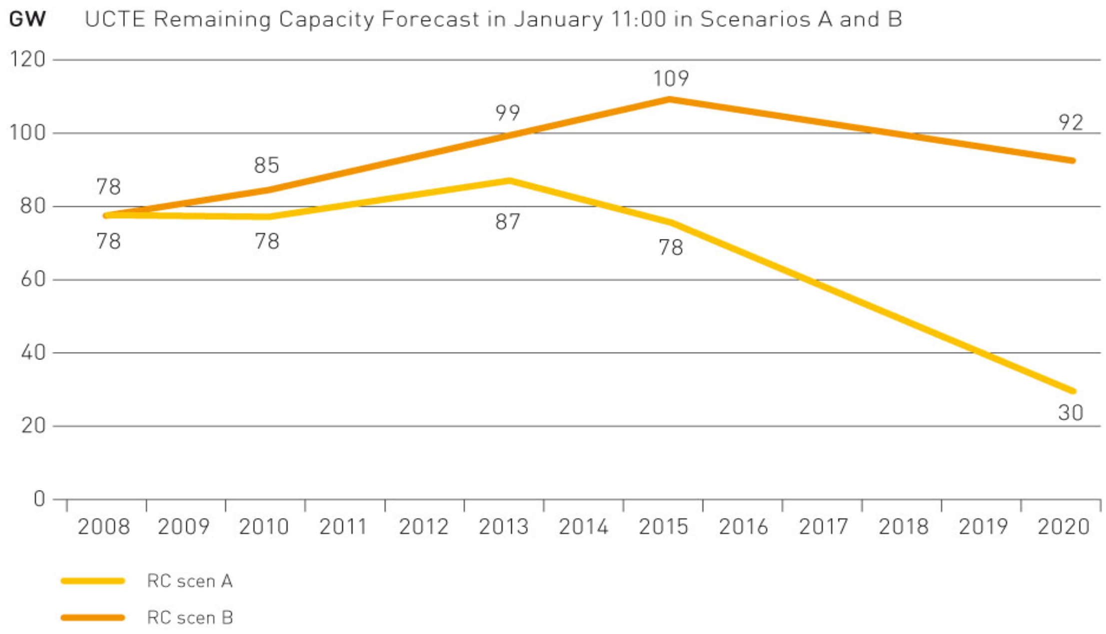


Fig. 17 UCTE Remaining Capacity Forecast in January 11:00 in scenarios A and B

UCTE Remaining Capacity is expected to be positive at all reference points at all time horizons and in both scenarios A and B (Fig. 17).

Remaining Capacity January 11:00 and July 11:00 show very comparable levels; Remaining Capacity for January 19:00, close to UCTE winter peak load is of course lower, by about 10 GW, but with a similar pattern to the other reference points (see Chapter 3.4 for Adequacy Analysis). Hence, as introduced in the methodology summary in Chapter 1.2.2, UCTE is likely to have capacity for exports under normal conditions in the coming 15 years.

Remaining Capacity appear to increase in the near future, as upcoming generation investments cover more than the load growth. The difference between scenario B and A corresponds, within the next five years, to some quick developments projects based on gas and RES, and in the longer-run to likely and not certain investment perspectives, accounted for in scenario B but disregarded in scenario A.

In conservative scenario A, Remaining Capacity is expected to increase by almost +10 GW up to 2013: Load rises by about +37 GW, but Reliable Available Capacity gains +47 GW (corresponding to +75 GW Net Generating Capacity[15]).

In Best Estimate scenario B, the situation looks of course better with Remaining Capacity going up by +21 GW in 2013: with the same Load increase, additional Reliable Available Capacity amounts to +58 GW (corresponding to +92 GW Net Generating Capacity).

Then, Remaining Capacity is likely to decrease from 2013 in Conservative scenario A and from 2015 in Best Estimate scenario B.

The decrease of Remaining Capacity in Best Estimate scenario B after 2015 mainly highlights:

- the decommissioning of fossil fuel plants due to the LCP Directive,
- the smaller impact of developing wind power capacity on Remaining Capacity,
- the uncertainty concerning the future of nuclear power,
- the doubt regarding when carbon capture technology could turn operational.

Compared to the previous SAF 2007-2020 report published one year ago, Remaining Capacity forecast appears much higher today by more than 10 GW in Conservative scenario A (see Fig. 18). This is an illustration of the steady investments in generating capacity decided and announced in most of the countries in the last few months.

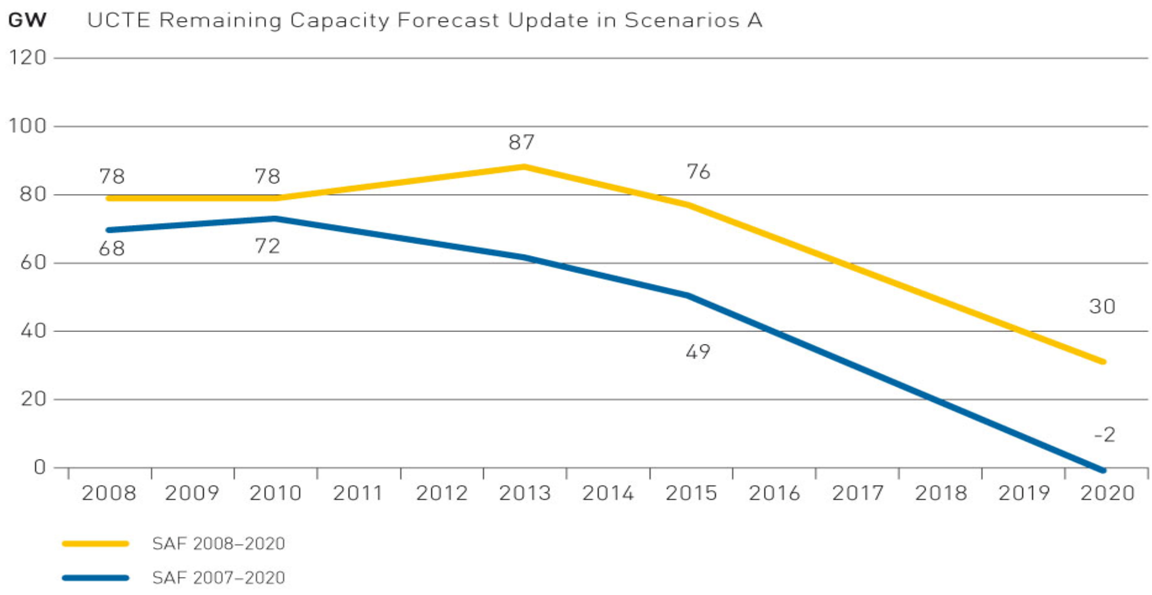


Fig. 18 UCTE Remaining Capacity Forecast Update in Scenario A

Here below are displayed the national evolutions of the forecasts for Remaining Capacity in January 11:00 2020 in scenario A.

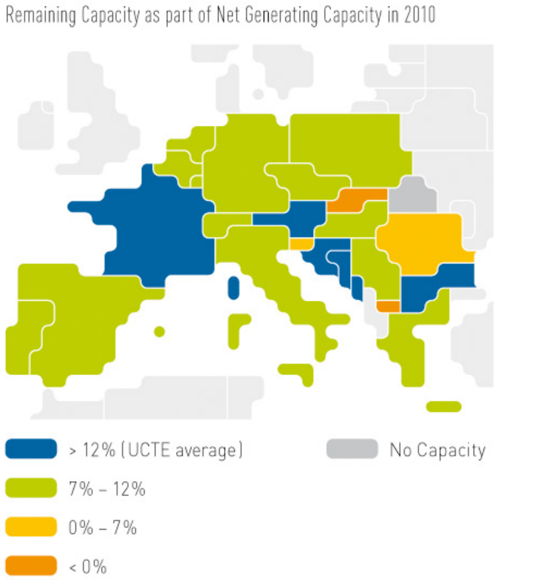
[15] The relationship between Net Generating Capacity, Reliably Available Capacity and Unavailable Capacity is detailed in Chapter 2.3

GW	SAF 2007-2020	SAF 2008-2020	Variation
DE	1.2	9.2	8.0
IT	-1.2	5.4	6.6
PT	-3.4	1.1	4.5
RS	-1.6	1.7	3.3
GR	1.2	4.3	3.1
FR	2.1	4.6	2.5
SI	-1.3	1.1	2.4
ME	-0.9	1.0	1.9
BE	-3.0	-1.5	1.5
NL	0.4	1.9	1.5
BG	2.2	3.4	1.2
HU	-4.0	-3.0	1.0
LU	0.4	0.6	0.2
BA	0.5	0.7	0.2
PL	-7.8	-7.7	0.1
AT	5.4	5.4	0.0
HR	-1.5	-1.5	0.0
CZ	0.5	0.5	0.0
MK	-0.2	-0.2	0.0
UA-W	0.8	0.8	0.0
CH	0.2	-0.2	-0.4
RO	0.8	0.4	-0.4
SK	0.8	-0.8	-1.6
ES	6.5	2.9	-3.6
UCTE	-1.6	30.0	31.6

Tab. 15 National Remaining Capacity Forecast Update in January 2020 11:00 in Scenario A

3.1.2 National Forecast

To locate the potential sources of remaining capacity to secure adequacy and potential needs for import, Remaining Capacity is compared to Net Generating Capacity. Considering Best Estimate scenario B, the average UCTE value should about 12% up to 2020. In 2010, countries most likely to import at winter peak are FYROM, and Slovakia.



Map 9 Remaining Capacity as part of Net Generating Capacity in January 2010 19:00 in Scenario B

Here below are national forecasts for Remaining Capacity in Best Estimates scenario B.

		2008			2010			2013			2015			2020	
GW	January		July	January		July	January		July	January		July	January		July
	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00
AT	4.9	5.1	5.7	5.8	5.9	6.6	6.8	6.9	7.7	6.5	6.6	7.4	5.4	5.5	6.5
BA	0.6	0.4	0.7	0.7	0.5	0.8	1.1	0.9	1.2	3.2	3.0	3.3	3.0	2.7	3.1
BE	1.4	0.8	1.5	2.6	2.0	2.5	3.2	2.5	3.0	3.1	2.4	2.6	0.8	0.0	0.9
BG	2.0	1.5	2.9	2.2	1.7	3.1	2.0	1.5	3.0	3.0	2.5	4.0	4.0	3.8	4.8
CH	0.8	1.3	4.1	1.5	2.0	5.1	1.3	1.8	5.0	1.9	2.4	5.8	2.2	2.7	6.3
CZ	1.6	1.4	2.1	1.5	1.3	1.8	1.3	1.1	1.8	1.7	1.4	2.2	1.8	1.5	2.4
DE	10.5	10.1	10.8	11.9	11.5	13.8	21.6	20.8	22.3	26.1	25.0	25.3	18.0	17.8	17.8
ES	11.9	9.9	13.0	10.2	8.2	10.3	8.6	6.6	9.1	6.7	4.7	6.4	7.5	5.5	6.6
FR	16.2	14.4	14.7	18.4	16.6	16.9	18.7	17.2	16.8	15.7	14.4	14.2	15.1	14.1	14.5
GR	1.1	0.8	0.0	2.0	1.6	-0.8	3.5	3.2	0.7	4.7	4.3	1.8	5.2	4.7	2.1
HR	0.8	0.9	1.4	0.5	0.6	1.2	0.4	0.4	0.4	-0.5	-0.4	0.4	-1.5	-1.3	-0.3
HU	0.9	0.8	0.7	0.8	0.7	0.6	0.8	0.7	0.6	1.5	1.4	1.2	1.6	1.5	1.5
IT	10.4	10.1	8.7	11.2	11.1	8.8	10.6	10.4	9.8	10.3	10.1	9.4	8.5	8.5	8.3
LU	0.6	0.8	0.7	0.2	0.4	0.3	0.7	0.9	0.8	0.6	0.8	0.8	0.6	0.9	0.7
ME	0.2	0.1	0.3	0.2	0.1	0.3	0.4	0.3	0.5	0.6	0.5	0.8	1.0	0.9	1.1
MK	-0.2	-0.3	0.2	-0.1	-0.2	0.3	0.4	0.2	0.8	0.2	0.0	0.4	0.1	-0.2	0.1
NL	1.8	2.0	2.8	2.2	2.4	3.2	4.6	4.8	5.6	8.5	8.7	9.5	6.7	6.9	7.7
PL	5.9	4.9	2.9	6.9	5.9	2.6	5.0	3.9	0.9	4.6	3.4	0.4	4.9	3.6	0.8
PT	2.1	1.6	1.7	3.2	2.7	4.2	3.8	3.2	3.3	3.1	2.4	2.8	1.7	0.9	1.7
RO	2.9	2.4	1.3	1.6	1.1	0.8	2.0	1.4	1.8	3.4	2.7	2.9	2.1	1.3	1.5
RS	0.5	0.2	2.2	0.6	0.3	2.2	1.1	0.7	2.5	2.1	1.7	2.9	1.7	1.2	2.5
SI	-0.1	-0.1	0.1	0.1	0.1	0.3	0.3	0.2	0.3	0.4	0.3	0.4	1.1	0.9	1.3
SK	0.2	0.0	-0.1	-0.4	-0.5	-0.6	0.2	0.1	0.0	0.8	0.7	0.6	0.1	0.0	-0.1
UA-W	0.6	0.5	0.6	0.8	0.7	0.7	0.8	0.7	0.7	0.8	0.7	0.7	0.8	0.7	0.7
UCTE	77.7	69.6	78.9	84.6	76.6	85.1	99.1	90.3	98.7	109.0	100.0	106.3	92.3	84.3	92.7

Tab. 16 National Remaining Capacity Forecast in Scenario B

3.2 Spare Capacity

Spare Capacity is the part of Net Generating Capacity which should be kept available at Reference Points to ensure the security of supply in most of the situations. Spare Capacity is supposed to cover a 1% risk of shortfall on a power system i.e. to guarantee the operation on 99% of the situations.

A 1% risk of shortfall is consistent for the whole UCTE system – respectively a regional block or some national systems – with a Remaining Capacity representing 5% of the generating capacity of the considered system.

For some other national systems, more sensitive to random factors (load variations or unavailability of generation), Remaining Capacity may represent about 10% of the national generating capacity to meet the same criterion.

Some countries developed their own estimation methodology. National comments are in Chapter 3.7.

3.3 Adequacy Reference Margin

Adequacy Reference Margin (ARM) is the part of Net Generating Capacity that should be kept available at all time to ensure the security of supply on the whole period each reference point is representative of. Adequacy Reference Margin in an individual country is equal to Spare Capacity plus the related Margin Against Peak Load.

Adequacy Reference Margin is influenced by Net Generating Capacity as far as Spare Capacity is estimated as a percentage of the Net Generating Capacity. Yet Adequacy Reference Margin calculated in Conservative scenario A and Best Estimate scenario B do not differ by more than 3.5 GW for the whole UCTE system. Therefore, in the following analysis, only Adequacy Reference Margin in scenario B is considered.

3.4 UCTE Global Adequacy

Here below are the UCTE forecasts of Remaining Capacity and Adequacy Reference Margin in the three reference points in both scenarios A and B.

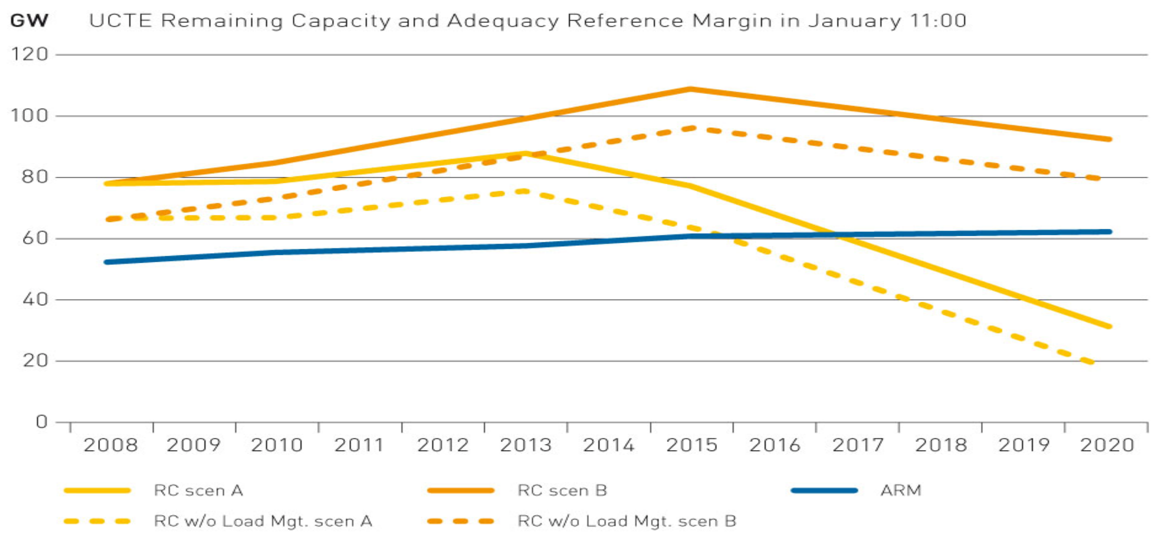


Fig. 19 UCTE Generation Adequacy Forecast in January 11:00 in scenario A and B

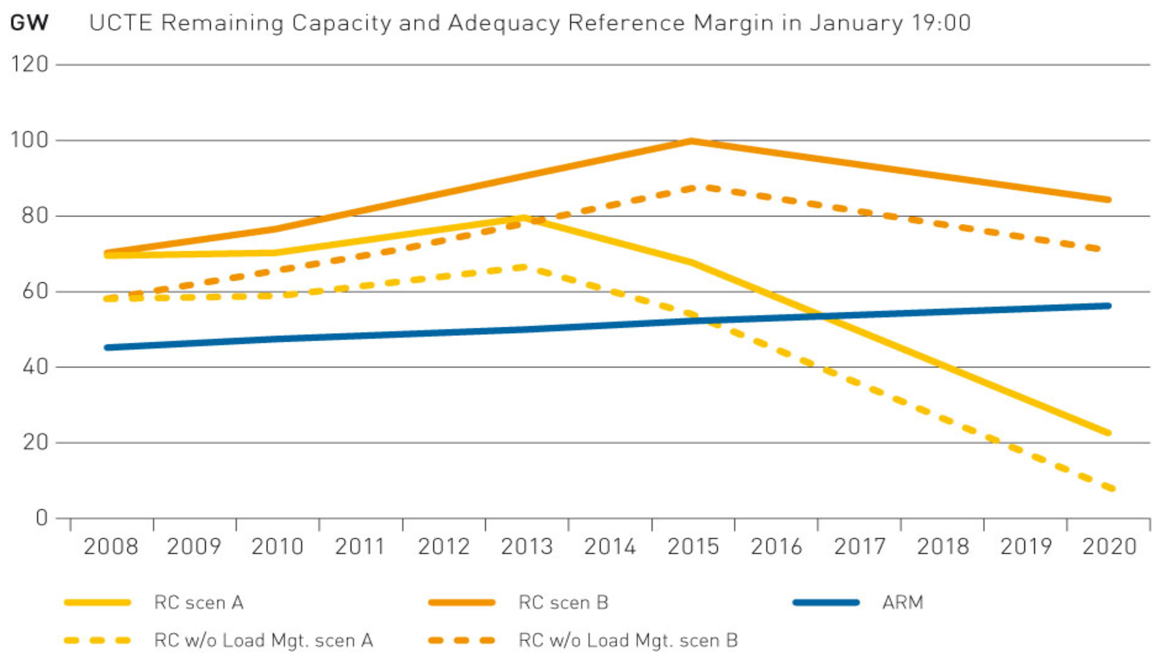


Fig. 20 UCTE Generation Adequacy Forecast in January 19:00 in scenario A and B

NB: the daily peak load in winter is close to 19:00, with hence a minimal Margin Against Peak Load at this reference point, and consequently lower levels of Remaining Capacity and Adequacy Reference Margin compared to January 11:00.

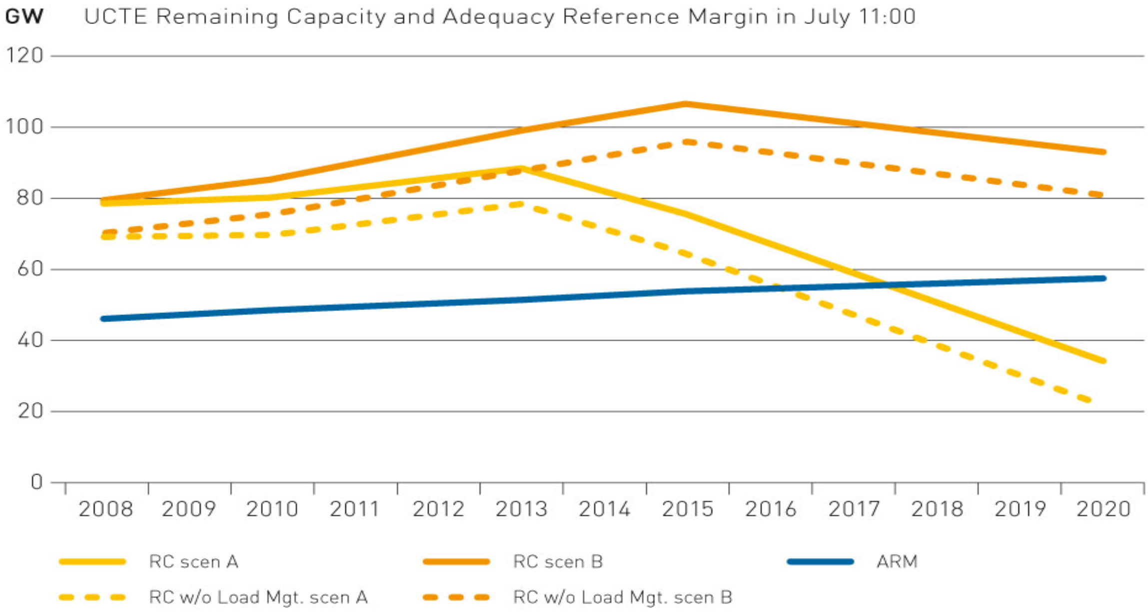


Fig. 21 UCTE Generation Adequacy Forecast in July 11:00 in scenario A and B

The comparison of Remaining Capacity and Adequacy reference Margin levels shows that generation adequacy of the UCTE system should not be at risk up to 2015 in any generation scenario and at any reference point.

Considering Conservative scenario A, Load Management introduced in Chapter 2.4.3 will help maintaining adequacy later than 2015. However, additional investments in generating capacity should be necessary before 2020 to maintain an appropriate level of adequacy: remaining Capacity should end up 30 GW below Adequacy Reference Margin in 2020, and some 60 GW of additional Reliable Available Capacity would even be necessary to maintain adequacy at the level of 2008. With 70% of Net Generating Capacity turning into Reliably Available Capacity (UCTE estimate, see Chapter 2.3.1), these figures are equivalent respectively to about + 50 GW and +90 GW of additional Net Generating Capacity required in 2020.

Additional investments in new generating capacity considered in Best Estimate scenario B should be sufficient to maintain adequacy up to 2020 at the level of 2008. Remaining Capacity should be +30 GW above Adequacy Reference Margin in 2020. In this generation scenario B, Remaining Capacity looks appropriate, even without Load Management measures, up to 2020 at all reference points. The situation might be different at actual peak load, where Load Management might prove useful.

3.5 Regional Adequacy

Regional blocks have been introduced in the methodology summary in Chapter 1.2.1.

3.5.1 North-Western Block

North Western block is made of Austria, Belgium, France, Germany, Luxembourg, the Netherlands and Switzerland.

Here below are the forecasts of Remaining Capacity and Adequacy Reference Margin in the North Western block in January 19:00 in both scenarios A and B.

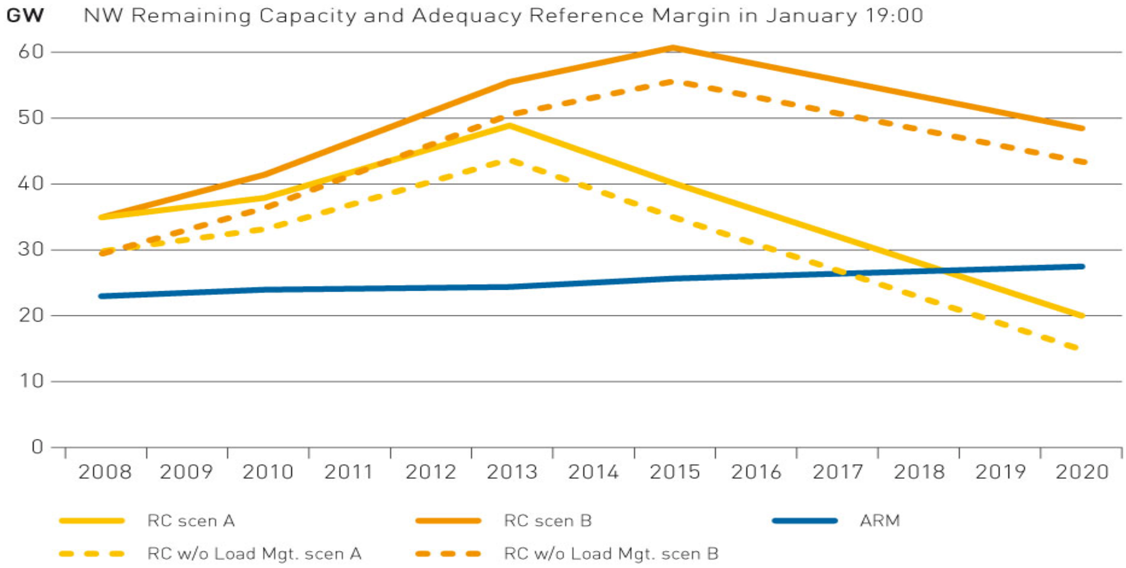


Fig. 22 North-Western Block Generation Adequacy Forecast in January 19:00 in Scenarios A and B

Remaining Capacity excess to Adequacy Reference Margin is slightly above 10 GW in 2008 and should continuously increase in the next 5 years in both scenarios A (about +13 GW) and B (about +20 GW). This is quite a change compared to the previous SAF 2007-2020 which reported a stable Remaining Capacity up to 2010. There is a major increase of the forecast regarding generating capacity. In scenario B for instance, up to 2013, Net Generating Capacity is expected to increase of about +47 GW (+15%) with Reliably Available Capacity increasing of +28 GW while Load in expected to grow of about +8 GW (+5%).

Considering in Conservative scenario A, Remaining Capacity will decrease after 2013 mainly because of the slowing growth rate of generating capacity (+3% from 2015 to 2020) with the shutdown of big fossil fuel and nuclear plants, while Load is expected to increase steadily (+4.5% globally over 2015-2020). In 2015, adequacy should be back at its level in 2008. More than 15 GW additional Remaining Capacity would be necessary to maintain the same level of adequacy in 2020. With 70% of Net Generating Capacity turning into Reliably Available Capacity (UCTE estimate, see Chapter 2.3.1), more than 20 GW of additional Net Generating Capacity would be necessary before 2020 to keep adequacy as in 2008.

Considering Best Estimate scenario B, the level of adequacy appears satisfactory up to 2020. Yet, if the level of adequacy should increase up to 2015, it then decreases afterwards.

3.5.2 North-Eastern Block

North Eastern block is made of Czech Republic, Hungary, Poland, Slovak Republic and Ukraine-West.

Here below are the forecasts of Remaining Capacity and Adequacy Reference Margin in the North Eastern block in January 19:00 in both scenarios A and B.

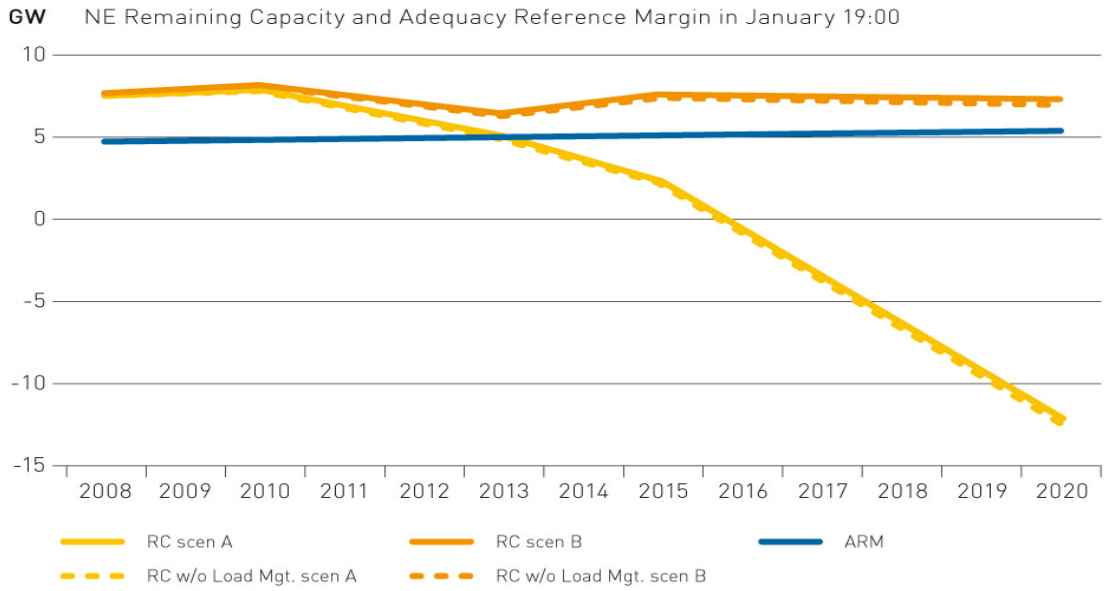


Fig. 23 **North-Eastern Block Generation Adequacy Forecast in January 19:00 in Scenarios A and B**

The level of adequacy of the North Eastern block should be stable up to 2010, confirming the forecast in the previous SAF 2007-2020 report published early 2007.

Considering Conservative scenario A, the situation will deteriorate from 2010 on to become inadequate as from 2013 with more and more fossil fuel plants likely to get closed and fossil fuel capacity decreasing -25% from 2010 to 2020. After 2013, +20 GW additional Remaining Capacity would be necessary to maintain in 2020 the present level of adequacy. With 70% of Net Generating Capacity turning into Reliably Available Capacity (UCTE estimate, see Chapter 2.3.1), about 30 GW of additional Net Generating Capacity should be necessary before 2020 to keep adequacy as in 2008.

Considering Best Estimate scenario B, the level of adequacy should be satisfactory up to 2020, making the situation better than in the previous SAF 2007-2008. The most tensed period should be around 2013 as Reliably Available Capacity should remain almost stable up to 2013 (+2.5% in the next five years) while Load will increase rapidly (+9% over the same period). Then, as additional nuclear capacity should be commissioned in Slovak Republic in 2015, Reliably Available Capacity should grow quicker than Load and the level of adequacy should remain satisfactory up to 2020.

3.5.3 South-Eastern Block

South Eastern block is made of Bosnia-Herzegovina, Bulgaria, FYROM, Greece, Montenegro, Romania and Republic of Serbia.

Here below are the forecasts of Remaining Capacity and Adequacy Reference Margin in the South Eastern block in July 11:00 in both scenarios A and B.

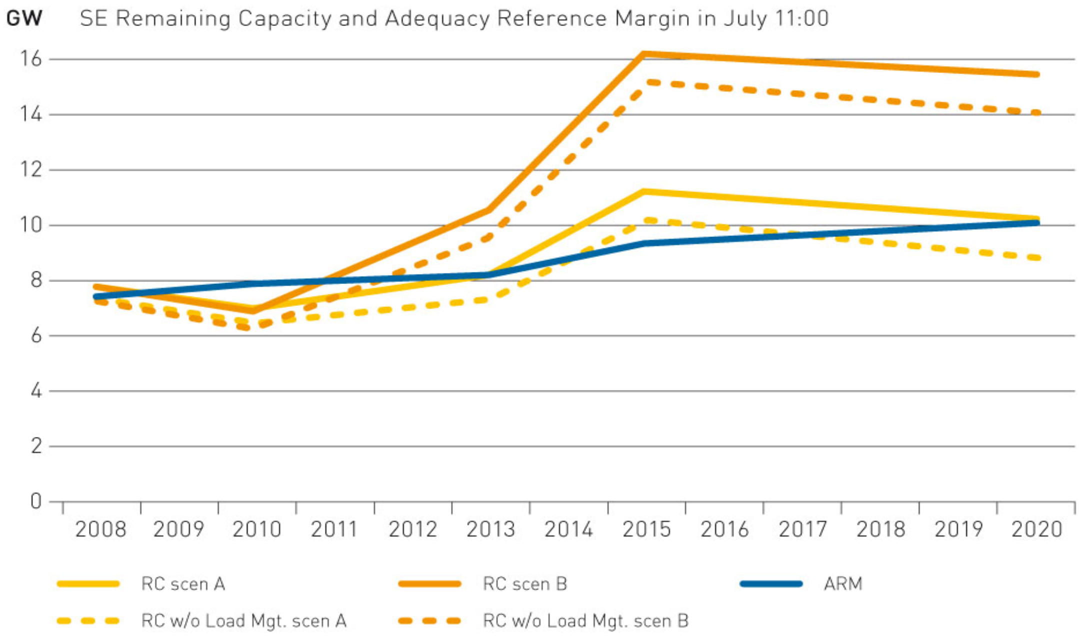


Fig. 24 South-Eastern Block Generation Adequacy Forecast in July 11:00 in Scenario A and B

Before 2010, South Eastern block is not expected to have the adequate level of adequacy. This is in line with the previous SAF 2007-2020 report published early 2007, bearing in mind that Romania and Bulgaria are now in the block.

Then Remaining Capacity should increase much more than Load, with the commissioning of additional gas capacity by 2013 and nuclear capacity in Romania and Bulgaria before 2015.

Considering Conservative scenario A, the level of adequacy would remain stable but minimal from 2008 up to 2020.

Considering Best Estimate scenario B, Remaining capacity should exceed Adequacy Reference Margin by +2 GW in 2013 and +5GW in 2020, and the level of adequacy is likely to be satisfactory from 2013 on. Remaining Capacity in 2010 should even amount to 7 GW, i.e. 2 GW higher than the 5 GW reported in the previous report for the same horizon. Romania and Bulgaria should be the major sources of Remaining Capacity in the block.

3.5.4 Centre-South Block

Centre South block is made of Croatia, Italy and Slovenia.

NB: no data have been provided for Croatia. As much as possible, figures from previous SAF 2007-2020 have been used. Due to the relative small size of the Croatian system in the UCTE one, this is not undermining the conclusions of this report. Yet this is an issue for the Centre-South Regional block.

Here below are the forecasts of Remaining Capacity and Adequacy Reference Margin in the Centre South block in July 11:00 in scenarios A and B.

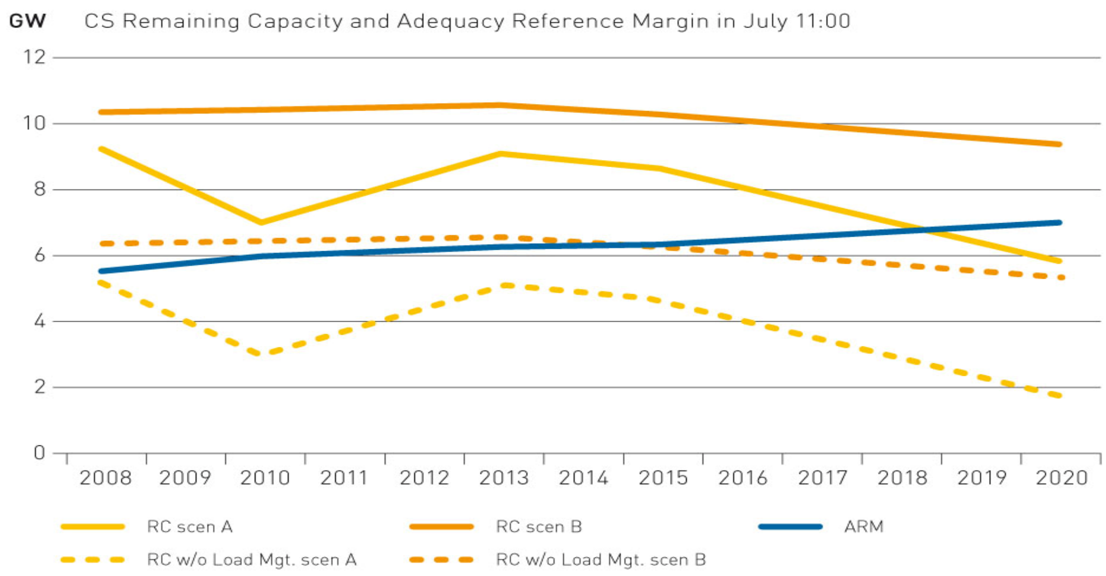


Fig. 25 Centre-South Block Generation Adequacy Forecast in July 11:00 in Scenarios A and B

Adequacy should be achieved up to 2018. Yet Centre South block is likely to rely on Load Management in some occasions, as Remaining Capacity without Load Management looks mostly below Adequacy Reference Margin.

Considering Conservative scenario A, Remaining Capacity should be higher than Adequacy Reference Margin up to 2015 with a minimum difference of 1 GW in 2010. In 2020, Remaining Capacity is 1 GW lower than Adequacy Reference Margin. With 70% of Net Generating Capacity turning into Reliably Available Capacity (UCTE estimate, see Chapter 2.3.1), less than 10 GW of additional Net Generating Capacity would be necessary before 2020 to keep adequacy as in 2008.

Considering Best Estimate scenario B, Remaining Capacity should exceed Adequacy Reference Margin by more than 4 GW in 2008 and still 2 GW in 2020. Thanks to Load Management (4 GW), the level of adequacy should be satisfactory up to 2020.

3.5.5 South-Western Block

South Western block is made of Portugal and Spain.

Here below are the forecasts of Remaining Capacity and Adequacy Reference Margin in the South Western block in July 11:00 in both scenarios A and B.

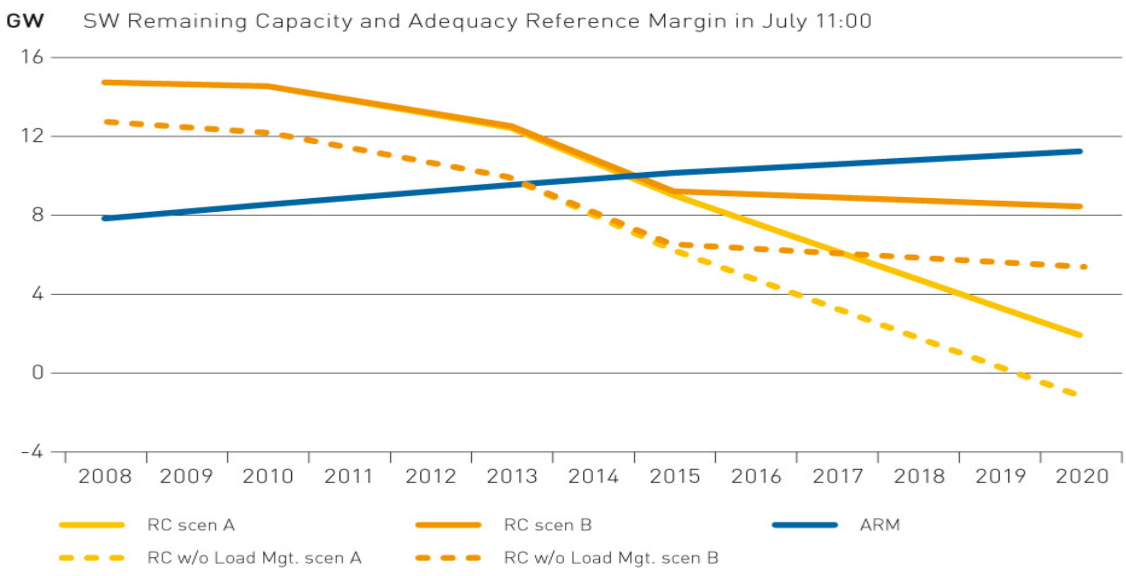


Fig. 26 South-Western Block Generation Adequacy Forecast in July 11:00 in Scenarios A and B

Remaining capacity excess to Adequacy Reference Margin in the next five years is much higher than in the previous SAF 2007 - 2020. It reflects a major increase of the forecast generating capacity in the medium term: + 21 GW by 2013. By 2013, renewable energy sources, especially wind farms, represent almost 60% of generating capacity investments, and its non usable capacity is important. Hence, the evolution of remaining available capacity is limited to + 7 GW. On the other hand, Load is expected to grow at a rate of 3,7% a year, representing +10 GW.

After 2015, the situation looks more constrained, and South Western block is likely to rely on Load Management in some occasions.

Considering Conservative scenario A, Remaining Capacity should continuously decrease down to 9 GW below Adequacy Reference Margin in 2020. With 70% of Net Generating Capacity turning into Reliably Available Capacity (UCTE estimate, see Chapter 2.3.1), more than 20 GW of additional Net Generating Capacity would be necessary before 2020 to keep adequacy as in 2008, but only 13 GW to meet the Adequacy Reference Margin requirement.

Considering Best Estimate scenario B, Remaining Capacity should be 1 GW below Adequacy Reference Margin in 2015. With 70% of Net Generating Capacity turning into Reliably Available Capacity (UCTE estimate, see Chapter 2.3.1), still about 1.5 GW of additional Net Generating Capacity should be necessary before 2015 and almost 5 GW in 2020 in order to meet the Adequacy Reference Margin requirements.

3.6 National Adequacy

Here below are the national forecasts of Remaining Capacity minus Adequacy Reference Margin in January 11:00 in Scenario A.

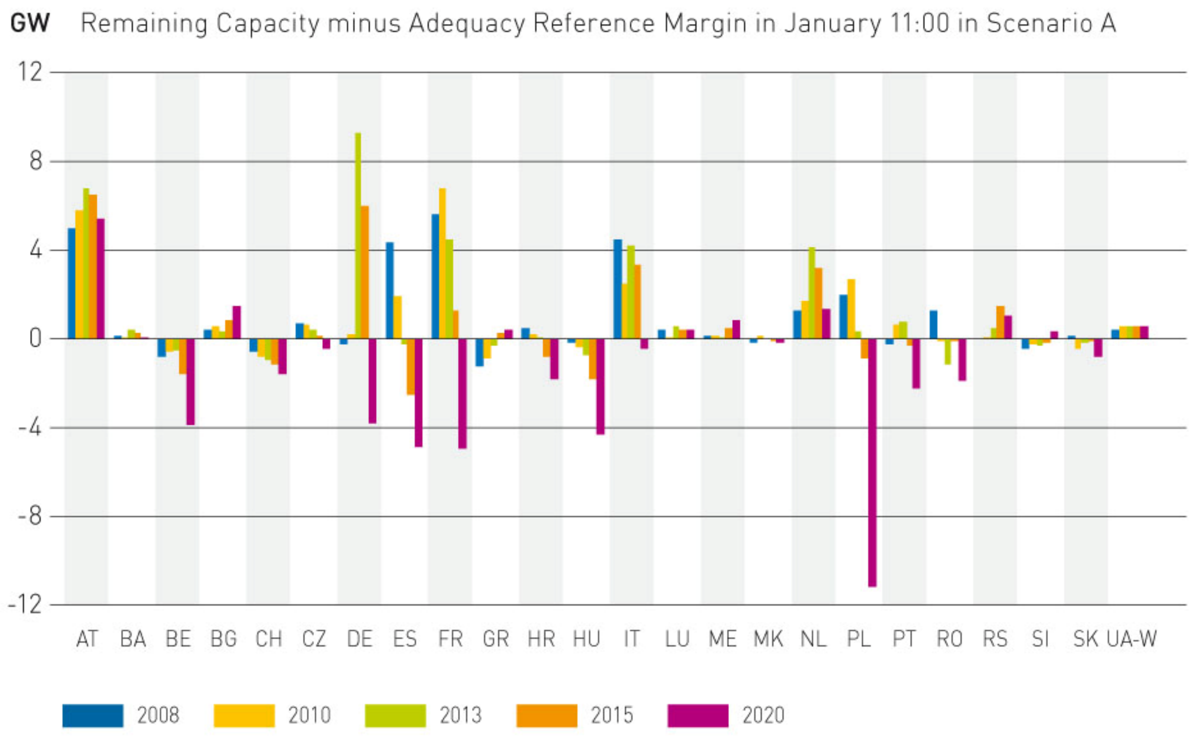


Fig. 27 National Generation Adequacy Forecast in January 11:00 in Scenario A

Considering Conservative scenario A (see Fig. 27), Adequacy Reference Margin appears higher than Remaining Capacity in 2010 in seven countries: Belgium, Switzerland, Greece, Hungary, Slovenia, and Slovak Republic. As expected in this conservative scenario, the situation worsens in 2015. Without additional investments in generating capacity than those already considered as secure, Remaining Capacity is lower than Adequacy Reference Margin in 2020 in Belgium, Switzerland, Czech Republic, Germany, Spain, France, Hungary, Italy, Poland, Portugal, Romania and Slovak Republic.

NB: the UCTE methodology for adequacy forecast might end up with a stronger capacity requirement than the actual national requirements.

Here below are the national forecasts of Remaining Capacity minus Adequacy Reference Margin in January 11:00 in Scenario B.

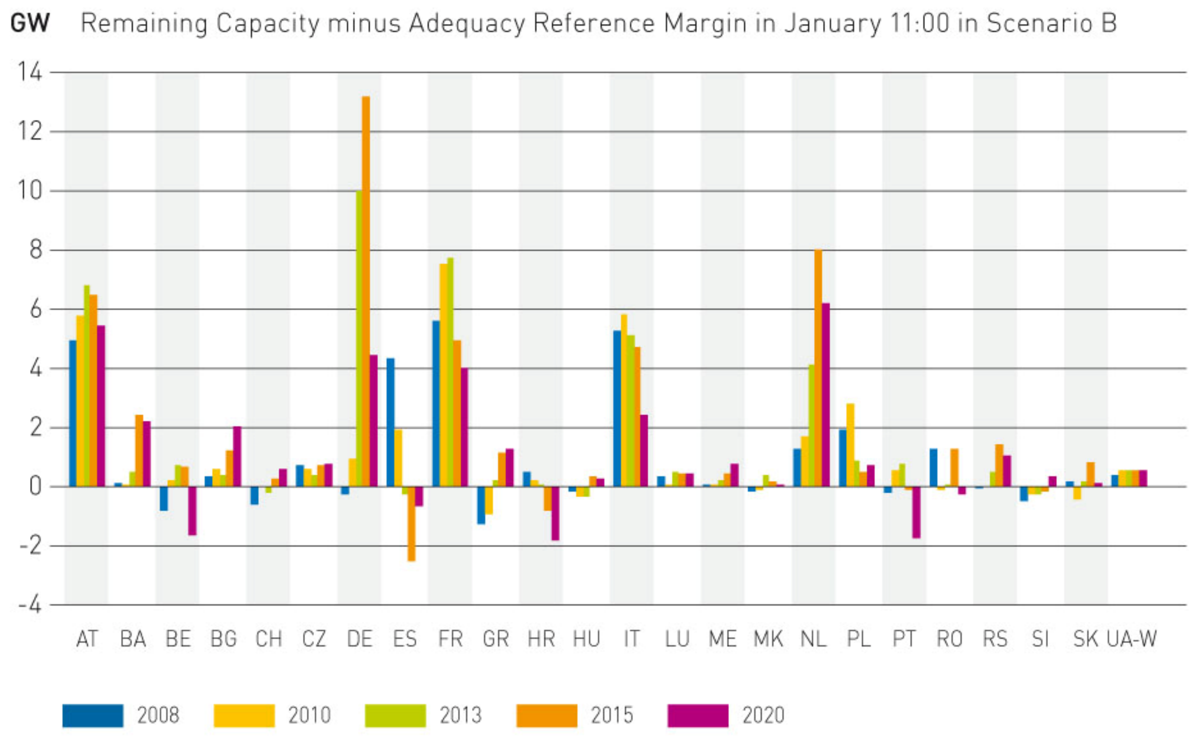


Fig. 28 National Generation Adequacy Forecast in January 11:00 in scenario B

Considering Best Estimate scenario B (see, the Remaining Capacity would be lower than the Adequacy Reference Margin in 2010 in five countries: Greece, Hungary, FYROM, Slovenia, and Slovak Republic.. In 2020, adequacy should be achieved in all countries apart from Belgium, Spain and Portugal.

The potential benefit from interconnection lines should be investigated in Chapter 4.

National comments are in Chapter 3.7.

3.7 National Comments on Generation Adequacy

AT Austria

The high values for remaining capacity minus adequacy margin result from the high share of storage power plants.

BA Bosnia-Herzegovina

In the past years there was a surplus of electrical energy in the power system of Bosnia and Herzegovina. With the including of the new HPP Mostarsko blato at energy balance in 2010 such situation is expected until 2012 year. After that period it is necessary the commissioning of the new power plants. According to the big number of applications for the new power plants (Scenario B), in the case of their realization, Bosnia and Herzegovina could become a big exporter of electrical energy.

BE Belgium

In 2008, the remaining capacity will not be sufficient to ensure that Belgium does not have to rely at all on neighbouring countries. Self-sufficiency is only possible if additional generation capacity is connected to the grid. The interconnection transmission capacity is crucial to ensure system adequacy until this supplementary generation capacity is available. Therefore, Elia is planning to upgrade its interconnections (see Development Plan 2005 2012; an updated version of this document will appear in late 2008). If the generation development projects that are currently considered realistic actually go ahead (Scenario B) before the deadlines indicated, the remaining capacity should be enough to ensure self-sufficiency from 2010 until 2015. From 2015, the implementation of the nuclear phase-out and the directive on large combustion plants may lead to significant decommissioning. This means that the system will rely on as yet unknown supplementary generation development projects to maintain the remaining capacity at a sufficient level. A level is estimated as sufficient when it ensures that Belgium does not have to call on its neighbours. However, if only the minimum investment scenario (Scenario A) is achieved, the interconnection transmission capacity will remain crucial throughout the time-frame under consideration.

BG Bulgaria

The needed spare capacity for BG power system has been calculated on the basis of optimal value of LOLP.

CH Switzerland

In Scenario A the remaining capacity is very low and in the month of January it doesn't match the Adequacy Reference Margin during the whole investigated period 2008 - 2020. In January 2020 the remaining capacity is even negative (-0.2 GW).

In Scenario B the remaining capacity matches exactly the Adequacy Reference Margin as soon as in January 2010. However a deficit of 0.2 GW can be seen again in January 2013. Fortunately this is of no long duration and in 2015 and 2020 the remaining capacity is well beyond the Adequacy Reference Margin.

Spare Capacity (reflecting random fluctuation of load, climatic sensitivity and additional power plant outages) should amount to 7% of the Net Generating Capacity i.e. 1.2 GW in 2008. The most part of this can be ascribed to extreme climatic conditions in case of a very cold winter (-15°C) which requires the activation of additional production capacities of about 1 GW in Switzerland.

CZ Czech Republic

Remaining capacity seems to be sufficient in both scenarios in the period from 2008 to 2013, even there are still some possibilities for export.

DE Germany

From the TSOs' point of view, power station operators would have to secure at least the output of the largest unit as hours reserve within the respective control area, as the TSO makes the reserve available only for a maximum of one hour (dimensioning of system services). However, almost all power station operators try to reduce this power through pooling with other power station operators. As a result, this reserve is likely to become even smaller in the future.

Adequacy Reference Margin and Remaining Capacity are balanced in both scenarios (related to 5% of the NGC).

ES Spain

Evaluation of remaining capacity is carried out by the adequacy index.

Adequacy index is defined as the ratio between available capacity and peak demand.

Available capacity is defined as generating capacity minus non usable capacity, overhauls and outages.

Reference value for adequacy supply index is 1,10

At the beginning of planning horizon (2008 to 2010), adequacy Index is about 1,10 to 1,20

At the end of the planning horizon (2015 to 2020), adequacy index is about 1,10

It can be observed a decrease in the value of adequacy index along the study period.

Remaining capacity evolution (according to UCTE methodology) is as follows:

2008: 9,9 GW – 13,0 GW (Winter – Summer)

2010: 8,2 GW – 10,3 GW

2013: 6,6 GW – 9,1 GW

2015: 4,7 GW – 6,4 GW

2020: 5,5 GW – 6,6 GW

One can observe a decreasing value of remaining capacity along the study period (same conclusion).

Main conclusions:

Present situation: the appreciation of situation for the coming winter and next year is not critical

Perspectives: medium and long term demand and generation expansion planning forecast show that there should be margin enough in the Spanish system

FR France

Comparing the demand expected under the baseline scenario with supply already acquired (i.e. the current generating fleet - less all unavoidable decommissioning and a loss of 1,000 MW of CHP in 2012 - plus generating units under construction only: four CCGTs, one EPR and 2,000 MW of wind farms), it appears that the supply-demand balance can be maintained satisfactorily until 2012.

Taking into account projects which have not yet reached the "point of no return", but which appear highly likely to be built (i.e. three additional CCGTs, wind farm development based on a trajectory rising from 5,000 MW in 2010 through 7,000 MW in 2012 and all CHP maintained), again compared with demand rising in line with the baseline scenario, the balance is maintained until 2014. If demand were to rise in line with the 'high' scenario, the balance would be maintained only until 2012.

The security of the electricity supply in mainland France therefore appears to be reasonably assured for the next five years. However, all the projects leading to this conclusion need to be monitored very closely over the next few years:

- concerning supply: the start of work on new CCGTs, the rate of development of wind farms (and other RES), possible decisions to decommission CHP units ,
- concerning demand: growth in demand, notably peak demand (for heating, heat pumps in particular), demand shading,
- concerning exchanges with neighbouring systems: development in the supply-demand balance within these systems, and available capacities at peak demand times in France.

Compared with the 2005 edition of the Generation Adequacy Report, the date at which the first requirements appear is pushed back by two years: this is due to decisions taken over the last two years to add new generating facilities, whereas peak demand forecasts and the possibilities for shading and obtaining supplies from foreign systems remain roughly unchanged.

(Source: RTE, Generation Adequacy Report, 2007 edition)

HU Hungary

Spare capacity is 0.5 GW (assumed until 2015), the capacity of the largest generation unit in the power system.

LU Luxembourg

The remaining capacity in Luxembourg is true for the interconnected UCTE grid but it does not represent the real situation for the local national grid because the two main generator plants in Luxembourg does not inject their energy directly to the national grid. The pump storage power plant (1 100 MW) is connected via dedicated lines to the German grid of RWE and delivers system services for that grid. The thermal power plant (385 MW) is located in our grid but there are dedicated lines (open switches) to connect it to the Belgium grid of ELIA. The needed interconnection capacity for the tie lines with the national grid must be defined in accordance.

This very important remark concerning the physical situation in Luxembourg should always be in mind when analysing the following figures and tables.

The spare capacity is assumed to be 10% of national Generating Capacity.

MK Former Yugoslav Republic of Macedonia

Macedonia is in the group of countries, which must keep 10% of their generating capacity to ensure the security of supply at each reference point.

NL The Netherlands

The experience of TenneT TSO BV until now is, that all contingencies were solvable with the available amount of reserve. So it appears to exist sufficient resources by market parties themselves to maintain programmatic balance, meanwhile sufficient resources were left to maintain system balance in an adequate way.

To our opinion market flexibility obtained by stimulating "demand side management" is a better driver for system adequacy than having an adequacy margin. In the actual situation in the Netherlands there are relative high imports at most hours and until now we didn't have major problems with remaining national capacity, even in cases of extensive power plant contingencies. To our opinion it's mainly a question of integrated system flexibility within an international playing field. We think that a national approach in an international market situation is an obsolete philosophy.

PL Poland

In the scenario “A” remaining capacity decreases, as the result of decommissionings caused by environmental constrains.

In the scenario “B” remaining capacity, in general, remains at the present level - part of added capacity is caused by rehabilitation activities, mostly connected with environmental upgrading.

According to the Polish “Instruction of Transmission System Operation and Maintenance” the required level of the power, which should be kept available at all time, in general, corresponds to the level of 5% of NGC (in the yearly time horizon).

Referring to the seasons in the SAF excel table (January – winter, July – summer) value in this table is calculated as 5% of Net Generating Capacity minus Maintenance and Overhauls: 5% * (NGC-M&O).

PT Portugal

In both scenarios the Remaining Capacity should stay slightly reduced in 2008 and will reach a significant margin in 2010-2011, with the commissioning of new combined cycle power stations. In scenario A, where we practically did not consider new units after 2012, new units should be necessary after 2015-2016. In scenario B new capacity should be necessary in 2018-2020. These necessities could be attenuated by DSM measures.

In this study Spare Capacity was considered as 10% of NGC for the entire horizon considered, according to the UCTE study made in 2003. Since then as the mixed of the generation has changed and will continue changing in the next years (namely with the increment of wind power) this value is under revision.

RO Romania

The figures of Remaining Capacity in Scenario A reveal that new investments in generating capacity are required after 2010; a part of them are covered in Scenario B, which, however, requires also more generating capacity, delayed at 2015 horizon.

Based on the past experience, related to the load variation and the generation capacity structure of Romania, a Spare Capacity of 5% of NGC was considered in order to assess the Adequacy Reference Margin.

Summer season includes the months from April to September, whereas the other six months are considered as winter season.

SI Slovenia

In the future, Slovenia will bring Remaining capacity on positive value. After year 2015 new generation units leads to surplus of remaining capacity and Slovenian power system is expected to be self-sufficient and capable of energy export.

SK Slovak Republic

Decommissioning of second unit of NPP in Jaslovske Bohunice in 2008 and another units in conventional thermal power plants will cause lack of capacities in Slovakia. Depending of realizing projects of new generation capacities several scenarios are possible (this study shows two of them).

Scenario A as pessimistic variant shows the lack of capacities in 2010 and later on (until 2020). Scenario B also shows lack of capacities in 2010, but taking into account some projects of new generation capacities, it also presents balanced power system in 2013 and later on (in 2015 spare capacity 700 MW).

Keeping security of supply at each reference point, control reserves are used by each TSO. Volume of required control reserves is mainly based on foreseen curve of load. System services reserves are stated in row 10. Spare capacity derived from net generating capacity has no meaning and therefore it is not stated in tables.

4 SIMULTANEOUS INTERCONNECTION TRANSMISSION CAPACITY

4 Simultaneous Interconnection Transmission Capacity

Simultaneous Interconnection Transmission Capacity (SITC) of a power system is the overall transmission capacity through its peripheral interconnection lines. SITC are calculated according to the UCTE Transmission Development Plans.

The SITC export value is called Export Capacity and may differ from the SITC import value, called Import Capacity.

4.1 System Adequacy Analysis

To analyse the potential role of transmission capacities in the adequacy of the national systems in a simplified way, Remaining Capacity is compared to Simultaneous Interconnection Transmission capacity. As introduced in Chapter 3.1.2 countries with positive Remaining Capacity are potential sources of support to others systems through interconnection lines at reference times and under standard conditions. When Export Capacity is lower than a positive Remaining Capacity, it means that all the extra capacity cannot be exported under standard conditions.

In 2008, as shown in Fig. 29, Spain, France, Italy, Poland, Portugal and Romania does not appear able to export all their extra capacity under standard conditions. Among the major contributors with positive Remaining Capacity, Germany and France have almost the adequate Export capacity, but Spain cannot export most of its positive Remaining Capacity.

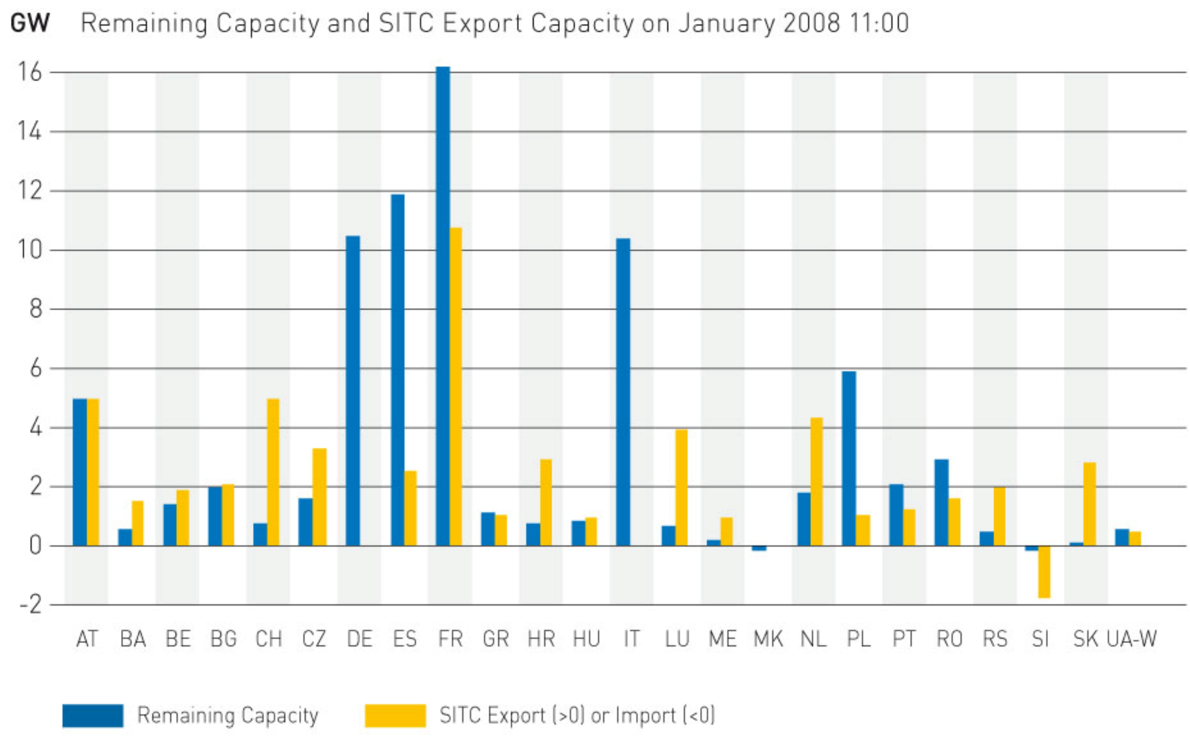


Fig. 29 **Remaining Capacity and Simultaneous Interconnection Transmission Capacity in January 2008 11:00 in Scenario B**

NB: no Export Capacity is reported for some countries.

As introduced in the methodology summary in Chapter 1.2.2, the previous analysis can be extended to the period the reference point is representative of and under most of the situations by cutting Remaining Capacity of Adequacy Reference Margin.

Any positive Remaining Capacity minus Adequacy Reference Margin is extra capacity potentially exportable in most of the situations, to be compared to simultaneous export capacity. In 2008, as shown in Fig. 30, unlike in the previous analysis, France can truly export its extra capacity while Spain can export most of it.

When negative, Remaining Capacity minus Adequacy Reference Margin is likely to be imported, it has to be compared to simultaneous import capacity. The situation is constrained in Greece where the capacity likely to be imported exceeds the simultaneous interconnection import capacity. Belgium, Switzerland, Germany and Slovenia are more comfortable with their import capacity.

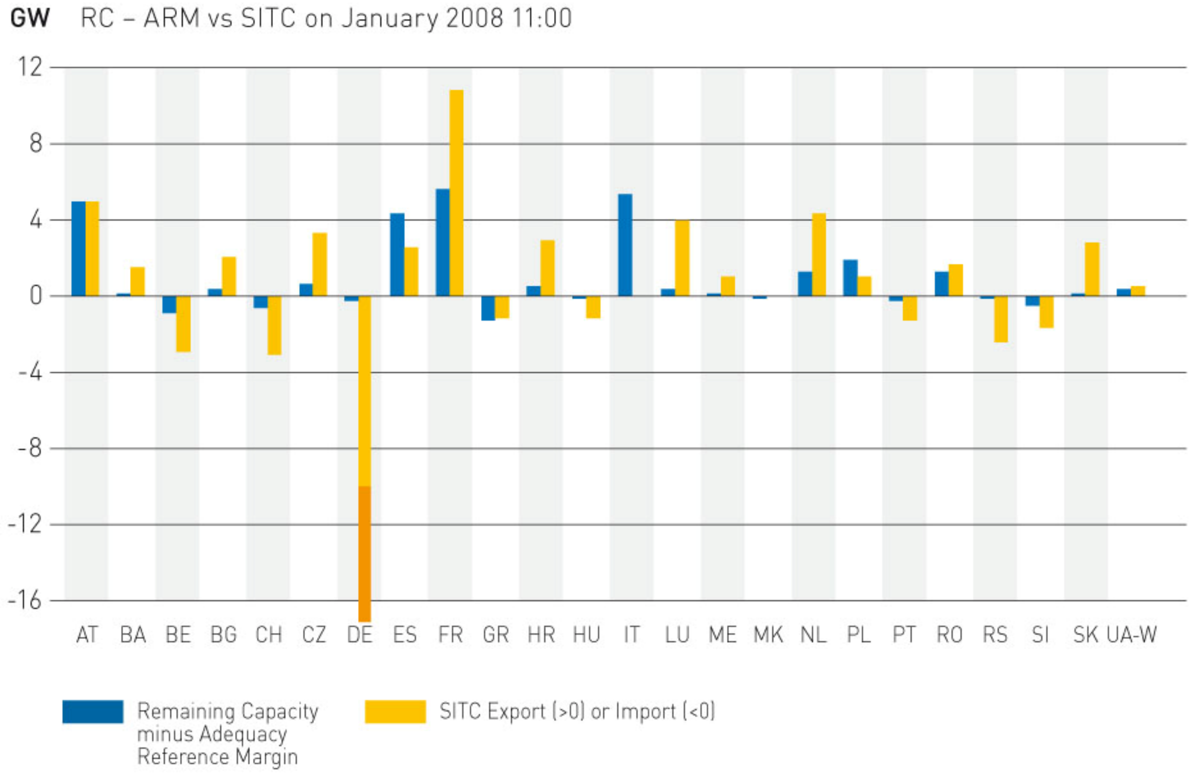
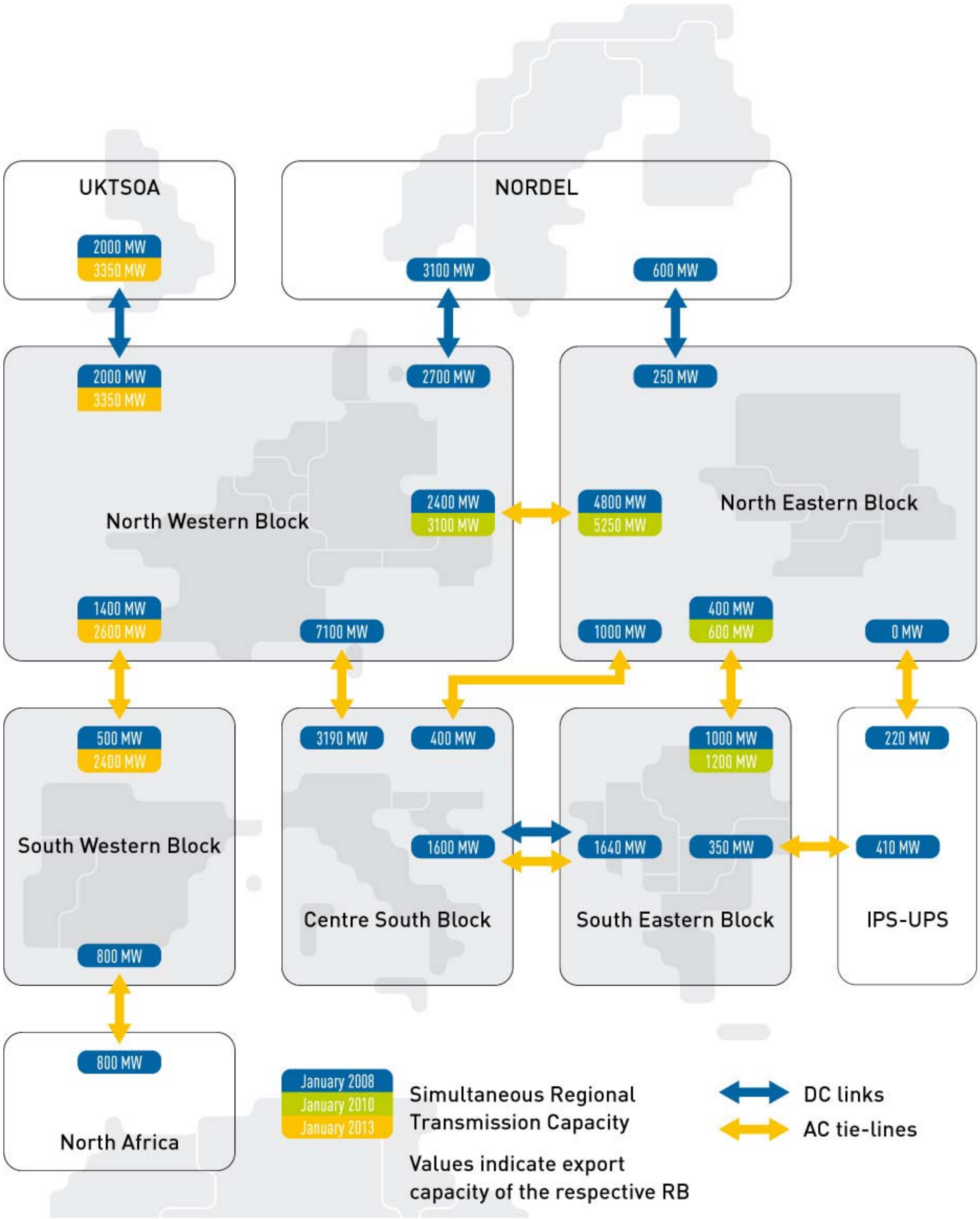


Fig. 30 Remaining Margin and Simultaneous Interconnection Transmission Capacity in January 2008 11:00 in Scenario B

NB: no Export Capacity is reported for some countries.

4.2 Interconnection Forecast

The following graphic sums up the evolution of Simultaneous Regional Transmission Capacity in 2008 and its forecasted evolution in the next five years based on identified projects. Beyond this horizon, too much uncertainty prevents to assess any relevant SITC evolution.



NB: values of SITC for the new Centre South block are still to be consolidated, with inputs from all involved countries. Only provisional indicative values are provided in the table supra.

4.3 National Comments

BE Belgium

The simultaneous import capacity of Belgium should be affected by the commissioning of a phase shifter in Zandvliet and two phase shifters in Van Eyck (spring 2008) and the second circuit of the 220 kV AC Aubange-Moulaine line (early 2010).

Indicative non-binding figures for the reference grid situation in the winter for the NTC value from France to Belgium:

- +300 MW in 2009;
- +300 MW in 2010.

Indicative non-binding figures for the reference grid situation in the summer for the NTC value from France to Belgium:

- +300 MW in 2008;
- +150 MW in 2010.

BG Bulgaria

The simultaneous interconnection capacity increases in 2010 due to the commissioning of the 400 kV line between Chervena mogila (BG) and Shtip (MK). The export capacity is bigger due to bigger stability limits.

CH Switzerland

The commissioning of a large number of new line projects with an impact on the Swiss interconnection capacities is under discussion, but no one of them can be considered as certain. There was no official application for any of them at the Swiss authorities. There are no plans for decommissioning of interconnecting lines.

CZ Czech Republic

New 400 kV line to Austria (mentioned in the table below) should increase both the safety of operation and simultaneous export capacity.

DE Germany

NTC values for the years 2008 to 2020 should be calculated by UCTE experts and published by ETSO; they are currently not available for the future.

ES Spain

Increase of interconnection transmission capacity between Spain and France (the rest of UCTE system) is one of the main concerns of Spanish TSO regarding adequacy evolution.

FR France

The French power system is interconnected with those of neighbouring countries. Since the cross-border line running towards Belgium was reinforced at the end of 2005, France's total export capacity for all borders has usually been in excess of 13 GW in winter, and 12 GW in summer. It should be noted that the transits allowed by the interconnections do not depend solely on the capacity of the cross-border lines used:

in a meshed network like the European 400 kV system, flows are distributed according to where electricity is injected and extracted, which varies considerably from day to day and even within a single day, not forgetting outages affecting network installations. As a result, NTC (or Net Transfer Capacity) can fluctuate significantly over time.

One border is currently judged as having insufficient transit capacity: the border with Spain, where the maximum NTC of 1,400 MW from France to Spain and 800 MW in the other direction (and often less, especially in summer) is very low given the size of the French and Iberian power systems, and in particular the magnitude of the operating contingencies that can affect them. A project to strengthen the link in the Eastern Pyrenees has been put forward, which would take the NTC to 2,600 MW for which a European coordinator should be appointed to help promote the consultation.

LU Luxembourg

The given import and export capacity takes into account also the lines for the connection of the power plants. The interconnection capacity available for the grid is lower but is sufficient to cover at all moment the national load in the grid.

NL The Netherlands

The given values aren't NTC-values but average operational values as agreed on with the TSO-auction partners. In these operational capacities isn't taken into account an increase that eventually could be obtained by developing the infrastructure in networks of the neighbouring TSO's, as far as isn't decided about yet.

Soon should be commissioned the DC-cable from Norway to the Netherlands with a capacity of 700 MW.

In August 2007 was decided about the BritNed cable between England and the Netherlands with a capacity of 1320 MW and the project was started. Most probably it can be taken into service in the year 2010.

PL Poland

PSE-Operator S.A. gives aggregated data for the whole PL - DE/CZ/SK profile.

The simultaneous interconnection transmission capacity for the DE/CZ/SK -> PL direction amounts 0 MW, all import concerns PL - SE and PL - UA border.

According to the changes in Polish network, there is no impact on interconnection transmission capacities.

PT Portugal

After 2013-14 the NTC should permit the complete integration of Portuguese and Spanish system in the scope of the Iberian Market – MIBEL.

The evolution predicted for the transmission capacity between Portugal and Spain is:

Portugal	Simultaneous import capacity (MW)								Simultaneous export capacity (MW)							
	Jan 08	Jul 08	Jan 10	Jul 10	Jan 15	Jul 15	Jan 20	Jul 20	Jan 08	Jul 08	Jan 10	Jul 10	Jan 15	Jul 15	Jan 20	Jul 20

to Spain	1300	1440	1900	1800	3000	3000	3000	3000	1200	1200	1900	1800	3000	3000	3000	3000

RO Romania

Until 2010 there should be commissioned 400kV OHL Nadab-Bekescsaba and 400kV OHL Timisoara (or Resita) – Varset (or Novi Sad or Pancevo) contributing to the increasing of the Romanian transfer capacities with 100 MW import / 250 MW export.

SI Slovenia

The import and export capacities are increasing after 2011 due to new double 400 kV interconnection lines, with Hungary. Later, interconnection with Italy is expected.

SK Slovak Republic

Scenario A: from 2015 one new interconnection between Slovakia and Hungary is expected (which can increase NTC by 500 MW).

Scenario B: from 2013 (two years earlier as in scenario A) one new interconnection between Slovakia and Hungary is expected (which can increase NTC by 500 MW) and from 2020 a new interconnection between Slovakia and Austria is foreseen (which can add 400 MW to NTC).

Export capacity is the capacity of power grid only, i.e. artificial generation increase was applied when calculated.

APPENDIX

Appendix 1 Comments on Data Representativeness

National Representativeness index is the estimated percentage of the national value the collected data are representative of.

Regarding the preparation of this report, this issue has been thoroughly dealt with in the past years.

Here are some comments on the national representativeness of the collected data, especially when index is not 100%.

BE Belgium

The Belgian figures refer to Belgian territory and reflect the Belgian national figures (including all voltage levels in Belgium). Furthermore, the reference point for the load figures is based on real measurements that were supplemented by estimates to ensure 100% representativeness.

BG Bulgaria

The representativeness is 99%, because 1 % of the generation is at distribution voltage level.

ES Spain

98%

Index is not equal to 100% because the power balance does not include the load (self consumption) of cogeneration plants

PT Portugal

The consumption indicated in our information represents presently about 97% of the Portuguese synchronous consumption. The remaining, about 3%, mainly represents the co-generators auto-consumption in the case they don’t use the possibility to sell all the production to the public grid.

Contact

Boulevard Saint-Michel, 15
B-1040 Brussels – Belgium
Tel +32 2 741 69 40
Fax +32 2 741 69 49

info@ucte.org
www.ucte.org

UCTE