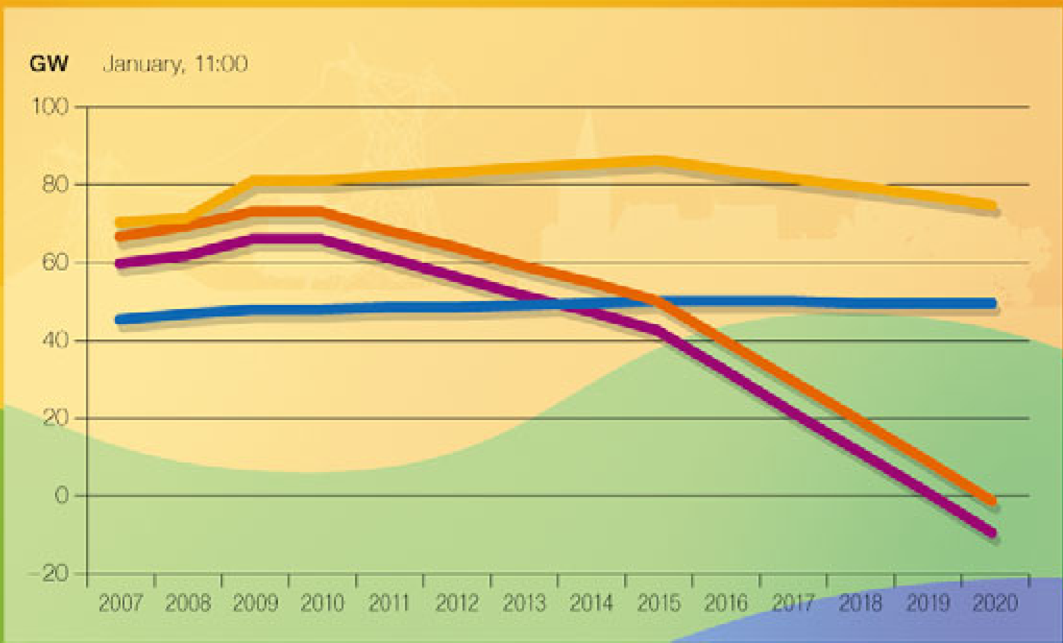
UCTE



System Adequacy Forecast 2007 – 2020

union for the co-ordination of transmission of electricity

January 16th, 2007

UCTE SYSTEM ADEQUACY FORECAST
2007 – 2020

UNION FOR THE CO-ORDINATION OF TRANSMISSION OF ELECTRICITY

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EXECUTIVE SUMMARY

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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 2007, 2010, 2015 and 2020,
- Adequacy analysis for overall UCTE and for main regional blocks over 2007 – 2020,
- Transmission system adequacy.

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:

Remaining Capacity ≥ Adequacy Reference Margin
With ARM = 5% Net Generating Capacity + Margin against the daily peak load

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

- **"Conservative**" **Scenario A**: only new generation projects known as firm are integrated. This scenario is used to identify the expected need for new investments in generation.
- **"Best estimate" Scenario B**: it takes into account future power plants whose commissioning can be considered as reasonably probable according to the information available for the TSOs. This scenario is used to give the best view of possible evolution of adequacy provided expected investments in generation are made.

UCTE Generation Adequacy

Over the period 2007-2010, the generation adequacy of the UCTE system does not seem to be at risk.

In scenario A, decided investments correspond to an increase of Net Generating Capacity of +45 GW by 2010. The new capacities are mainly renewable energy sources, especially wind farms, which represent a growing share in the generation mix. As a large part of this type of generation is considered as non usable at reference time, due to intermittency, the evolution of Reliably Available Capacity is limited to +30 GW.

By the same time, load is expected to grow at a rate of 2% a year, that is +24 GW by 2010. Given this, Remaining Capacity is lightly increasing from 66 GW in 2007 to 71 GW in 2010 (at January 11.00 time point), including in this calculation the load reduction possibilities offered by DSM measures which represents approximately 7 GW in UCTE. Those levels are acceptable when compared to the UCTE Adequacy Reference Margin.

Still in scenario A, already decided investments on the **period 2010-2015** are not sufficient to prevent a decrease of generating capacities and consequently of margins. Though renewable energy sources (mainly wind power) is still expected to grow, the period will be marked by the decommissioning of many fossil fuel plants, under the effect of the Large Combustion Plants (LCP) Directive.

Remaining Capacity at UCTE level would thus decrease under the threshold of 50 GW by 2013. This horizon may be postponed to 2015 provided that the potential for load reduction, thanks to demand side management, is reliably available to achieve power balance. **By 2015, the generation adequacy for UCTE is no longer met, unless further investment than those already decided and known by TSO are made.**

For 2015 – 2020 period, the situation becomes quickly more and more tightened. Though this horizon is too far from nowadays for giving a precise plan of generating capacity evolution, following evolution are expected by TSO concerning generation:

- a continuous increase of renewable generating capacity,
- the decommissioning of fossil fuel plants,
- no definite assumption concerning the evolution of nuclear generation.

As far as consumption is concerned, its growth is expected to slow down, especially in the western and northern parts of UCTE, but not sufficiently to stabilize the level of load.

This lead to a vision of global Remaining Capacity drastically decreasing: in 2020 the lack of Generating Capacity in scenario A would amount to 50 GW.

When considering scenario B, estimated investments would be sufficient to ensure the global adequacy over the period, Remaining Capacity staying in this case at a comparable level with present situation. But uncertainties on future developments and especially decommissioning which would result of regulatory context evolution, in relation with environmental policies, are strong. Such decommissioning decisions, which are notified to TSOs with short delay, would negatively affect the margins.

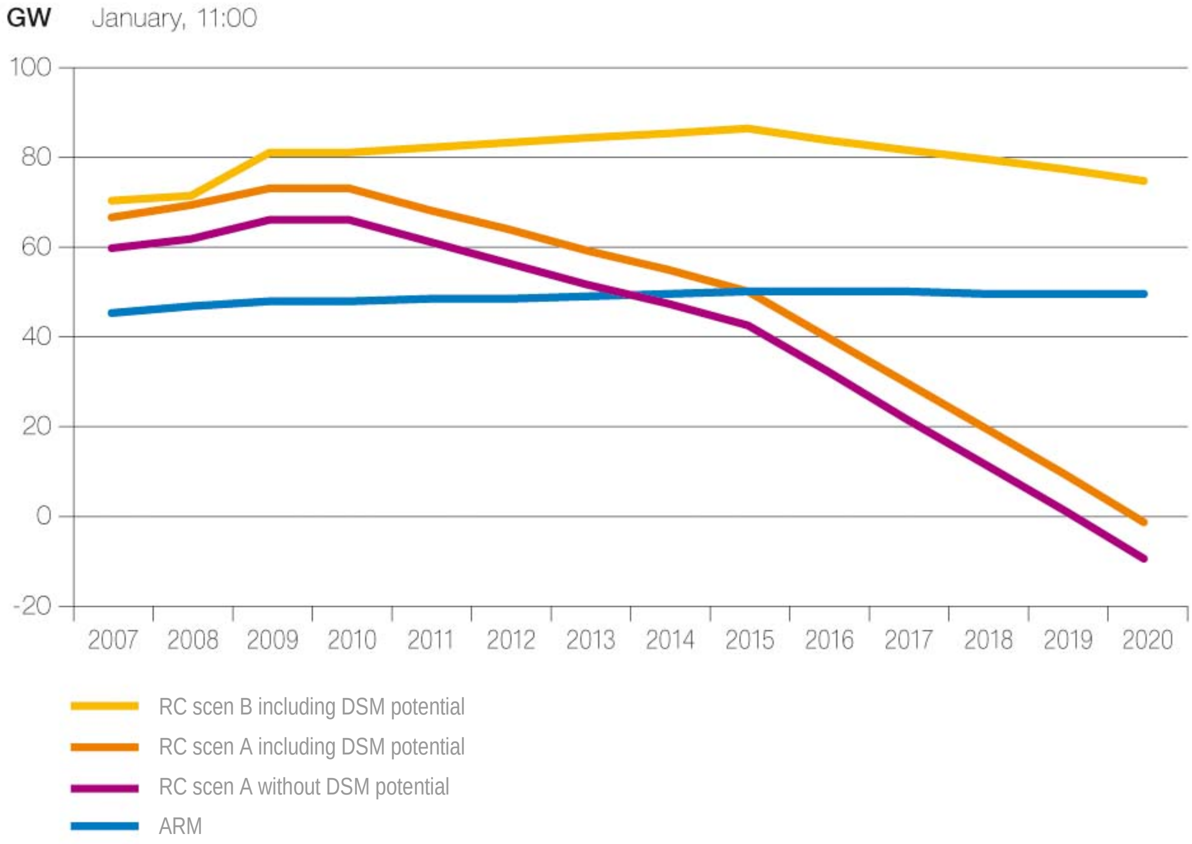
In scenario A, confirmed investment decisions seem sufficient, at UCTE level, to get a reasonable level of adequacy from now on to 2010.

Nevertheless, adequacy will be at risk by 2014-2015 if further investments are not decided in due time.

Furthermore, 50 GW of new generation capacities would be necessary to meet the adequacy in 2020.

In scenario B, global adequacy would be ensured all over the studied period, provided estimated investments are actually realised.

Figure 1 | **Remaining Capacity Against Adequacy Reference Margin** | **GW**



Generation Adequacy by Geographical Blocks

The global view of UCTE as a whole deserves to be enhanced by a more detailed vision on six geographical blocks1. Indeed, the variety of situations of power balances on these blocks determines exchange opportunities within UCTE. Furthermore, as each block has limited interconnection capacities, it may be uneasy in some situations to take advantage of full potential of extra capacities from neighbouring blocks.

CENTREL block[2]:

The situation of the CENTREL block looks comfortable in the present years, with a Remaining Capacity almost doubled compared to ARM . But in scenario A, this situation would quickly deteriorate after 2010, mainly under the effect of decommissioning of fossil fuel plants. ARM would no longer be met after 2013 unless decommissioning are compensated by new investments as foreseen in scenario B.

Main UCTE block[3]:

Sufficient Remaining Capacity is available at the moment to be over ARM in main UCTE. But in scenario A, a regular decrease of Remaining Capacity is foreseen over next years, so that the ARM would no longer be met in 2015. This block, globally exporter today, would thus have a decrease in its potential for export, and 20 GW of further investments would be necessary in 2020 to reach ARM again.

[1] It is to be noticed that geographical blocks do not correspond to area control blocks
[2] CENTREL: Czech Republic, Poland, Hungary, Slovakia and Western Ukraine
[3] Main UCTE block: Belgium, Germany, France, Slovenia, Croatia, Luxembourg, Netherlands, Austria, Switzerland and Bosnia-Herzegovina.

According to scenario B, the situation could be maintained at the present level over the whole period 2007-2020.

Spain + Portugal block:

In scenario A, the adequacy is met over the period 2007-2015 thanks to undergoing developments of generation in Spain. Without further investments, the situation would quickly worsen after 2015, with a need for 10 GW investments by 2020.

In scenario B, a slow raise of Remaining Capacity could be expected to improve adequacy in further years.

Italian block:

Thanks to expected commissioning of new conventional thermal plants, the Remaining Capacity of Italy is increasing. If these investments were actually confirmed and achieved, the situation of Italy would become quite different from what it was in the past. The Remaining Capacity would become higher than ARM from 2007. After 2015, the Remaining Capacity gets back under the ARM. 7GW further investments would be needed in 2020 in scenario A, likely to be realised if considering scenario B.

South Eastern UCTE block[4]:

The situation of this block is very tightened all along the period. Remaining Capacity is at the moment significantly under the ARM. The decided increase of capacities from now to 2010 is likely to improve the situation, but is still just sufficient to reach the adequacy in scenario A.

In scenario B, adequacy could be mantained by 2010.

Romania + Bulgaria block:

Remaining Capacity of the block remains close to the adequacy indicative level over 2007-2020 period. After a small decrease in 2008-2009, new investments in generating capacities are supposed to improve the situation of the block, in scenario A as well as in scenario B.

Transmission Adequacy

According to the comparison between adequacy indicative criteria and NTC, it emerges that transmission capacities do not seem to be an obstacle to power balance achievement. The main limitation consist in insufficient transmission capacities to realise exports at the level where available remaining capacities could allow it, especially in the north-eastern part of UCTE, but without consequence on the security of the system.

However it can not be excluded that, due to market (striving for the most economic use of power system resources), congestion points appear in the interconnected network, where transmission bottlenecks make it impossible to use available more economical electricity sources abroad. The constant increasing share of renewable energy sources, mainly wind power, in the generation mix, could contribute to reinforce these situations.

[4] South Eastern UCTE Block is made of Greece, Serbia, Montenegro and Macedonia.

1 INTRODUCTION AND METHODOLOGY

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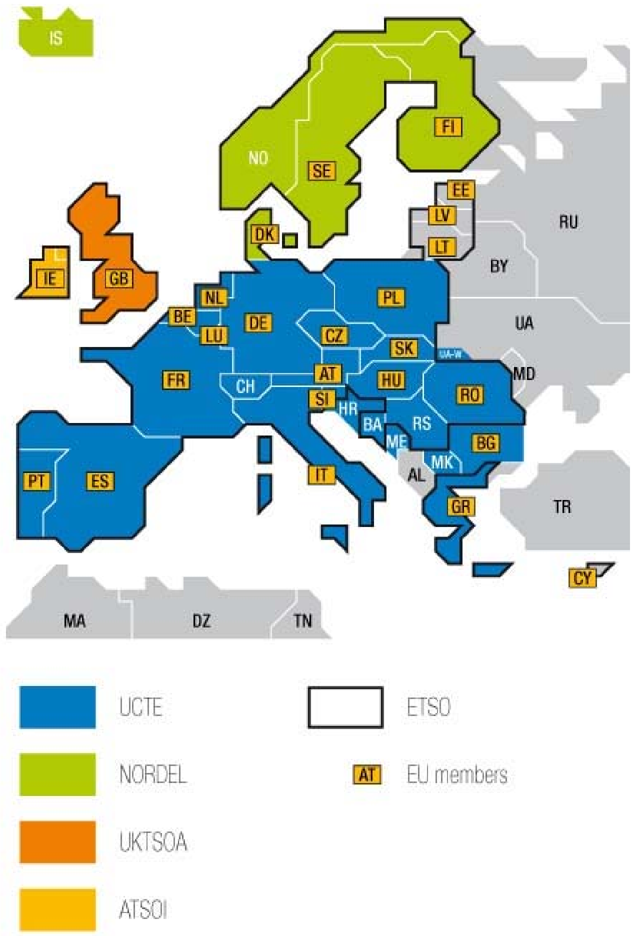
1.1 Presentation of UCTE

The Union for the Co-ordination of Transmission of Electricity (UCTE) co-ordinates the interests of transmission system operators in 23 European countries. Their common objective is to maintain the security of operation of the interconnected power system.

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

Through the networks of the UCTE, 450 million people are supplied with electric energy ; annual electricity consumption exceeds 2500 TWh (16% of world electricity consumption).

With regard to the other members of ETSO (European Transmission System Operators, 37 Transmission System Operators in 23 countries), the geographical perimeter of UCTE in 2006 is represented in the picture below.



Optimal Co-operation Requires Joint Action

Close co-operation of member companies is imperative to make the best possible use of benefits offered by interconnected operation. For this reason, the UCTE has developed a number of rules and recommendations that constitute the basis for the smooth operation of the power system. Only the consistent maintenance of the high demands on quality will permit to set standards in terms of security and reliability in the future as well as in the past.

The UCTE – Security of Electric Power Supply and Promotion of Competition

From the very outset of liberalization in the European electricity markets, the UCTE has intensively pursued the development of schemes for the promotion of competition in the electricity sector. The aim is to support the electricity market without accepting restrictions in the security of supply.

The liberalization of electricity markets cannot be implemented without a transparent and non-discriminatory opening up of electric networks. The UCTE sets the prerequisites that enable a compromise to be ensured between competition and security of supply.

As of System Adequacy Forecast 2007-2020, the member companies of the UCTE come from the following countries:

Table 1	**UCTE - Perimeter**
Complete name	Abbreviation
Austria	AT
Bosnia - Herzegovina	BA
Belgium	BE
Bulgaria	BG
Switzerland	CH
Czech Republic	CZ
Germany	DE
Western Denmark	DK-W
Spain	ES
France	FR
Greece	GR
Croatia	HR
Hungary	HU
Italy	IT
Luxembourg	LU
Former Yugoslav Republic of Macedonia	MK
Montenegro	ME
Netherlands	NL
Poland	PL
Portugal	PT
Romania	RO
Slovenia	SI
Serbia	RS
Slovak Republic	SK
Western Ukraine	UA-W

NB: In this forecast 2007-2020, Serbia and Montenegro are separated.

1.2 General Features

1.2.1 Abbreviations

Abbreviations below are used in the report.

Table 2	**UCTE abbreviations**
Abbreviation	Complete title
ARM	Adequacy Reference Margin calculated under scenario A conditions
CENTREL	CENTREL is a regional group of four transmission system operator companies: - CEPS of **Czech Republic**, - MAVIR of **Hungary**, - PSE-Operator SA of **Poland**, - SEPS of **Slovakia**.
DSM	Demand Side Management
ETSO	European Transmission System Operators
LCP	Large Combustion Plants
Main UCTE	The main UCTE is a regional group of transmission system operator companies: - VERBUND-APG of **Austria**, - Elia of **Belgium**, - ISO BiH of **Bosnia Herzegovina**, - HEP-OPS of **Croatia**, - RTE of **France**, - VDN of **Germany,** representing German TSOs, - CEGEDEL Net S.A. of **Luxembourg**, - TENNET of **the Netherlands**, - ELES of **Slovenia**, - Swissgrid of **Switzerland**.
NGC	Net Generating Capacity
NORDEL	Nordel is an association for electricity co-operation in the Nordic countries: - **Denmark**, - **Norway**, - **Finland**, - **Iceland**, - **Sweden**.
RAC	Reliably Available Capacity
RC	Remaining Capacity
RL	Reference Load
SAF	System Adequacy Forecast
SAR	System Adequacy Retrospect
South Eastern UCTE	South Eastern UCTE is a regional group composed by four transmission system operator companies: - HTSO/DESMIE of **Greece**, - MEPSO of **Macedonia**, - JP EMS of **Serbia**, - EPCG of **Montenegro**.
TSO	Transmission System Operator
UCTE	Union for the Coordination of Transmission of Electricity

1.2.2 Definitions

In this note, CIGRE definitions for reliability, adequacy and security are used.

Reliability – a general term encompassing all the measures of the ability of the system, generally given as numerical indices, to deliver electricity to all points of utilisation within acceptable standards and in the amounts desired. Power system reliability (comprising generation and transmission facilities) can be described by two basic and functional attributes: adequacy and security.

Adequacy – a measure of the ability of the power system to supply the aggregate electric power and energy requirements of the customers within component ratings and voltage limits, taking into account planned and unplanned outages of system components. Adequacy measures the capability of the power system to supply the load in all the steady states in which the power system may exist considering standards conditions.

Security – a measure of power system ability to withstand sudden disturbances such as electric short circuits or unanticipated losses of system components or load conditions together with operating constraints. Another aspect of security is system integrity, which is the ability to maintain interconnected operations. Integrity relates to the preservation of interconnected system operation, or the avoidance of uncontrolled separation, in the presence of specified severe disturbances.

The above definitions are described in detail in the following two CIGRE reports:
Power System Reliability Analysis – Application Guide, Paris, 1987,
Power System Reliability Analysis – Composite Power System Reliability Evaluation, Paris, 1992.

1.3 Methodology

1.3.1 General Approach

Over the past years UCTE has made continuous efforts to improve the content of the system adequacy forecast reports as a contribution to the general debate concerning the security of supply in the European power system that rose in the previous years and has been reinforced in 2003 after the blackouts in North America and in Italy.

In 2002 information concerning the transmission grid developments were introduced.

In 2003 the time horizon of forecasts has been extended up to 7 years.

In 2004, UCTE System Adequacy Forecast report was integrating three major developments:
- the extension of the time horizon up to ten years ahead ;
- the improvement of the method used to assess generation adequacy in order to take into account the specificity of every individual system ;
- the introduction of a new reference point in January at 19:00, closer to the synchronous peak load than the usual reference point January 11:00.

The same methodology is applied for the 2007-2020 report with further improvements:
- the extension of the time horizon up to fourteen years head ;
- the addition of the fuel breakdown of the generating capacity ;
- the use of load reduction possibilities in the power balance assessment.

1.3.2 Scenarios of the UCTE System Adequacy Forecast

Because longer term forecasts are subject to higher uncertainties, considering that today it takes at only two to three years to build new power plants, UCTE has developed long term scenarios whose aim is to give an evaluation of the range of uncertainties, and an evaluation of the risks concerning security of supply over the ten coming years.

The first scenario is called "Conservative" scenario or scenario A. It only takes into account the new power plants whose commissioning can be considered as sure: plants under construction or whose investment decision is notified as firm to the TSOs.

This scenario shows the evolution of the potential unbalances if no new investment decision were taken in the future. It allows to identify the amount of investments which are necessary over the period to maintain the expected security of supply.

The second scenario is called "Best estimate" scenario or scenario B. It takes into account future power plants whose commissioning can be considered as reasonably probable according to the information available for the TSOs: commissioning resulting from governmental plans or objectives, concerning for example the development of renewable sources in accordance with the European legislation, or estimation of the future commissioning resulting from the requests for connection to the grid of from the information given by producers to the TSOs.

This scenario gives an estimation of potential future developments, provided that market signals give adequate incentives for investments.

It is also to be noticed that the power balance data for 2015 and 2020 have not the same level of reliability as for 2007-2010.

1.3.3 Generation Adequacy Assessment

Generation adequacy assessment consists in investigating the ability of the generating units to match the system load evolution.

UCTE approach is based on a comparison between the load and the generating capacity considered as “reliably available” for power plant operators (generating capacity after the deduction of various sources of unavailability - non-usable capacity, scheduled and unscheduled outages - and reserves required by TSOs for system services ; see figure hereafter).

The load corresponds to a common synchronous reference for the entire UCTE network. The selected reference points are the third Wednesday of January at 11:00 and 19:00 and the third Wednesday of July at 11:00; the load forecast is based upon the assumption of normal climatic conditions.

In addition the difference between these reference loads and peak load is estimated.

The resulting balance, called “Remaining Capacity” (RC), can be interpreted as the capacity that the system needs to cover the difference between the peak load of each country and the load at the UCTE synchronous reference time, and, at the same time to cover demand variations (resulting for example from weather conditions) and longer term unplanned outages which the power plant operators are responsible to cover with additional reserves.

Developments have been performed by UCTE in order to estimate the level of RC, so called Adequacy Refece Margin (ARM), necessary to provide the expected level of security of supply taking into account the characteristics of every subsystem. A probabilistic approach has been used which allowed to define the statistical characteristics of the RC as the results of the probabilistic characteristics of each component: load and unavailability of generation.

Considering a level of risk for each national system corresponding to 1% is consistent for the UCTE system and some national systems with RC at peak load representing 5% of the national generating capacity.

For some other national systems, more sensitive to random factors (load variations or unavailability of generation), RC should represent around 10% of the national generating capacity.

Thus when considering individual countries, generation adequacy will be assessed on the basis of the comparison between RC at reference points and ARM.

ARM is calculated for scenario A in the present report. For scenario B it would a little higher, due to the increase of Net Generating Capacity taken into account.

This method is also applied to assess generation adequacy for the whole UCTE system or for larger geographical blocks ; in this case the synchronous peak load of the blocks is estimated by the sum of the peak loads of the individual countries.

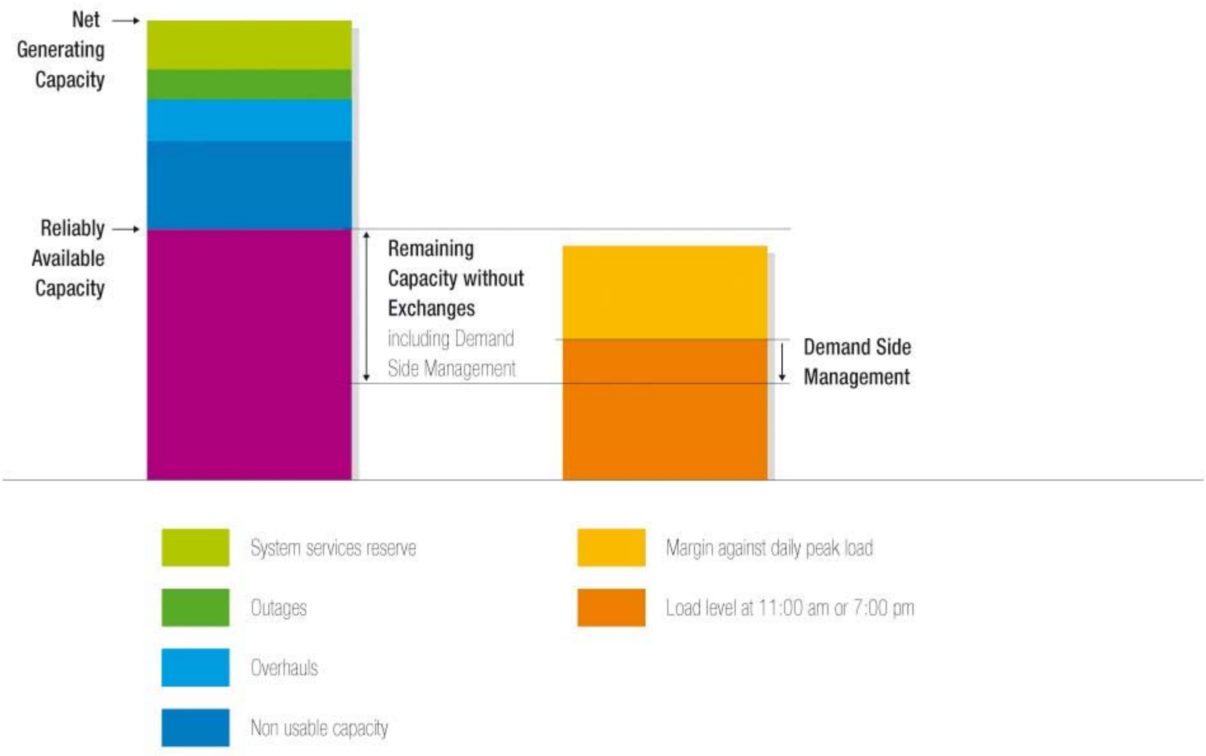
This approximation leads on one hand to an overestimation of the peak load for the largest geographical blocks and to a conservative view of the level of adequacy. On the other hand, considering the synchronous peak load of large size blocks leads to rely on the assumption that it is always possible to carry where needed the generating power available in a country in any other country of the block, whereas the capacities of the transmission system actually limit these possibilities.

The future trends in generation capacity are developed according to the assumptions underlying each scenario.

But when considering the results of these scenarios the following simplifications must be taken into account :

- because decommissioning decisions concerning generation units are often notified to TSOs with a short notice, the national generating capacity can be overestimated, especially on the medium long term,
- because cross-border exchanges forecasts are not taken into account in the power balance, the analysis considers neither long term contracts nor the participation in power plants located out of the national territory. However, these contracts can represent a significant and permanent contribution to satisfying the national load in some countries.

Here below is shown the graph illustrating the Power Balance according to UCTE methodology:



For an individual country, Remaining Capacity minus the margin against the peak load should be at least 5% or 10% of the Net Generating Capacity.

The synthetic feature is: to ensure the reliability of the system, Remaining Capacity should be higher or equal to the ARM defined as 5 or 10% of the NGC.

Remaining Capacity ≥ ARM means generating capacity available for export in most of the situations

Remaining Capacity < ARM means system is likely to have to rely on import when facing in severe conditions

1.3.4 Transmission System Adequacy

After the generation adequacy assessment has highlighted the ability of each country to cover the internal load with the available national capacity, transmission adequacy assessment consists in investigating if the transmission system is sufficiently sized in order to enable the power flows across the European system resulting from the location of loads and generation, and in analysing the role which the internal and the interconnected networks play in terms of system security.

At this stage the methodology does not aim at identifying the cross border flows that would be originated by market price differences resulting for example from differences in fuel mix between blocks.

At the UCTE level the transmission system adequacy analysis is focused on the interconnection and on the internal lines which have a direct effect on the international exchanges.

Because the Remaining Capacity (as a result of the power balance) represents, if positive, a potential possibility for exports and, if negative, a potential need for imports, transmission adequacy assessment consists in comparing this Remaining Capacity with the Net Transfer Capacity at the borders, as published by ETSO or estimated by the TSOs.

The comparison is made for each country considered individually, but also at the interfaces of the different regional blocks which can be identified in the UCTE system.

For more details about the methodology, the reader can also refer to the document available on the UCTE web site (www.ucte.org).

GENERATION ADEQUACY ANALYSIS 2

2 GENERATION ADEQUACY ANALYSIS

2.1 Power Balance Figures

The following table gives a summary of UCTE consolidated figures used to assess power balance and generation adequacy over the 2007 – 2020 period. Appendix A gives detailed figures per country.

Table 3.1 **UCTE - Power Balance Data “Conservative” Scenario A** **GW**

	2007 3rd Wednesday January 11:00	2007 January 19:00	2007 July 11:00	2010 3rd Wednesday January 11:00	2010 January 19:00	2010 July 11:00	2015 3rd Wednesday January 11:00	2015 January 19:00	2015 July 11:00	2020 3rd Wednesday January 11:00	2020 January 19:00	2020 July 11:00
Generating Capacity:												
hydro power stations	134.8	134.8	135.1	137.7	137.7	138.1	141.1	141.1	141.5	143.0	143.0	143.0
nuclear power stations	111.4	111.4	112.1	108.9	108.9	108.9	107.2	107.2	106.5	100.3	100.3	99.7
fossil fuel power stations	323.9	323.9	326.2	340.1	340.1	345.0	353.5	353.5	353.6	340.8	340.8	341.2
renewable energy sources (other than hydro)	53.0	53.0	57.6	81.8	81.8	84.6	101.0	101.0	103.1	114.4	114.4	116.2
not clearly identifiable energy sources	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Generating Capacity	**623.2**	**623.2**	**631.0**	**668.6**	**668.6**	**676.6**	**702.8**	**702.8**	**704.7**	**698.6**	**698.6**	**700.1**
non-usable capacity	112.7	112.7	131.0	138.0	138.0	162.2	157.6	157.5	181.7	168.7	168.6	189.8
maintenance and overhauls (fossil fuel power stations)	13.8	13.8	51.7	7.9	7.9	40.7	7.6	7.6	38.6	7.7	7.7	38.1
outages (fossil fuel stations)	22.9	22.9	22.3	16.5	16.5	16.2	15.2	15.2	15.3	14.9	14.9	15.1
system services reserve	29.8	29.8	29.2	31.5	31.6	30.5	32.6	32.6	31.3	34.1	34.1	32.7
Reliably Available Capacity	**444.0**	**444.0**	**396.7**	**474.7**	**474.7**	**427.0**	**489.9**	**490.0**	**437.9**	**473.2**	**473.2**	**424.5**
Load	385.1	391.8	336.0	409.8	417.3	359.3	448.3	455.6	395.6	483.1	491.0	428.2
DSM potential	7.1	7.1	4.4	7.0	7.0	5.0	7.4	7.4	5.4	8.0	8.0	6.0
Remaining Capacity	**58.9**	**52.2**	**60.7**	**64.9**	**57.5**	**67.7**	**41.7**	**34.3**	**42.3**	**-9.9**	**-17.8**	**-3.8**
Remaining Capacity Including DSM potential	**66.0**	**59.3**	**65.2**	**71.9**	**64.4**	**72.6**	**49.1**	**41.8**	**47.8**	**-1.9**	**-9.8**	**2.3**
Margin against daily peak load	13.3	8.8	11.0	13.7	8.6	10.7	14.1	9.1	11.4	13.9	8.5	11.3
Adequacy Reference Margin*	**44.5**	**39.9**	**42.5**	**47.1**	**42.0**	**44.6**	**49.2**	**44.2**	**46.6**	**48.8**	**43.5**	**46.3**

*defined as 5% of NGC + Margin against daily peak load

Table 3.2 **UCTE - Power Balance Data “Best estimate” Scenario B** **GW**

	2007			2010			2015			2020		
	3rd Wednesday			*3rd Wednesday*			*3rd Wednesday*			*3rd Wednesday*		
	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**
Generating Capacity:												
hydro power stations	134.8	134.8	135.1	139.1	139.1	139.3	145.5	145.5	145.9	148.4	148.4	148.5
nuclear power stations	111.4	111.4	112.1	108.9	108.9	108.9	108.1	108.1	107.4	101.2	101.2	100.5
fossil fuel power stations	326.1	326.1	328.0	347	347	351.9	384.4	384.4	386.3	409.7	409.6	410.9
renewable energy sources (other than hydro)	53.1	53.1	57.9	84.7	84.7	88.3	115.1	115.1	117.6	142.3	142.3	144.2
not clearly identifiable energy sources	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Generating Capacity	**625.5**	**625.5**	**633.0**	**679.8**	**679.8**	**688.4**	**753.1**	**753.1**	**757.2**	**801.6**	**801.5**	**804.2**
non-usable capacity	111.6	111.5	130.1	140.8	140.8	166.2	170.4	170.4	196.4	193.6	193.6	217.7
maintenance and overhauls (fossil fuel power stations)	13.8	13.8	51.8	7.9	7.9	40.6	7.8	7.8	39.3	8.0	8.0	39.9
outages (fossil fuel stations)	22.9	22.9	22.3	16.6	16.6	16.3	15.9	15.9	15.9	16.3	16.3	16.3
system services reserve	29.9	29.9	29.3	31.9	31.9	30.7	33.0	33.0	31.6	34.8	34.8	33.4
Reliably Available Capacity	**447.3**	**447.3**	**399.5**	**482.6**	**482.6**	**434.6**	**526.0**	**526.1**	**474.0**	**548.9**	**548.9**	**496.9**
Load	385.1	391.8	336.0	409.8	417.3	359.3	448.3	455.6	395.6	483.1	491.0	428.2
DSM potential	7.1	7.1	4.4	7.0	7.0	5.0	7.4	7.4	5.4	8.0	8.0	6.0
Remaining Capacity	**62.2**	**55.5**	**63.5**	**72.8**	**65.4**	**75.3**	**77.8**	**70.5**	**78.4**	**65.8**	**57.9**	**68.7**
Remaining Capacity Including DSM potential	**69.4**	**62.6**	**68.0**	**79.8**	**72.3**	**80.2**	**85.2**	**77.9**	**83.8**	**73.8**	**65.9**	**74.7**
Margin against daily peak load	13.3	8.8	11.0	13.7	8.6	10.7	14.1	9.1	11.4	13.9	8.5	11.3
Adequacy Reference Margin*	**44.6**	**40.1**	**42.6**	**47.6**	**42.6**	**45.1**	**51.7**	**46.8**	**49.2**	**54.0**	**48.6**	**51.5**

*defined as 5% NGC + Margin against daily peak load

2.2 Net Generating Capacity

2.2.1 UCTE Generating Capacity Mix

In scenario A, generating capacity increases by +80 GW in UCTE from 2007 to 2015.

Developments mainly concern renewable energy, specially wind power projects, up to +54 GW (including hydro) of additional capacity. It results from plans made by Member States in order to fulfil the requirements of European Directive on Renewable (22% of the European consumption has to be covered by renewable energy sources in 2010).

In the same period, conventional thermal capacity also increases by +30 GW. On the opposite, nuclear capacity decreases by –4 GW.

In scenario B, the overall capacity increases by +128 GW, also based on renewable and fossil fuel thermal plants development.

These trend leads to double the share of renewable in the UCTE mix, while fossil fuel remains stable and nuclear share is reduced as a results of national nuclear phase out policies in some countries.

Figure 2.1 **UCTE Generating Capacity Mix**

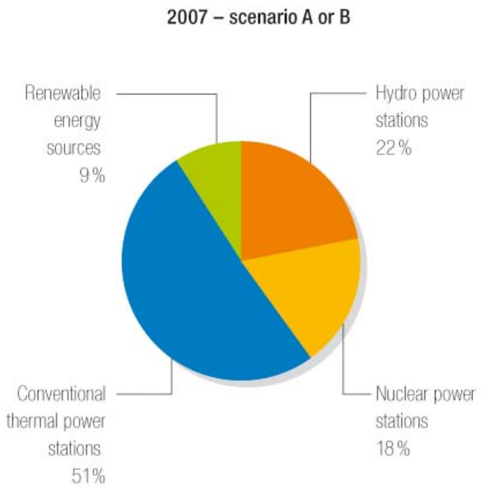
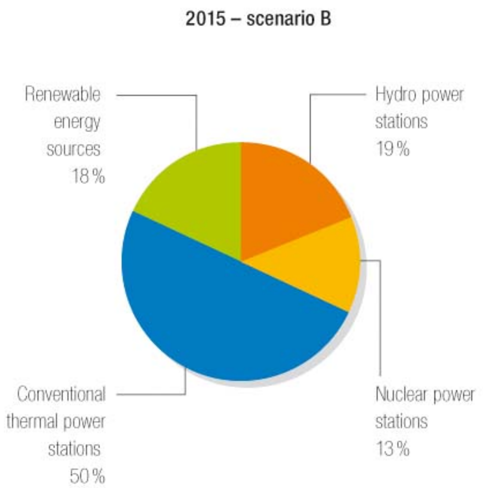


Figure 2.2 **UCTE Generating Capacity Mix**



*Note: these graphs show the evolution of the UCTE **power** generating capacity mix over 2007 – 2020. To have the effective share of each type of **energy** production it is necessary to focus on the effective productibility. For such a view, it is necessary to consider the annual load factor of the considered source, not treated in this forecast report. Some elements for this topic can be found in the UCTE System Adequacy Retrospect study.*

2.2.2 Fossil Fuel Breakdown

For the first time in SAF studies, data have been collected to give an overview of fossil fuel breakdown.

Lignite and gas appear to be the main fuels used for thermal generation. There is no significant evolution of this repartition over the period 2007 – 2015.

Table 4.1	**Fossil Fuel Breakdown** Only given for countries where breakdown is relevant **2007 - Scenario A**	**in proportion of total fossil fuel generating capacity**

	Lignite	Hard Coal	Gas	Oil	Mixed Oil / Gas	Non Attributable*
BA	100	-	-	-	-	-
BE	0	3	52	4	32	9
CZ	79	14	6	-	1	-
DE	28	38	21	8	2	2
ES	29	18	39	-	14	-
FR	-	34	18	35	-	13
GR	59	-	30	9	-	1
HR	-	17	7	18	59	-
HU	12	7	58	7	15	-
IT	10	1	39	-	43	7
LU	-	-	100	-	-	-
ME	-	100	-	-	-	-
MK	100	-	-	-	-	-
NL	-	17	76	1	-	6
PL	27	70	3	-	-	-
PT	-	30	37	20	12	-
RO	42	12	-	-	46	-
RS	93	-	7	-	-	-
SK	19	27	50	4	-	-
UCTE	**29**	**19**	**26**	**5**	**11**	**11**

* In many cases fossil fuel plants can burn different fuels. The gas / oil combination is the only one to be identified. Other mixed-fuel plants have been classified according to their main fuel, when identified, or as non–attributable in other cases. Further details per country are given in appendix A.

Table 4.2 **Fossil Fuel Breakdown**
Only given for countries whose breakdown is relevant
2015 - Scenario B
in proportion of total fossil fuel generating capacity

	Lignite	Hard coal	Gas	Oil	Mixed oil / gas	Non attributable
BA	100%	-	-	-	-	-
BE	-	9%	65%	2%	19%	5%
CZ	80%	14%	6%	-	1%	-
DE	26%	40%	24%	7%	2%	2%
ES	16%	15%	69%	-	1%	-
FR	-	21%	33%	34%	-	12%
GR	44%	-	48%	7%	-	1%
HR	-	45%	35%	-	21%	-
HU	13%	8%	61%	6%	12%	-
LU	-	-	100%	-	-	-
ME	100%	-	-	-	-	-
MK	100%	-	-		-	-
NL	-	17%	76%	1%	-	6%
PL	27%	65%	8%	-	-	-
PT	-	23%	76%	1%	-	-
RO	38%	15%	-	-	47%	-
RS	93%	-	7%	-	-	-
SK	12%	23%	62%	3%	-	-
UCTE	32%	15%	33%	3%	5%	11%

2.3 Reliably Available Capacity

Reliably Available Capacity is obtained from Net Generating Capacity after deduction of the non usable capacity, overhauls, outages and reserves for system services.

Next table gives an overview of RAC at UCTE level. Detailed data per country are exposed in Appendix.

Table 5 **UCTE – Reliably Available Capacity**
Scenario A
GW

	2007		**2008**		**2010**		**2015**		**2020**	
	3rd Wednesday		3rd Wednesday		3rd Wednesday		3rd Wednesday		3rd Wednesday	
	January 11:00	**July 11:00**	**January 11:00**	**July 11:00**	**January 11:00**	**July 11:00**	**January 11:00**	**July 11:00**	**January 11:00**	**July 11:00**
NGC	**623.2**	**631.0**	**640.0**	**646.1**	**668.6**	**676.6**	**702.8**	**704.7**	**698.6**	**700.1**
Non usable capacity	112.7	131.0	118.4	137.2	138.0	162.3	157.6	181.7	168.7	189.8
Maintenance and overhauls	13.8	51.7	13.8	53.6	7.9	40.7	7.6	38.6	7.7	38.1
Outages	22.9	22.3	23.2	22.5	16.5	16.2	15.2	15.3	14.9	15.1
System services reserve	29.8	29.2	31.3	30.4	31.6	30.5	32.6	31.3	34.1	32.7
RAC	**444.0**	**396.7**	**453.4**	**402.5**	**474.7**	**427.0**	**489.9**	**437.9**	**473.2**	**424.5**

While Net Generating Capacity is increasing by 80 GW in 2015, Reliably Available Capacity is increasing by only 46 GW.

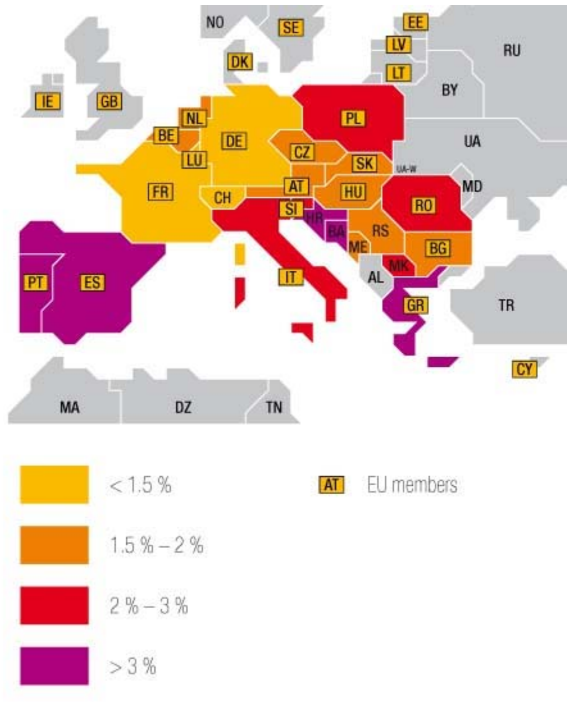
This is clearly due to the important share of renewable in the new generating capacity, as the contribution of wind power capacity is quite low in terms of Reliably Available Capacity.

2.4 Load

2.4.1 Consumption Map

The map hereafter indicates the average yearly growth of energy consumption (as given by correspondents on specific inquiry) expected for the first part of the study period (up to 2010). The consumption growth is quite different from one area to the other, generally higher in the south and eastern part of UCTE.

Figure 3 **Average yearly consumption growth per country Up to 2010** **In proportion of national consumption**



2.4.2 Load at Reference Time

Next table gives the UCTE synchronous load for January and July reference times. The load at January 11.00 am reference time points increases of +63 GW by 2015, corresponding to an annual average growth of nearly 2% a year. It is also noticeable that the growth is expected to slow down in most of the countries, under the effect of energy efficiency improvement, so that the overall load growth of UCTE falls down to 1,5% per year after 2015.

Table 6 **Reference Load** **GW**

	2007 3rd Wednesday			2010 3rd Wednesday			2015 3rd Wednesday			2020 3rd Wednesday		
	January 11:00	January 19:00	July 11:00	January 11:00	January 19:00	July 11:00	January 11:00	January 19:00	July 11:00	January 11:00	January 19:00	July 11:00
AT	8.9	8.8	7.7	9.4	9.3	8.1	10.4	10.3	9.0	11.5	11.3	9.9
BA	1.8	1.9	1.5	1.9	2.0	1.6	2.2	2.4	2.0	2.2	2.4	2.0
BE	12.6	13.0	10.8	13.4	13.8	11.4	14.2	14.6	12.1	15.1	15.6	12.9
BG	6.2	6.6	3.8	6.5	7.0	4.0	6.8	7.3	4.2	7.2	7.6	4.6
CH	9.8	9.3	8.0	10.3	9.8	8.4	10.6	10.1	8.7	11.1	10.6	9.0
CZ	9.6	9.8	7.0	10.0	10.1	7.3	10.5	10.7	7.7	11.0	11.2	8.1
DE	74.0	74.1	66.5	75.4	75.6	67.7	76.5	76.8	68.8	77.7	78.0	69.8
ES	41.2	43.2	40.8	45.9	47.9	45.3	55.1	57.1	55.1	64.2	66.2	63.9
FR	79.4	80.6	58.6	82.5	84.3	61.6	87.8	89.1	65.6	93.1	94.0	69.7
GR	7.9	8.2	9.4	8.6	8.9	10.3	10.1	10.4	12.0	11.7	12.0	14.2
HR	2.9	2.8	2.3	3.4	3.3	2.7	4.3	4.1	3.4	5.5	5.3	4.3
HU	5.4	5.6	5.3	5.8	6.0	5.6	6.6	6.8	6.1	7.3	7.5	6.8
IT	56.2	56.4	56.8	62.9	63.2	63.8	72.0	72.0	73.0	77.0	77.0	78.0
LU	0.9	0.7	0.9	1.1	0.9	1.0	1.2	0.9	1.1	1.3	1.0	1.2
ME	0.7	0.7	0.5	0.7	0.8	0.6	0.8	0.8	0.6	0.8	0.9	0.7
MK	1.5	1.6	1.0	1.7	1.7	1.0	1.9	2.0	1.2	1.9	2.3	1.4
NL	16.3	16.1	15.3	17.0	16.8	16.0	18.0	17.8	17.0	19.1	18.9	18.1
PL	20.5	21.7	17.5	21.5	22.6	18.4	23.2	24.4	19.9	25.8	27.1	22.1
PT	7.9	8.5	7.2	8.8	9.4	8.0	10.5	11.2	9.5	12.3	13.2	11.1
RO	8.0	8.4	5.9	8.9	9.4	6.4	10.2	10.8	7.4	10.8	12.0	8.6
RS	6.5	6.7	3.8	6.8	7.0	4.2	7.3	7.5	4.6	7.8	8.1	4.9
SI	2.1	2.1	1.9	2.3	2.3	2.1	2.5	2.5	2.3	2.7	2.7	2.5
SK	3.8	3.9	3.0	4.0	4.1	3.2	4.3	4.4	3.5	4.6	4.8	3.7
UA-W	1.0	1.0	0.6	1.0	1.1	0.6	1.0	1.1	0.7	1.1	1.2	0.7
UCTE	**385.1**	**391.8**	**336.0**	**409.5**	**417.0**	**359.1**	**448.1**	**455.4**	**395.4**	**482.8**	**490.8**	**428.0**

2.4.3 Demand Side Management Potential

In the framework of this report, Demand Side Management is made of deliberate load reduction potential at peak load used to balance the system and ensure reliability when the system is stressed out. In 2007, at least 7 GW of load can be briefly reduced at UCTE peak load.

Table below presents the existence of DSM measures for each country.

Table 7 **DSM Potential**
Only given for countries with DSM potential **GW**

	2007 3rd Wednesday			2010 3rd Wednesday			2015 3rd Wednesday			2020 3rd Wednesday		
	January 11:00	January 19:00	July 11:00	January 11:00	January 19:00	July 11:00	January 11:00	January 19:00	July 11:00	January 11:00	January 19:00	July 11:00
BE	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
CZ	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DE	0.1	0.1	0.1	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5
ES	2.0	2.0	2.0	2.3	2.3	2.3	2.5	2.5	2.5	3.0	3.0	3.0
FR	3.7	3.7	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0	3.0	1.0
HU	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
NL	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
UCTE	**7.1**	**7.1**	**4.4**	**7.0**	**7.0**	**5.0**	**7.4**	**7.4**	**5.4**	**8.0**	**8.0**	**6.0**

2.5 Remaining Capacity

Remaining Capacity is the difference between Reliably Available Capacity and reference load. On the period 2007 – 2010, the Reliably Available Capacity increases slightly quicker than the load. As a consequence, RC increases lightly from 2007 to 2010, in January and July.

On the period 2010 – 2015, load is expected to increase with a lightly lower trend. But meanwhile, in scenario A, the Reliably Available Capacity increases even more slowly. So that the additional Reliably Available Capacity does not cover the additional load over the period, and Remaining Capacity decreases from 2010 to 2015 by 23 GW in winter and 25 GW in summer.

Period 2015 – 2020 is clearly too far from nowadays to give an accurate plan of generating capacity evolution. Nevertheless, two effects may be expected by TSO:

- The continuous increase of renewable generating capacity,
- The decommissioning of many fossil fuel plants, especially under the effect of LCP Directive,
- The lack of clear assumption concerning the evolution of nuclear plants.

This lead to a light decrease of reliable available capacity over the period. Load being supposed to increase by 1.5% in winter and 1.6% in summer, Remaining Capacity strongly decreases to become negative in 2020.

The detailed results concerning Remaining Capacity are displayed in tables hereafter.

Table 8.1 **Remaining Capacity**
Including DSM potential
Scenario A **GW**

	2007			**2010**			**2015**			**2020**		
	3rd Wednesday			*3rd Wednesday*			*3rd Wednesday*			*3rd Wednesday*		
	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**
AT	4.8	4.9	4.6	5.5	5.6	5.3	6.5	6.6	6.4	5.4	5.6	5.5
BA	0.9	0.8	1.1	0.8	0.7	1.0	0.5	0.3	0.6	0.5	0.3	0.6
BE	1.0	0.7	1.3	0.9	0.6	1.3	-0.3	-0.7	-0.2	-3.0	-3.4	-2.1
BG	0.8	0.4	1.6	1.2	0.7	1.7	1.9	1.4	2.2	2.2	1.8	3.2
CH	1.2	1.7	3.7	0.9	1.4	3.5	0.7	1.2	3.2	0.2	0.7	2.9
CZ	2.3	2.1	2.3	1.6	1.5	1.6	1.1	0.9	1.2	0.5	0.4	0.7
DE	10.0	9.8	8.8	8.5	8.2	9.6	7.7	7.4	7.0	1.2	0.9	2.0
ES	7.3	5.3	8.0	9.7	7.7	10.1	13.5	11.5	13.4	6.5	4.5	5.8
FR	15.9	14.7	11.2	14.4	12.6	10.1	9.7	8.4	6.6	2.1	1.2	0.5
GR	1.1	0.8	0.1	2.8	2.5	2.2	2.5	2.2	0.9	1.2	0.9	-1.2
HR	0.5	0.6	1.1	0.5	0.6	1.2	-0.5	-0.4	0.4	-1.5	-1.3	-0.3
HU	0.8	0.6	0.6	0.6	0.5	0.3	-1.7	-1.9	-1.8	-4.0	-4.2	-3.9
IT	5.2	5.0	6.1	10.2	9.9	10.4	2.4	2.4	1.4	-1.2	-1.2	-2.4
LU	0.8	1.0	0.8	0.6	0.8	0.7	0.5	0.8	0.6	0.4	0.7	0.5
ME	-0.5	-0.1	-0.2	-0.6	-0.1	-0.2	-0.9	-0.2	-0.4	-0.9	-0.2	-0.5
MK	0.0	-0.6	-0.1	-0.1	-0.7	0.0	-0.1	-1.0	-0.1	-0.2	-1.2	-0.1
NL	1.8	2.0	2.8	3.4	3.6	4.4	1.6	1.8	2.6	0.4	0.6	1.4
PL	7.4	6.2	4.2	6.8	5.7	3.5	3.0	1.8	0.7	-7.8	-9.1	-7.9
PT	1.7	1.2	1.8	2.8	2.2	2.9	-0.4	-1.1	-0.6	-3.4	-4.2	-3.4
RO	2.2	1.7	3.6	1.1	0.6	2.1	1.7	1.1	2.9	0.8	-0.3	1.5
RS	0.1	-0.1	0.0	-0.3	-0.4	-0.3	-1.0	-0.9	-1.0	-1.6	-1.6	-1.6
SI	0.1	0.0	0.8	-0.2	0.2	0.4	-0.7	0.9	0.0	-1.3	0.8	-0.3
SK	0.0	0.0	0.3	0.2	-0.4	0.3	0.9	-1.2	1.0	0.8	-1.8	0.9
UA-W	0.7	0.6	0.7	0.8	0.7	0.8	0.8	0.7	0.8	0.8	0.7	0.8
UCTE	**66.0**	**59.3**	**65.2**	**72.1**	**64.7**	**72.8**	**49.3**	**42.0**	**48.0**	**-1.6**	**-9.5**	**2.5**

Table 8.2	Remaining Capacity Including DSM potential Scenario B	GW

	2007 *3rd Wednesday*			2010 *3rd Wednesday*			2015 *3rd Wednesday*			2020 *3rd Wednesday*		
	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
UCTE	**69.4**	**63.2**	**68.0**	**80.0**	**72.7**	**80.4**	**85.4**	**78.4**	**84.0**	**74.0**	**66.6**	**74.9**

2.6 Analysis Of Generation Adequacy

Assessment of adequacy is done by comparing Remaining Capacity to Adequacy Reference Margin.

2.6.1 Global Adequacy For UCTE

For the overall UCTE, ARM is set to 5% of UCTE Generating Capacity + the sum of margins against peak load of all countries, which can be considered at UCTE level as a reasonably low risk of shortfall.

Tables hereafter recall expected Remaining Capacity and compares it to ARM.

Table 9.1	Remaining Capacity and Adequacy Reference Margin Scenario A	GW

	2007 *3rd Wednesday*			2010 *3rd Wednesday*			2015 *3rd Wednesday*			2020 *3rd Wednesday*		
	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
Remaining Capacity	58.9	52.2	60.7	65.2	57.7	67.9	41.9	34.6	42.6	-9.7	-17.6	-3.6
Remaining Capacity Including DSM potential	66.0	59.3	65.2	72.1	64.7	72.8	49.3	4120	48.0	**-1.6**	**-9.5**	2.5
Adequacy Reference Margin*	44.5	39.9	42.5	47.1	42.0	44.6	49.2	44.2	46.6	48.8	43.5	46.3

* defined as 5% NGC + Margin against daily peak load

Table 9.2	Remaining Capacity and Adequacy Reference Margin Scenario B	GW

	2007 *3rd Wednesday*			2010 *3rd Wednesday*			2015 *3rd Wednesday*			2020 *3rd Wednesday*		
	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
Remaining Capacity	62.2	56.1	63.5	73.1	65.6	75.5	75.0	70.7	78.6	66.0	58.1	68.9
Remaining Capacity Including DSM potential	69.4	63.2	68.0	80.0	72.7	80.4	85.4	78.4	84.0	74.0	66.6	74.9
Adequacy Reference Margin	44.6	40.1	42.6	47.6	42.6	45.1	51.7	46.8	49.2	54.0	48.6	51.5

* defined as 5% NGC + Margin against daily peak load

Following graphs give a view of evolution of Remaining Capacity compared to ARM for the three reference time points studied. As already mentionned, ARM in this document is calculated according to scenario A conditions and would be a little higher in scenario B.

Figure 4-1	**Remaining Capacity against Adequacy Reference Margin Without DSM Potential**	**GW**

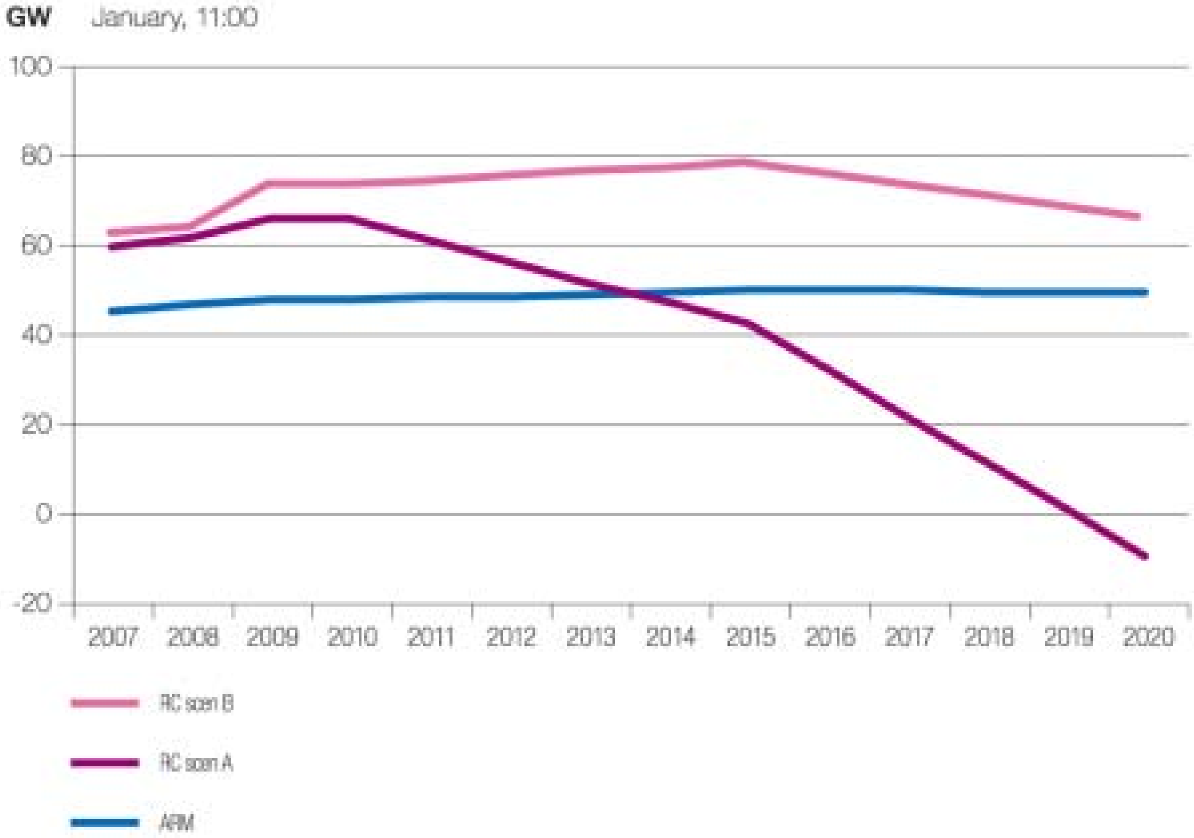


Figure 4-2	Remaining Capacity against Adequacy Reference Margin Without DSM potential	GW

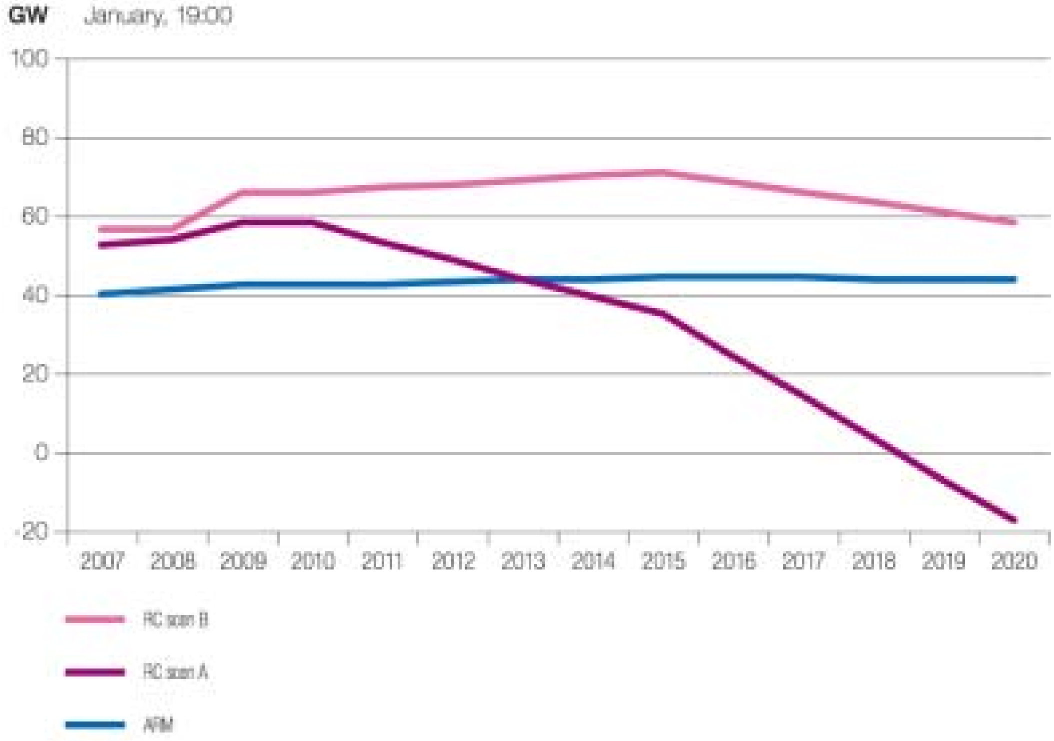
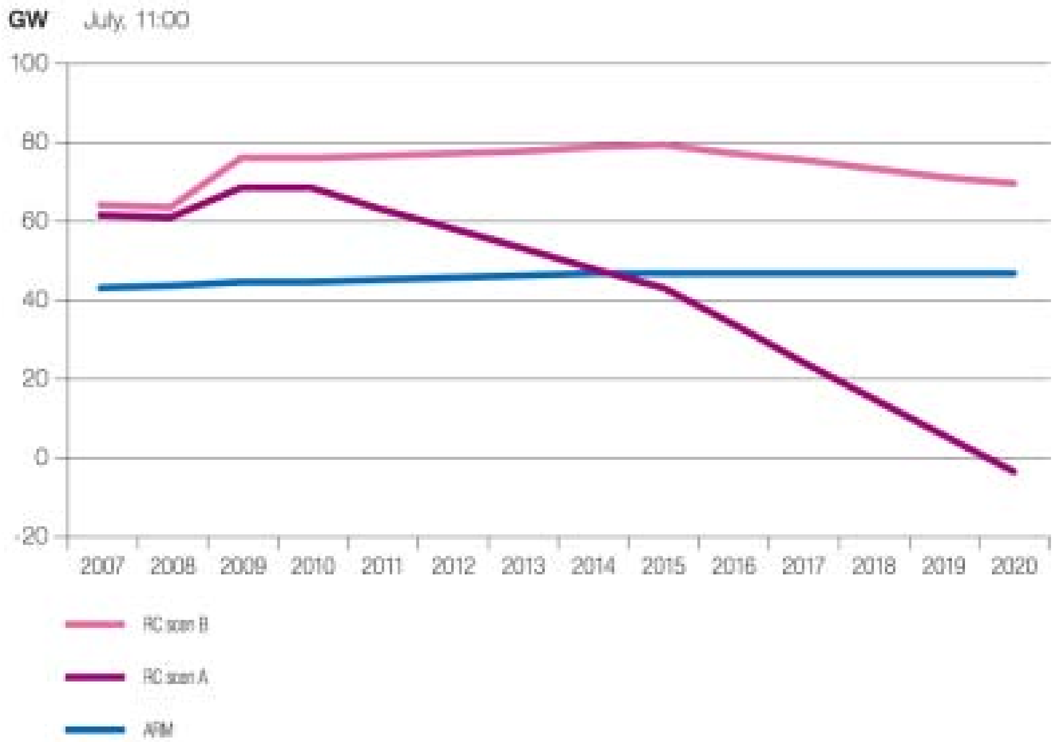
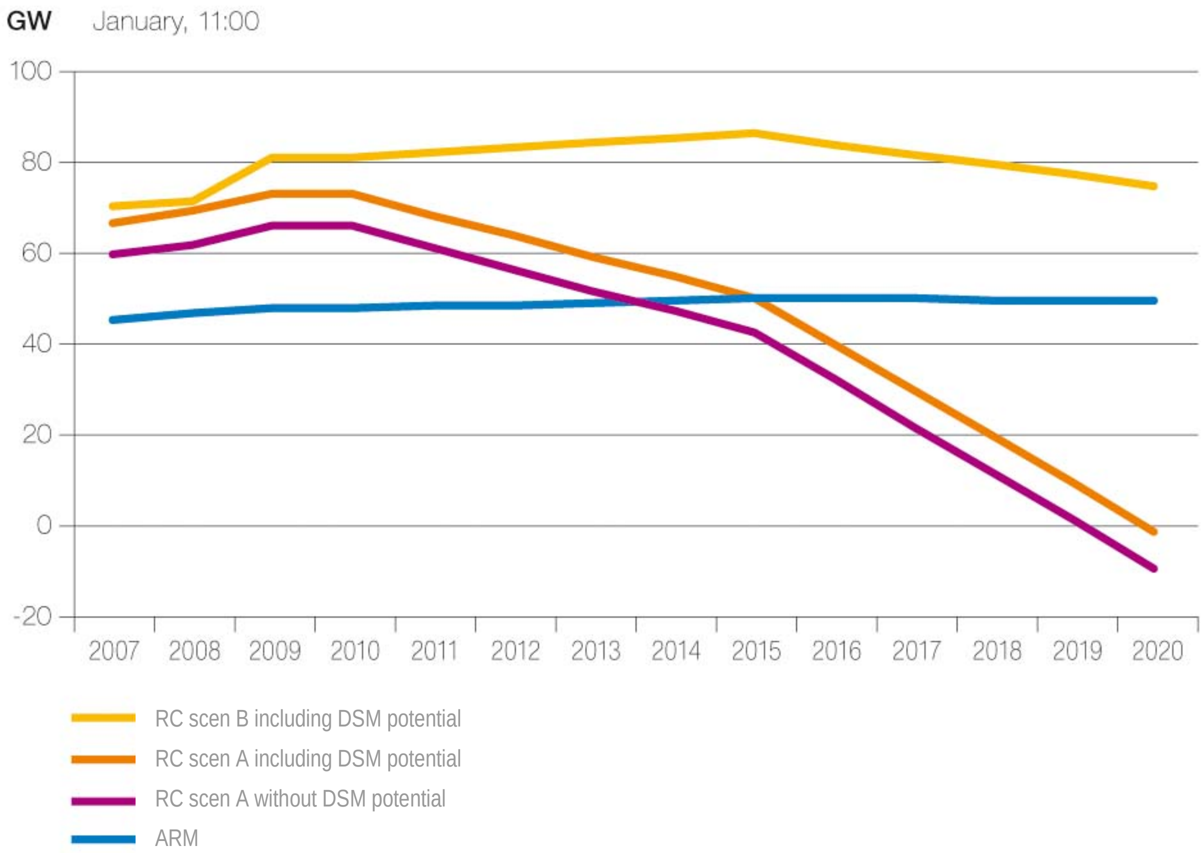


Figure 4-3	Remaining Capacity against Adequacy Reference Margin Without DSM potential	GW



When taking into account the load reduction induced by DSM measures, the Remaining Capacity is increased and adequacy improves. The date when ARM is no longer fulfilled is postponed by up to two years.

Figure 5.1 **Remaining Capacity against Adequacy Reference Margin** **GW**



On the basis of these graphs, derived from assumptions made by each TSO of UCTE, generation adequacy in the UCTE system seems not to be at risk from 2007 to 2010, and seems to even slightly improve thanks to undergoing investments.

When drawing this conclusion, two uncertainty factors must be taken into consideration:
- On one hand, it is still possible to increase new investments decisions for this time horizon ;
- On the other hand, decommissioning may occur quicker than expected during the coming period especially as a result of the effects of new environmental requirements on the oldest fossil fuel plants.

The system adequacy is then regularly decreasing from 2010 to 2015, and further investments in generating capacity than the one already decided are necessary to keep meeting the adequacy in 2015.

In scenario A, the fall of the Remaining Capacity is dramatically reinforced from 2015 to 2020. At this horizon the lack of capacity identified would reach 50 GW.

Relying on scenario B projects could ensure the adequacy over the period, Remaining Capacity staying in this case at a comparable level with present situation.

When assessing the level of security over the next years on this simplified comparison of RC to ARM, the following characteristics of the UCTE system should be kept in mind:
- *There is a significant sensitivity of the load to the temperature ; it can be estimated at more than 3400 MW /°C in winter and 2200 MW / °C in summer ;*

- *the random nature of the "Reliably Available Capacity" which results from the forced outages of the thermal plants and from variations of the inflows in the hydro power plants. According to the expertise of the TSOs, the standard deviation of each of these factors can be estimated between 2500 and 3000 MW ;*
- *in addition there may be significant correlations between meteorological factors which may worsen simultaneously generation availability (hydro, wind) and load level (low temperature).*

On the basis of these elements, a Remaining Capacity of 71.4 GW on January 11am 2010, including DSM, may also be interpreted as follows:

- *First, 13,7 GW should be available to meet the maximum peak load of the day (sum of margins against peak load) ;*
- *In case of a cold wave leading to temperatures up to 10°C below normal temperature, the load increase would call for 34 GW of the Remaining Capacity ;*
- *There would then remain 23.7 GW left to face unfavourable availability of generating units, which is to be compared to the standard deviation of hydro and thermal plants in order to assess the risk of failure ;*
- *By the same time, 7 GW of load are anyway supposed to be reduced by DSM measures.*

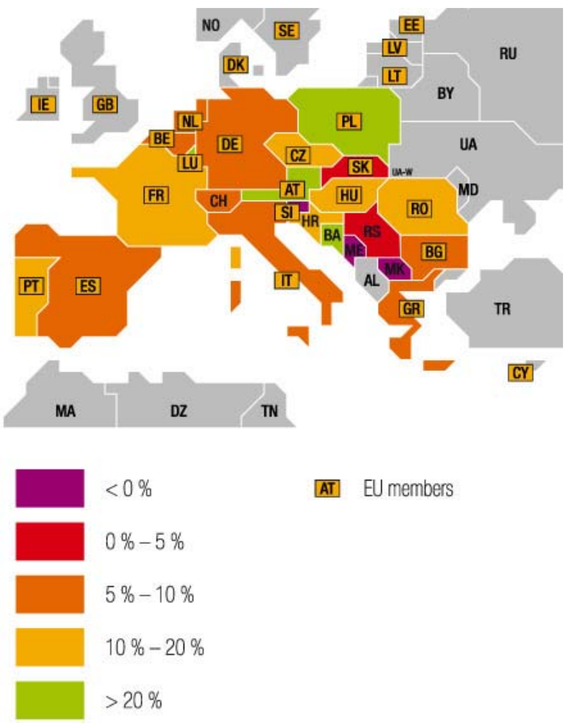
2.6.2 Detailed Adequacy Per Country

UCTE Overview

The situation of generation adequacy in each country, when it is analysed isolated from the others, may be very different from the overall view.

In order to represent the location of potential remaining capacities available to secure adequacy, the following map indicates, for each country considered isolated from the others, the level of Remaining Capacity as a proportion to its Net Generating Capacity, for January 11:00 in 2007.

Figure 6 | **Remaining Capacity**
Including DSM potential
Scenario A – 2007 – January 11:00 | **% of NGC**



Details Per Country

Figures below show the evolution of Remaining Capacity minus the national ARM in 2008, 2010, 2015 and 2020 at reference time, detailed by country for scenario A. Countries have been classified according to the generation adequacy assessment methodology: countries whose ARM is related to "5% of NGC", and those whose ARM is related to "10% of NGC", due to higher sensitivity to random factors (temperature, hydro conditions, wind, large plant unavailability…)

Figure 7.1 | **Remaining Capacity Minus Adequacy Reference Margin Including DSM Potential** | **GW**

In 2010, indicative ARM in isolated situation is not met in half of the UCTE countries. Nevertheless in some cases ARM can be a stronger objective than the feature used for the national generating adequacy assessment.

In 2015, indicative ARM in isolated situation is not met in most of UCTE countries, which is not surprising as scenario A is considered.

In 2020, scenario A, indicative ARM is only met in Austria, Bulgaria, Spain, Serbia, Western Ukraine and Luxembourg.

Figure 7.2	**Remaining Capacity Minus Adequacy Reference Margin Including DSM Potential**	**GW**

In 2010, indicative ARM in isolated situation is not met in few of the UCTE countries: Germany, Slovakia, Romania, Slovenia, Macedonia and Montenegro. Nevertheless in some cases ARM can be a stronger objective than the feature used for the national generating adequacy assessment.

In 2015, indicative ARM in isolated situation is met in most of UCTE countries, appart from Germany, Slovakia, Hungary, Romania and Macedonia.

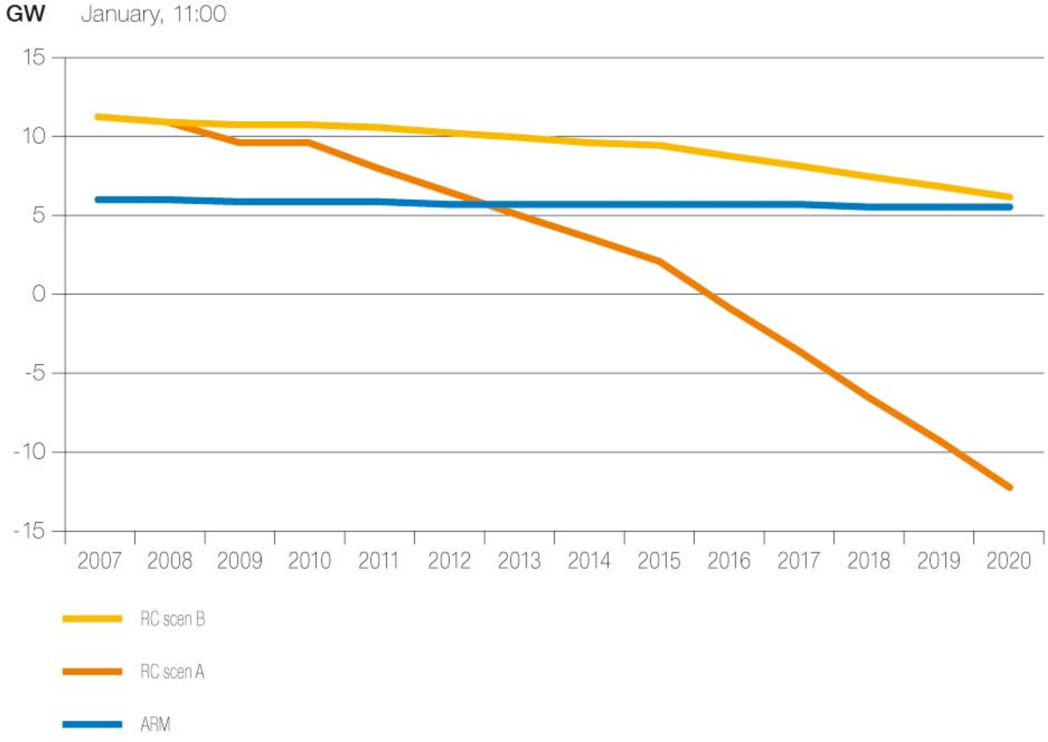
In 2020, even with the “Best estimates” scenario B, indicative ARM is not met in Belgium, Germany, Slovakia, Hungary, Greece, Romania, Poland and Slovenia.

2.7 Analysis by Geographical Blocks

Considering the role that the interconnected transmission system plays for the reliability of some national systems, the situation of different geographical blocks is analysed below.

2.7.1 CENTREL: PL,CZ,SK,HU, UA-W

Figure 9 | **Remaining Capacity minus Adequacy Reference Margin Including DSM potential CENTREL block** | **GW**



The Remaining Capacity in CENTREL is quite important compared to ARM for the time being.

Owing to fossil fuel plant decommissioning (Large Combustion Plants Directive) and to an increasing share of renewable energy sources, remaining available capacity is decreasing from 2007 to 2015.

By the same time, load is expected to grow at a rate of 1.8% a year, representing +6GW by 2015.

Given this, Remaining Capacity is regularly decreasing from 2007 to 2015, and even more after, the lack of capacity reaching 17 GW in 2020.

Extra investments expected when considering scenario B would enable to maintain adequacy for the block.

Specific remarks

Czech Republic

The consumption growth is expected to evoluate from 2% now to 1% after 2010. Nevertheless, existing surplus in the power balance will be lower in the future, so that supply and demand are expected to be just balanced by 2013 (without export possibility).

Development of new power station building-up highly depends on the expected decision about changing the limits of the lignite mining in the region North-West Bohemia.

Poland

The base scenario for consumption growth represents 2.0 to 2.5 % per year. Some commissioning of lignite and hard coal plants are expected before 2010. But the main concern for Poland are :

The rehabilitation of existing power plants due to environmental constraints;

The growth of Renewable Energy Sources (RES) and their connection to the transmission system without detarioting its reliability.

A significant amount of supplementary generating capacity is expected to be required at the horizon 2016.

Slovak Republic

Slovak Republic has been an exporter of electricity for 7 years (2000 - 2006). The shutdown of two nuclear units at the end of 2006 and 2008 will change the situation and SK will become an importer.

The shutdowns of other units of conventional power plants are expected in the coming years (horizon 10 years). The power balance can be improved mainly by commissioning of two nuclear units (expected in 2011-2012) and two co-generating units (probably in 2010 or later).

In scenario B, Slovak Republic could be balanced from 2011 on.

Hungary

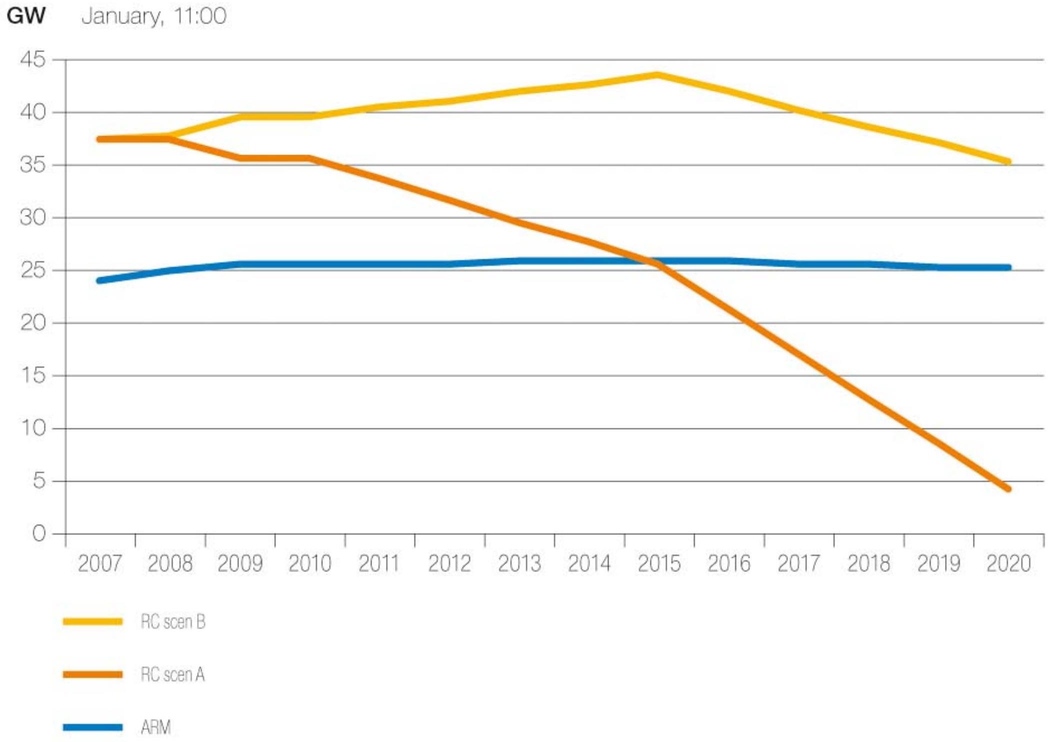
A constant rate of 2% per year is assumed for the consumption growth of Hungary.

In the short term, commissioning of combined cycle, heating power plant and biomass is already planned. By 2010-2015, supplementary capacities will be necessary.

In the mid-long term, the replacement of power plant capacities to be shut down is an important issue for the system.

2.7.2 Main UCTE: BE, DE, FR, SI, HR, LU, NL, AT, CH, BA

Figure 10	Remaining Capacity minus Adequacy Reference Margin Including DSM potential Main UCTE block	GW



Between 2007 and 2010, the increase of Net Generating Capacity amounts + 16 GW.

New capacities are mainly renewable energy sources, especially wind farms, which represent a growing share in the generation mix. But as this type of generating capacity is partly non usable at reference time, the evolution of Remaining Available Capacity is limited to +7 GW.

By the same time, load is expected to grow at a rate of 1.2% a year, representing +8GW by 2010.

Given this, Remaining Capacity is relatively stable from 2007 to 2010.

Investments foreseen in scenario A for the 2010-2015 period are not sufficient to prevent a decrease of margins and generating capacities. Owing to fossil fuel plant decommissioning (Large Combustion Plants Directive) and to the low contribution of renewable sources to the Reliably Available Capacity, the adequacy for the block is no longer ensured by 2015.

In scenario A, due to further expected decommissioning, the Remaining Capacity decreases dramatically so that the amount of new investment needed reaches 20 GW in 2020.

<u>Specific Remarks:</u>

Belgium

The electricity consumption growth rate for Belgium is estimated at 1.9 percent for the period 2006-2010, at 1.2 percent for the period 2010-2015 and at 1.3 percent for the period 2016-2020 (source : Federal Planning Bureau - Belgium).

A Remaining Capacity margin of 1000 MW (equivalent to the biggest unit in the grid) is considered as the desired safety level for short-term outlooks. However, this safety level is currently not obtained throughout the year. Based on the CREG indicative production plan (publication date : January 2005 - http://www.creg.be/pdf/Propositions/C388FR.pdf), market players are encouraged to build new power plants to counteract this situation. If the currently considered generation development projects are realized (Scenario B) within the indicated deadlines, the desired Remaining Capacity margin will be attained for the winter 2009-2010 at the earliest.

When assuming a surplus of power within the main UCTE-bloc, the current available simultaneous import capacity as well as the planned interconnection re-enforcements will compensate a domestic capacity generation shortage.

Germany

The expected consumption growth for Germany is only 0.4% a year.

The increase of renewable-based generating capacity during the period from 2007-2020 is expected to be more than 30 GW, mainly in the North of Germany, so that it has to be transmitted to the main areas of consumption in the South and West of Germany. However, supplementary generation may be needed from 2009. Germany as a hub in the European electricity trade expects an increase of physical exchanges both in terms of imports and exports, following the observed trend of recent years.

Austria

Based on studies the consumption growth till 2010 is about 2% and will increase to 1,6% afterwards, the Austrian value for Remaining Capacity minus ARM as shown in Figure 7.1 is relatively high because a large share of "Generating Capacity" are storage power plants (approx. 6.4 GW).

The surplus of electricity in the north and the deficit of electricity in the south of Austria combined with insufficient north-south transmission capacity result in congestions on the transmission grid of Verbund-APG. Counter measures in order to reduce these congestions consist in re-dispatching of power plants (including restrictions for pumping) and special switching in network operation.

Due to the decommissioning of a thermal power plant in the south by mid 2006 which was very important for congestion management and the further increase of wind power and biomass-production in the north the above mentioned bottlenecks will become even more critical in winter 2006/2007.

The installation of phase shifting transformers in 2006 in combination with re-dispatching will help to handle the north-south-bottlenecks until the commissioning of new 380 kV lines (Südburgenland - Kainachtal, St. Peter – Tauern).

Furthermore, 50% of the Austrian thermal power plants are fired by natural gas. In case of problems concerning natural gas delivery this can cause critical situations, especially in winter.

Slovenia

Consumption growth in Slovenia will be of 2,8 % a year in the years to come with enough power plants commisioning.

Additionnal generating capacity will be necessary between years 2015 and year 2020.

Bosnia Herzegovina

Consumption growth is facing a high trend in the forthcoming years, estimated up to 5% a year. Nevertheless, system adequacy present situation is favourable, without risks as there is enough capacity. Supplementary generation does not seem to be needed, and exports are supposed to increase. In perspectives some indicative for development of the new generating capacities are planned (hydro, thermal and wind).

Switzerland

At present the system adequacy is ensured. However, though consumption growth is limited to 1.5% until 2010 and 0.75% after, it will be jeopardized after 2010 unless additional generating capacity is built and particularly after 2015 in the case of decommissioning of the oldest nuclear power plants Beznau and Mühleberg (3 units of about 0.36 GW) without replacing them by new ones (regardless of the fuels and sites to be used).

France

The adequacy for the French System is supposed to be met until 2010 provided that the consumption growth does not exceed 1,5% per year and that at least 3 of the combined cycle gas turbine projects launched by producers are actually achieved by 2010.

After 2010, new generation will be needed to face consumption growth and to replace the decommissioning of oldest plants, mainly coal. About 1000 MW per year of new capacity would be needed, apart from the new nuclear power plant EPR expected in 2012 and from the development of wind generation. Though combined cycle gas turbine expected projects may be an answer to this situation, the exporting situation of France is likely to decrease in the future. The ability for the TSO to adapt and reinforce the network to these new needs is a major issue in the forthcoming years.

Croatia

Consumption growth is high in Croatia, estimated to 4% per year.

System adequacy present situation is favourable, without risks as there is sufficient capacity. After 2007 there is insufficient capacity, and in perspectives are indicated plans for development of the new generating capacities (hydro, thermal, nuclear, renewable: solar, wind, small hydro, geothermal, biomass, and waste). Supplementary generation is needed between years 2010 and 2015, after the decommissioning of many fuel oil powered plants.

Luxembourg

The Remaining Capacity for Luxemburg doesn't represent the real situation as two main generation plants in Luxembourg, the pump storage power plant of Vianden (1.100 MW) and the thermal plant of TWINerg (385 MW) are not injecting directly in the national grid, but in the German grid of RWE for the first one and in the Belgium grid of ELIA for the second one.

However, consumption in Luxemburg is supposed to be more or less stable. New generation of approximately 600 MW would be necessary to become independent from neighbouring countries, but its realisation is very unlikely. In this condition, imports would increase and Luxemburg has to rely on the development of interconnection line with neighbouring system to guarantee its supply.

The Netherlands

Consumption growth in the Netherlands is supposed to rank around 2% per year.

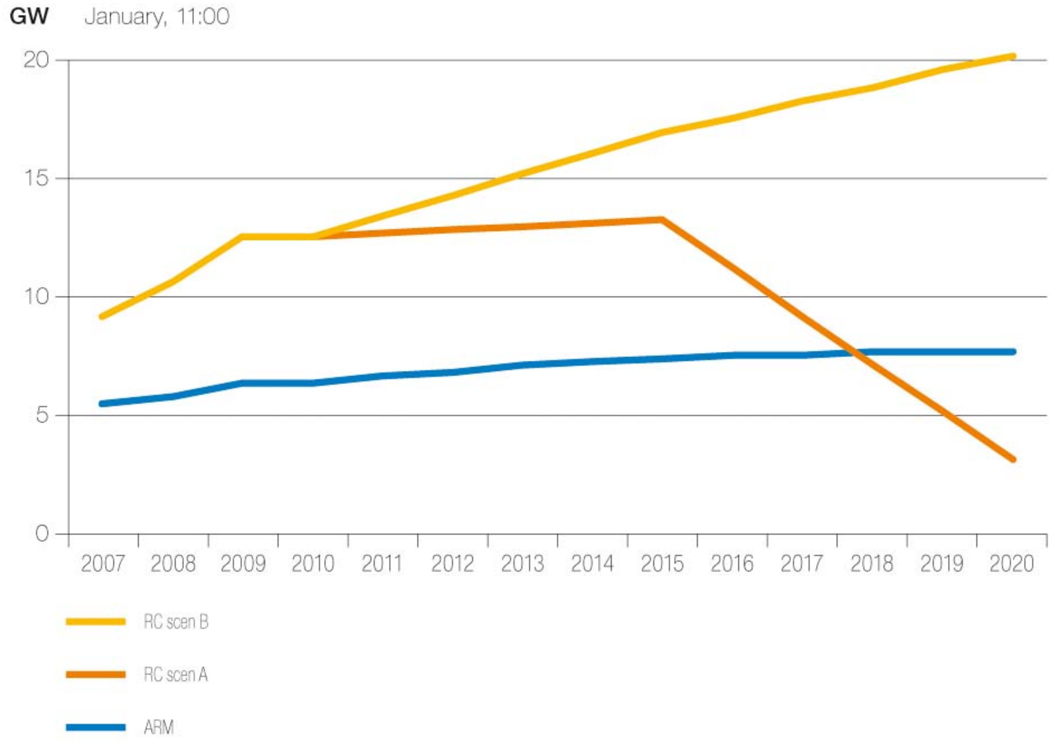
From the point of view of national market, power balance is probably ensured until 2015, when significant investments will have to be made. As for all transmission systems in the area, physical exchanges are expected to increase both for imports and exports.The results of last monitorings indicate that no structural problems need to be expected. Nevertheless, extreme situations may occur such as cooling water restrictions in summer and gas supply problems during extremely cold winters.

There are indications that the electricity supply system will probably be less vulnerable to such situations in the future, because the larger part of the new production capacity will be built at coastal locations, where there are no cooling water restrictions.

Also some of the reported new capacity will not be gas-fired and this diversification of fuels is favourable to reliability of supply as it reduces the vulnerability of the system to gas supply restrictions in extremely cold periods.

2.7.3 Spain & Portugal

Figure 11	Remaining Capacity minus Adequacy Reference Margin Including DSM potential Spain + Portugal block	GW



The increase of Net Generating Capacity is quite strong: + 17 GW by 2010.

Renewable energy sources, especially wind farms, represent 75% of these generating capacity investments, and the non-usable part is important. Therefore, the evolution of RAC remains limited (+8GW).

By the same time, load is expected to grow at a rate of +3.5% a year, representing 6GW by 2015.

After 2015, in scenario A, expected decommissionings induce a quick drop of Remaining Capacity. The lack of capacity amounts to 5 GW in 2020. Extra investments expected when considering scenario B would allow to achieve the system adequacy for the block.

Specific Remarks:

Spain

The consumption growth reaches +3.6% per year at the moment, value expected to decrease in the future.

From the point of view of system adequacy, the appreciation of situation for the coming winter and next year is not critical. Medium and long term demand and generation expansion planning forecasts show that there will be margin enough in the Spanish system, provided that supplementary generating capacity is developed at the very significant level which is expected (3500 MW per year including renewable).

The major characteristics for system adequacy as seen by the Spanish TSO are:
- High demand growth rate
- Increase of interconnection capacity with France (the rest of UCTE system)
- Wind plants technical adequacy
- Generation mix adequacy (almost all new thermal plants to be commissioned in the following 10 years are gas combined cycle)
- Fuel (natural gas) security of supply for new thermal plants (CCGT)

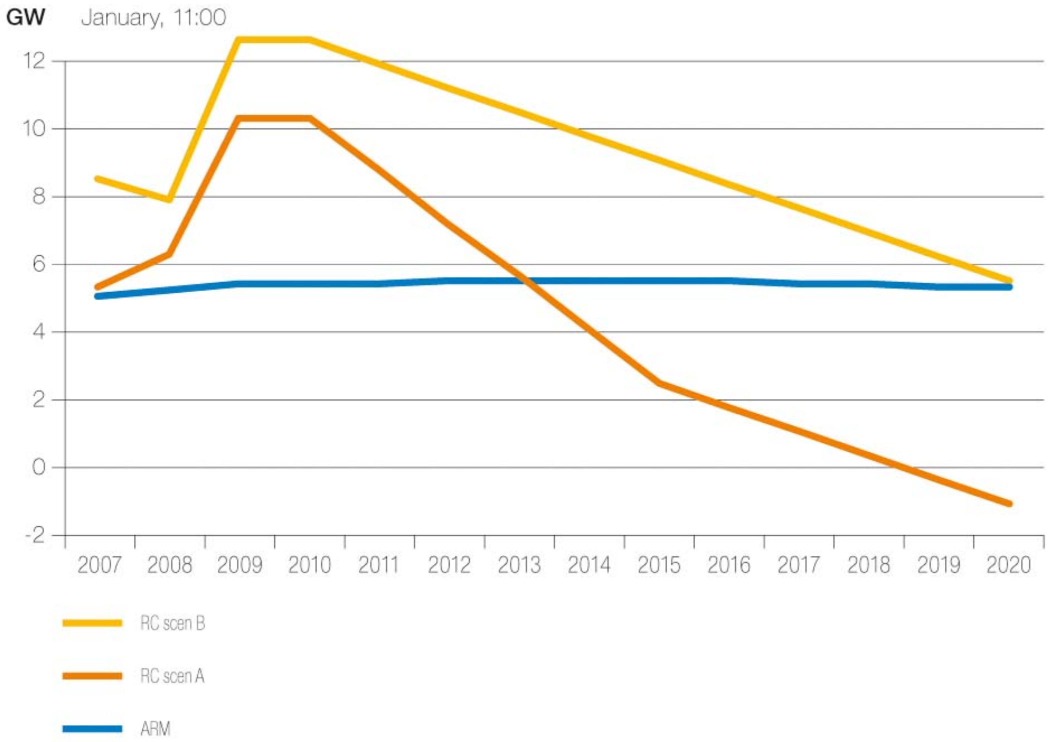
Portugal

Consumption growth is expected at 3.5% in the forthcoming years reducing to 3.2% in the end of the period.

No important projects of new generating capacity is expected by the end of 2008, except the strong development in wind farms. The future thermal projects considered refer to combined cycle power stations (presently undergoing licensing). After 2008, scenario B corresponds approximately to the capacities considered as adequate.

Italy

Figure 12	Remaining Capacity minus Adequacy Reference Margin Including DSM potential Italian block	GW



The increase of Net Generating Capacity is 8 GW by 2010. Fossil fuel power plants represent 75% of these generating capacity investments.

By the same time, load is expected to grow at a rate of 3 to 4% a year at the moment, representing +6GW by 2010, then decreasing around 2% in the next decade.

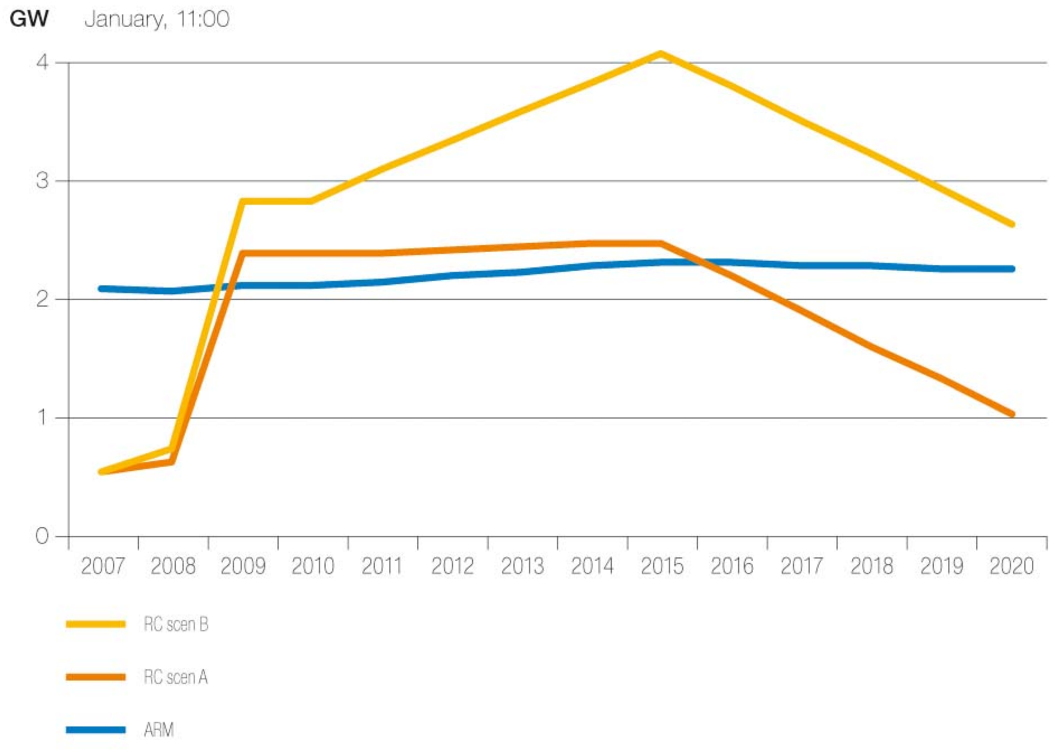
Remaining Capacity thus presents a increase from 2007 to 2010, likely to change situation of Italy compared to previous years.

Investments foreseen in scenario A seem to be not sufficient to maintain this level of Remaining Capacity after 2010. Owing to a strong load growth rate and to a limited evolution of generating capacity, the adequacy for the block would no longer be ensured after 2013 without further investments.

Extra investments expected when considering scenario B would allow keeping the adequacy for the block.

2.7.4 South Eastern UCTE: Greece, FYROM, RS, ME

Figure 13 | **Remaining Capacity minus Adequacy Reference Margin**
Including DSM potential
South eastern UCTE block | **GW**



As seen by TSO the adequacy is not achieved from 2007 to 2010.

The increase of Net Generating Capacity is 3 GW by 2010 (mainly in renewable energy sources). Reliably Available Capacity increases in a stronger way than the load. As a consequence, the situation is improving over the period but the surplus of capacity in 2010 is 0.5GW only.

Investments planned for 2010 – 2015 period just fulfil the adequacy .Extra commissionings foreseen in scenario B could make it from 2010 to 2020.

The South Eastern UCTE block will be in a tight situation for its adequacy from 2007 on to 2020 and could have to rely on its importable capacities.

Specific Remarks:

Greece

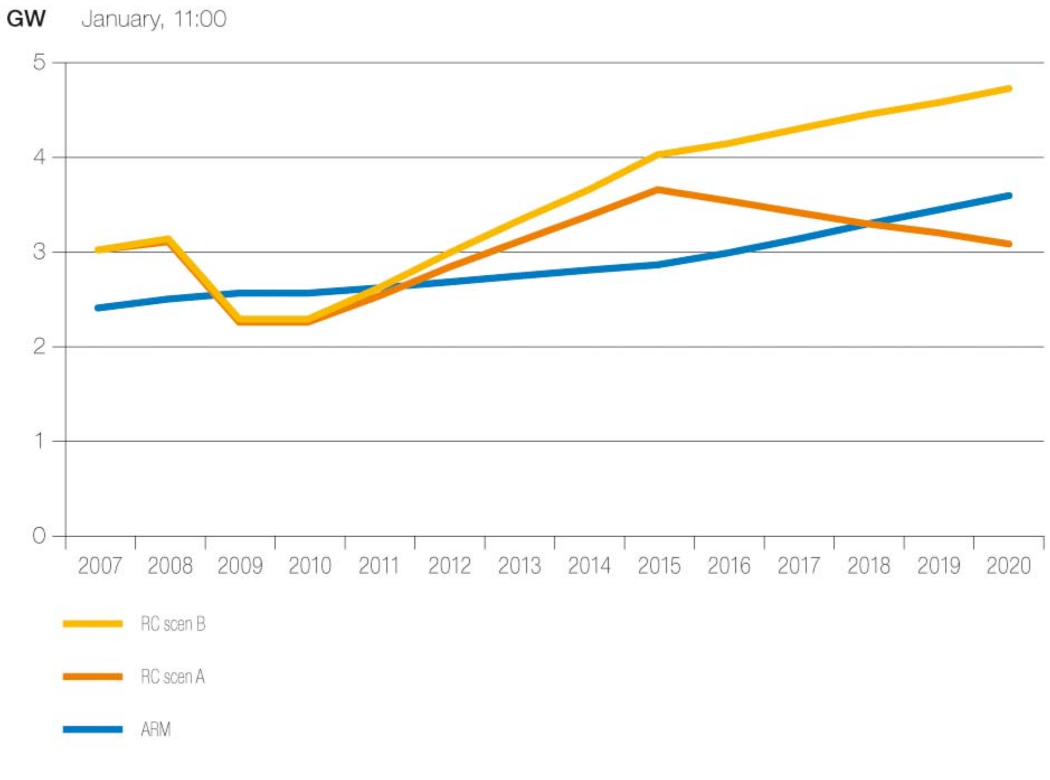
As in the major part of southern Europe, consumption growth in Greece is overpassing 3% per year with peculiar attention having to be paid to the peak load increase in summer with the development of air conditioning.

On short term the main concern of the HTSO is to face the high peaks and the low level of voltage in the area of Athens, in summer. Some peak units commissioned in the South where the consumption is concentrated, some transmission devices installed, especially in the area of Athens, the proper management of the water reserves, and a new power plant near Athens contracted for reserve, ensured the system adequacy and security.

In the longer term, new power plants under construction or in tendering procedure, grid reinforcements, extension of the 400kV grid, upgrade of the tie-line Florina – Bitola, construction of a new tie-line between Greece and Turkey, are the main developments to ensure the system adequacy and security.

2.7.5 Romania & Bulgaria

Figure 14	Remaining Capacity minus Adequacy Reference Margin Including DSM potential Romania + Bulgaria block	GW



The Reliably Available Capacity of the block is stable over the period 2007-2010.

Owing to the load increase (+1.2GW), the Remaining Capacity slightly decreases, but remains quite close to the ARM over the period, for Romania as well as Bulgaria.

For the 2010-2015 period generating capacity investments planned help to adequate to the indicative UCTE ARM.

Specific remarks:

Romania

During the first half of 2006 year, the consumption demand has entirely been satisfied. Consequently the Remaining Capacity allowed to carry out exchange schedules taking into account the reliable monthly NTCs.

The consumption growth for Romania is assessed at 2.9% per year.

A new nuclear unit and two conventional thermal plants are planned from now to 2010. After this date, supplementary generating capacity will be necessary.

For the following years an increase of the export/import activities is expected thanks to new interconnection and national transmission lines that will be commissioned, as well as the development of the energy market.

Bulgaria

As a whole the system will be adequate excluding some periods after shutting down the oldest units in Kozlodui nuclear power plant.

Further generating capacity will have to be commissioned before 2010 and export are expected to decrease.

TRANSMISSION SYSTEM ADEQUACY 3

3 TRANSMISSION SYSTEM ADEQUACY

3.1 Interconnection Development

The tables in Appendix C show the details on grid developments in the UCTE countries. The following table shows the clearly identified main developments on international interconnections between regional blocks over the period from 2006 to 2015.

Table 11 UCTE Interconnection Line Development

Line	Voltage level	Date of commissioning	Cross-border
Chooz - Jamiolle - Monceau	225/150 kV	2006	BE - FR
Bitola - Florina	400 kV	2007	GR - MK
Mraclin - Jajce	220 kV	2007	HR - BA
Stip - Cervena Mogila	400 kV	2007	MK - BG
NORNED cable	450 kV	2007 - 2008	NL - NO
2d line Slavetice – Durnrhor	400 kV	2008	AT - CZ
Steinach - Prati	380 kV	2008	AT - IT
Cervena Mogila - Dubrovo	400 kV	2008	BG - MK
Ernestinovo - Pecs	400 kV	2008	HR - HU
Békéscsaba – Nadab	400 kV	2008	HU - RO
Podgorica – Tirana – Elbasan	400 kV	2008	ME – Albania
Skopje - Nis	400 kV	2008 - 2010	MK - RS
Portugal - Spain: Tajo river corridor	400 kV	2009	ES - PT
France – Spain: eastern reinforcement	400 kV	2010	ES - FR
Sombor - Pecs	400 kV	2010	RS - HU
Novi Sad - Resita	400 kV	2010	RS - RO
Udine - Okroglo	380 kV	2010 - 2011	IT - SI
Bitola - Vlore + DC link to IT	400 kV	2010 - 2015	MK - Albania
Valdigem – Douro Internacional – Aldeadavilla	400 kV	2011	PT - ES
BRITNED cable	450 kV	2013	NL - UK
Algarve - Andaluzia	400 kV	2013	PT - ES
Galiza - Minho	400 kV	2013	PT - ES
Suceava - Balti	400 kV	2015	RO - Moldavia
Timisoara - Varsac	400 kV	2015	RO - RS
Thaur – Bressanone through Brenner Basis Tunnel	400 kV	2015 - 2020	AT - IT
Wien/Südost - Győr	380 kV	Undefined	AT - HU
Nauders - Curon / Glorenza	220 kV	Undefined	AT - IT
Lienz - Cordignano	380 kV	Undefined	AT - IT
Udine/Sandigro - Lienz	380 kV	Undefined	AT - IT
Meliti – Bitola	400 kV	Undefined	GR - MK
Philippi – Turkey	400 kV	Undefined	GR - TR

As far as regional blocks are concerned, noticeable increase of exchange capacities are expected according to developments on interconnections :

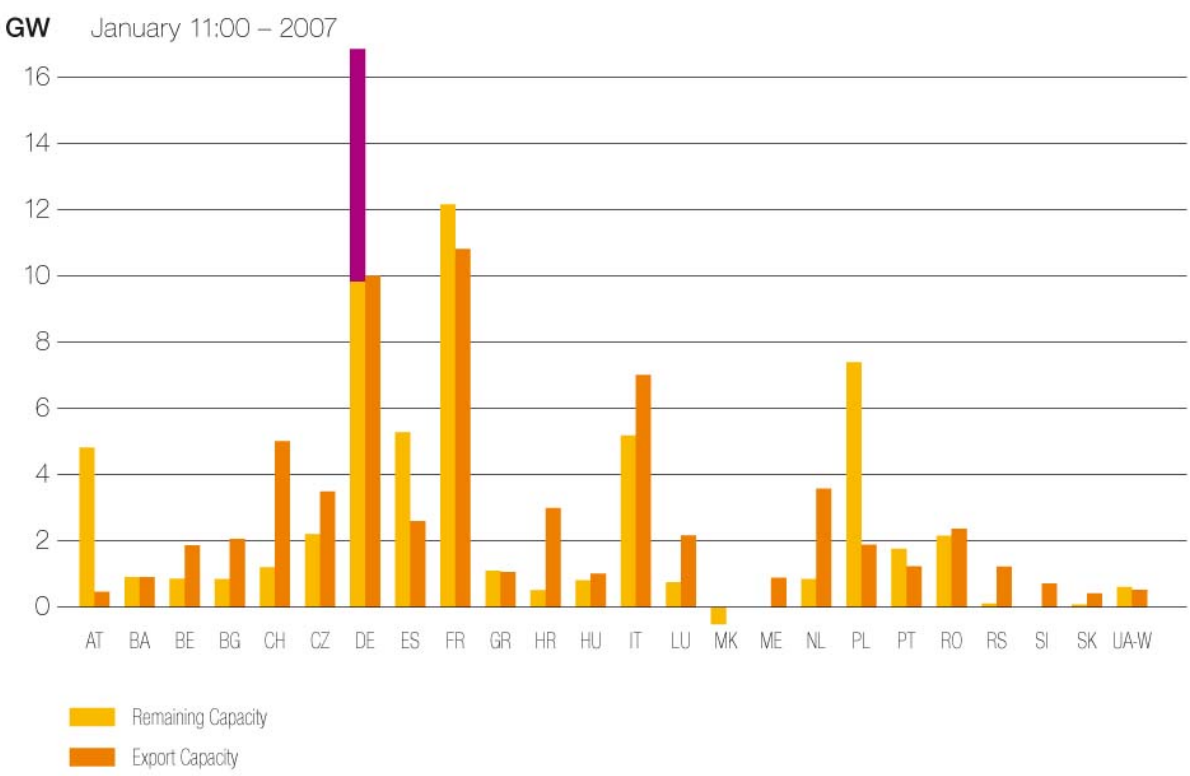
- between **main UCTE** and **NORDEL** (+700 MW in 2007)
- between **South Eastern UCTE** and **Turkey** (+400 MW in 2007)
- between **Main UCTE** and **CENTREL** (two projects for 2008)
- between **main UCTE** and **Spain+Portugal** (+1200 MW in 2010-2011)
- between **CENTREL** and **Romania-Bulgaria** (+500 MW in 2008)
- between **South-Eastern UCTE** and **Romania-Bulgaria** (+ 1700 MW in 2015)
- between **main UCTE** and **Italy** (+2000 MW in 2008-2010)
- between **main UCTE** and **United Kingdom** (+1320 MW around 2015)

3.2 Transmission Adequacy Simplified Analysis

To analyse transmission adequacy in a simplified way, a first comparison may be done between the Remaining Capacity of each country and the overall transmission capacity of its interconnection lines. Indeed, Remaining Capacity is the amount of generating capacity which may be available for exports in normal conditions at the reference time point. If it is higher than transmission capacity, congestions and tightened situations are likely to appear when implementing economic exchanges between countries, which can be interpreted as a need for reinforcing interconnection.

Due to corelation between export capacities on the various borders of a country, it is not allways possible to calculate the overall export capacitiy of a country by adding NTC values per border as given by ETSO. When necessary, Export Capacity have been estimated with values provided by correspondents. The following graph compares remaining capacities to export capacities.

Figure 15.1 **Remaining Capacity compared to Export capacity** **GW**



It appears on this graph that some countries like Spain or Poland are likely to have available Remaining Capacity significantly higher than their ability to export it. Countries with important remaining capacities like Germany or France seem to have transmission capacities approximately sized at the level of their ability to export.

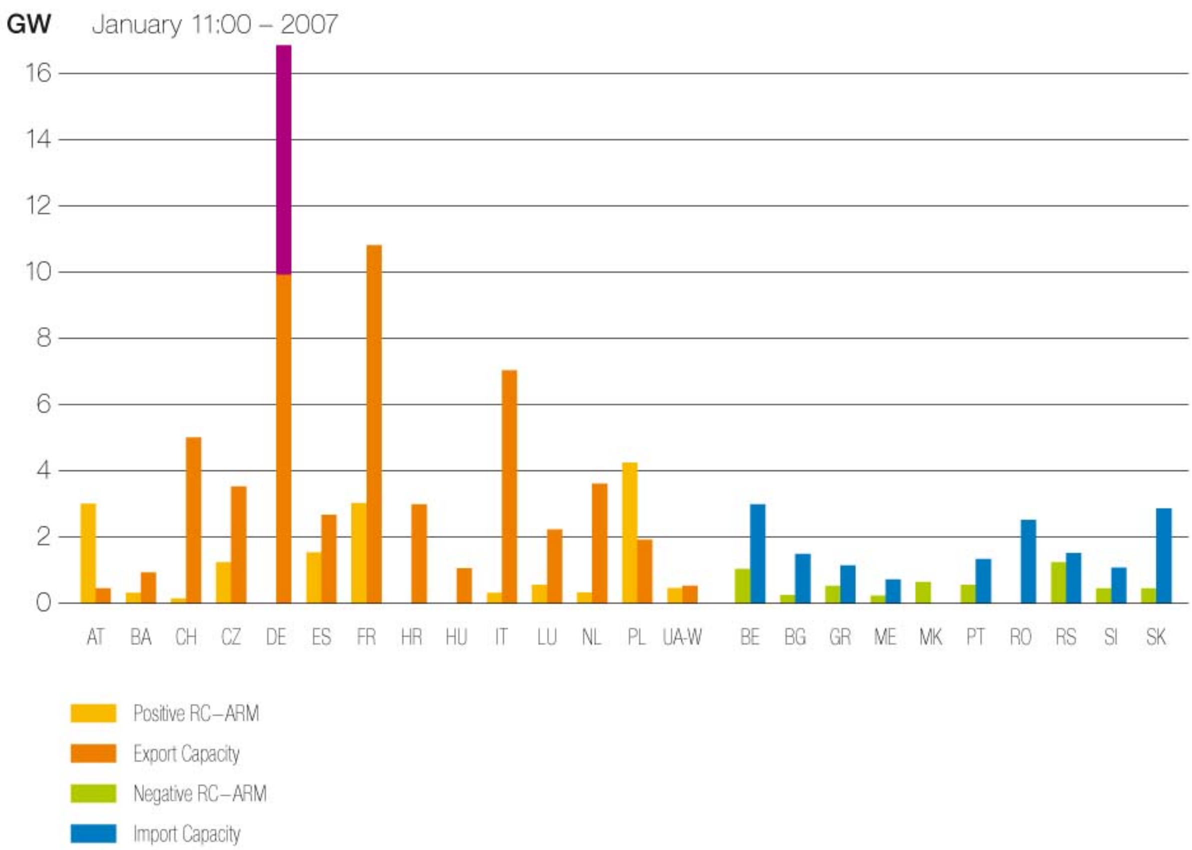
However it can not be excluded that, due to market phenomena (striving for the most economic use of power system resources), congestion points appear in the interconnected network, where transmission bottlenecks make it impossible to use available more economical electricity sources abroad. The increasing share of renewable energy sources in the generation mix, especially wind power, will contribute to reinforce these situations.

As seen in UCTE System Adequacy Retrospect 2005 (downloadable on http://www.ucte.org) high flows are observed on cross borders lines between BE, DE, NL and LU. Main congestions were mentioned at the borders between FR-CH-AT and Italy, within CENTREL and at the borders of CENTREL with Germany and Austria.

A second analysis consists in referring to “Remaining Capacity minus ARM” which may be interpreted as the “exportable” capacity under severe conditions when it is positive, or as the “need for import” when it is negative. It is interesting to compare the “exportable” and “import need” capacities respectively to the export / import capacities at the borders of the countries concerned. If the first ones are lower than the second ones, then congestion are likely to appear and prevent generation adequacy to be satisfied through exchanges between countries.

The following graph presents the comparison, for each country, between its “exportable” (respectively “import need”) capacity and the export (respectively import) capacity of its interconnection lines.

Figure 15.2 | **Remaining Capacity minus Adequacy Reference Margin compared to Export / Import capacities Including DSM potential** | **GW**



Overall, it appears that transmission capacities do not seem to be an obstacle to power balance achievement. The only limiting point concerns the export capacity of Poland and Austria, which is insufficient to enable exporting the generation available in these countries. But the important point is that no country likely to need to rely on imports when facing severe conditions seems to lack sufficient transmission capacity to do it.

3.3 Geographical Representation of Power Balance

Figures 16-1 to 16-4 summarize the results of the power balance forecasts in different regions of the UCTE synchronous area for the 3rd Wednesdays in January at 11:00, 2007, 2010, 2015 and 2020.

FIGURE 16-1
Data for January 2007

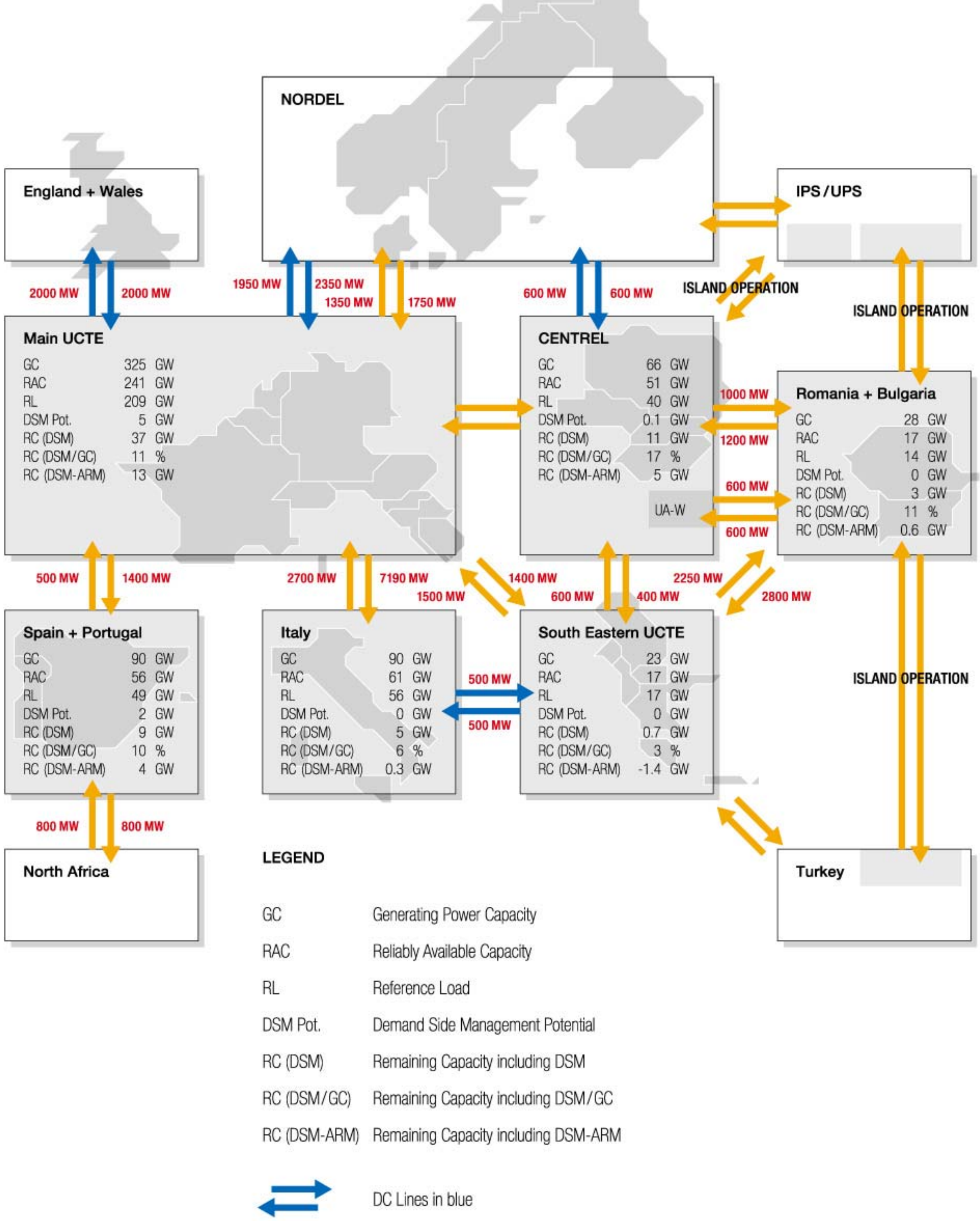


FIGURE 16-2
Data for January 2010 (Modified transport capacity are indicated only)

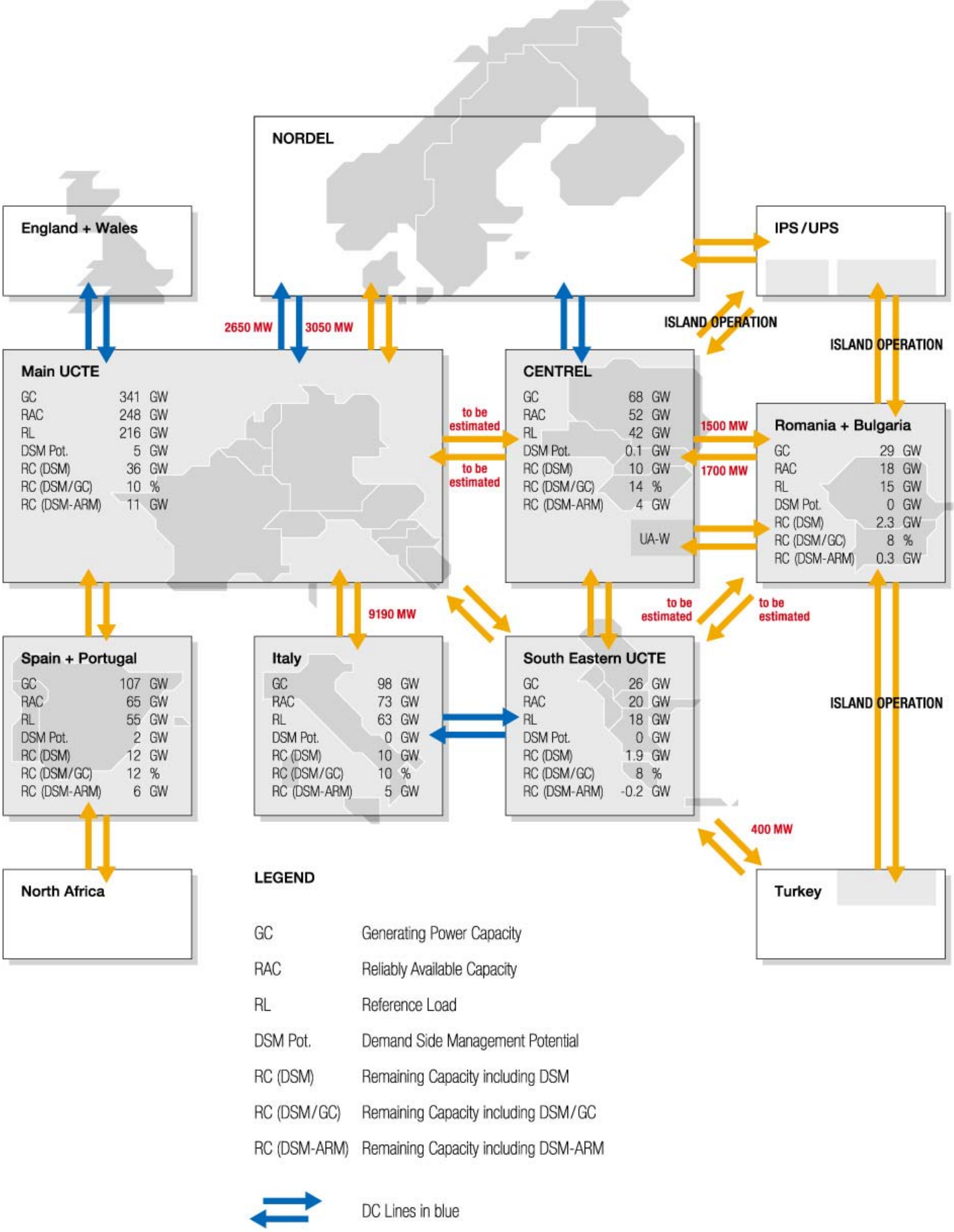


FIGURE 16-3
Data for January 2015 (Modified transport capacity are indicated only)

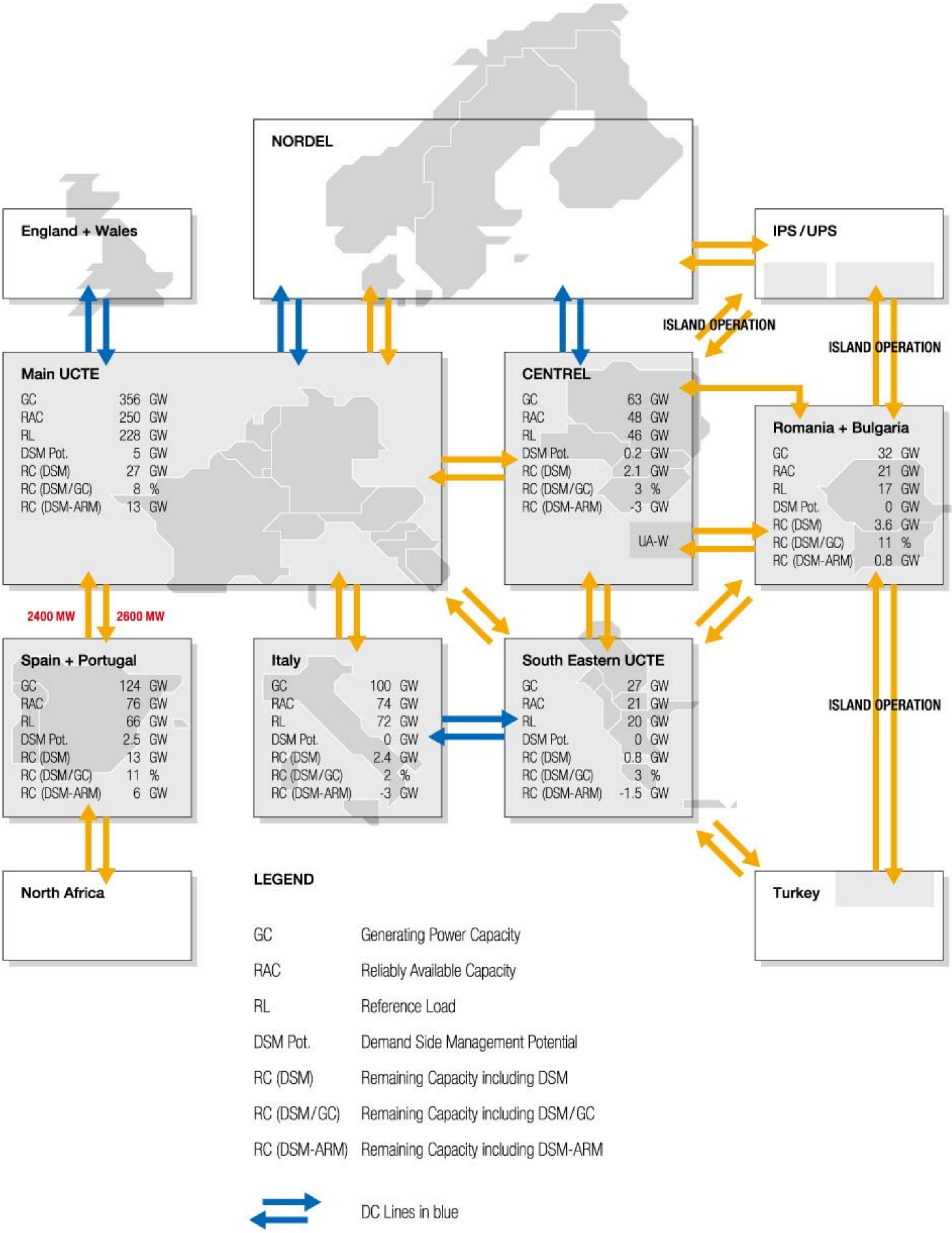
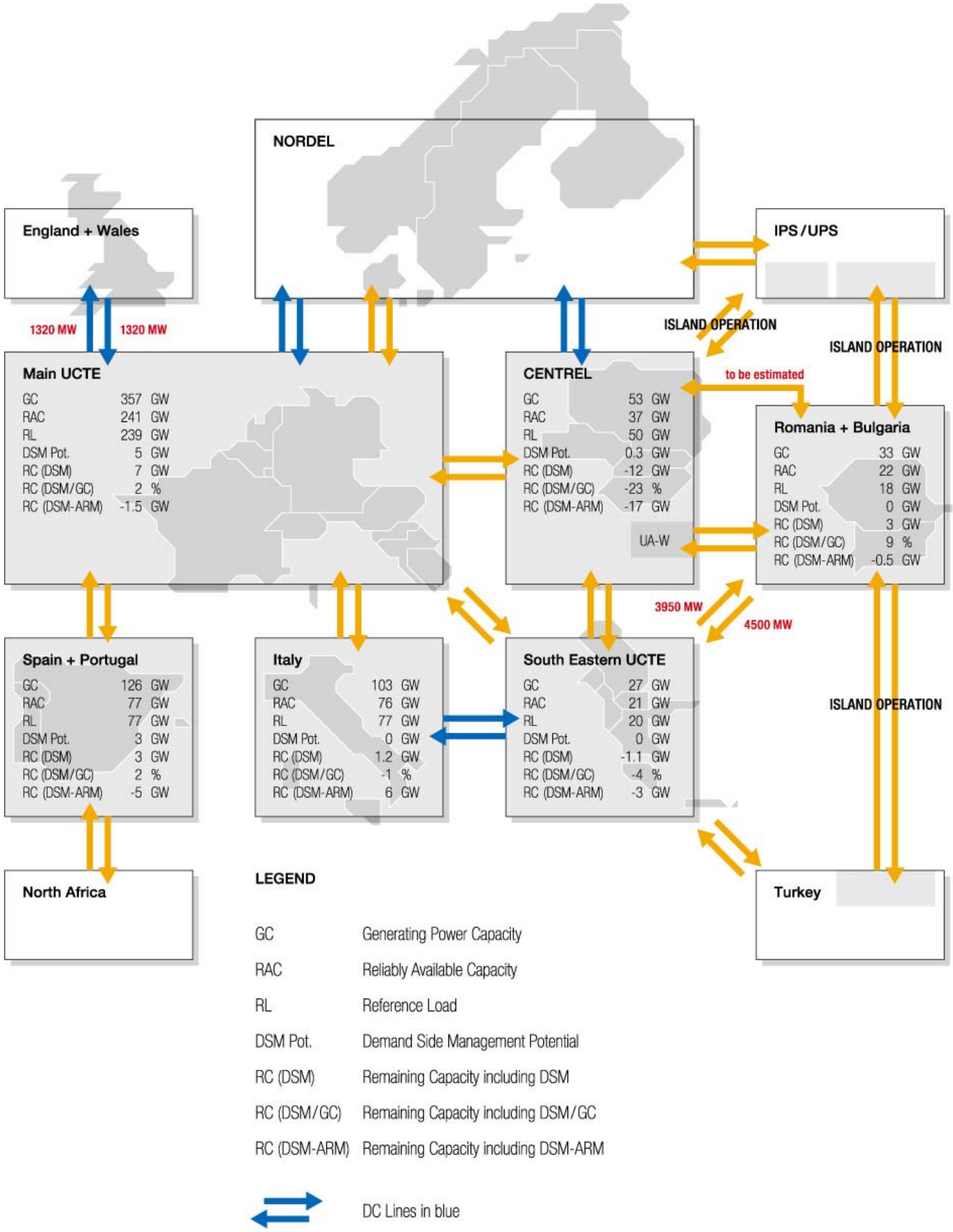


FIGURE 16-4
Data for January 2020 (Modified transport capacity are indicated only)



APPENDIX

APPENDIX A: DETAILED ANALYSIS OF THE POWER BALANCE ELEMENTS

A-1. Net generating capacity

The "**Generating Capacity"** of a power station is the maximum electrical net active power that it can produce continuously throughout a long period of operation in normal conditions, where:

"**Net**" means the difference between, on the one hand, the gross generating capacity of the alternator(s) and, on the other hand, the auxiliary equipments' load and the losses in the main transformers of the power station;

"**Normal Conditions**" mean average external conditions for thermal plants (weather, climate…) and full availability of fuel.

Table A-1.1 **UCTE-Power Balance, Net Generating Capacity Scenario A** **GW**

	2007		2010		2015		2020		2007 - 2010	2010 - 2015	2015 - 2020
	3rd Wednesday		*3rd Wednesday*		*3rd Wednesday*		*3rd Wednesday*		*Variation*	*Variation*	*Variation*
	Jan 11:00	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**Jan 11:00**	**Jan 11:00**
AT	18.3	18.3	19.5	19.5	21.5	21.5	21.5	21.5	6.6%	10.3%	-
BA	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	-	-	-
BE	16.2	16.3	17.2	17.2	16.7	16.3	14.9	14.9	6.1%	-2.8%	-10.7%
BG	11.2	11.2	11.8	11.9	12.9	12.6	13.7	13.9	5.4%	9.2%	6.0%
CH	17.5	17.5	17.7	17.7	17.8	17.8	17.8	17.8	1.1%	0.6%	-
CZ	16.3	16.4	16.4	16.4	16.4	16.4	16.4	16.4	0.6%	-	-
DE	122.3	123.9	130.9	134.0	141.0	140.9	145.2	145.6	7.1%	7.7%	3.0%
ES	76.4	78.5	90.2	91.8	107.0	108.9	110.2	110.2	18.1%	18.6%	3.0%
FR	116.4	116.0	117.3	117.3	117.9	117.9	115.5	115.5	0.8%	0.6%	-2.1%
GR	11.8	12.1	14.6	15.7	15.8	16.1	16.1	16.1	19.9%	11.3%	2.2%
HR	3.9	3.9	4.4	4.4	4.5	4.5	4.7	4.7	12.7%	1.3%	4.7%
HU	8.1	8.3	8.5	8.5	7.0	7.0	5.5	5.5	4.1%	-17.0%	-21.6%
IT	90.3	92.9	97.8	99.2	100.1	100.4	103.3	104.3	8.3%	2.4%	3.2%
LU	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.1%	1.1%	1.3%
MK	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	-	-	-
ME	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	2.9%	-	-
NL	22.1	22.1	25.3	25.3	27.1	27.1	27.0	27.0	14.6%	7.0%	-0.3%
PL	32.4	32.5	33.4	33.3	31.2	31.3	22.2	22.1	3.2%	-6.6%	-28.8%
PT	13.9	14.4	17.2	18.0	16.6	16.6	15.4	15.4	23.6%	-3.5%	-7.2%
RO	17.2	17.9	17.1	17.2	19.4	19.4	19.2	19.2	-0.4%	13.0%	-0.9%
RS	6.8	6.8	6.6	6.6	6.3	6.3	6.2	6.2	-2.4%	-5.3%	-1.8%
SI	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	0.1%	-	-
SK	2.9	2.9	3.4	3.4	4.4	4.4	4.5	4.5	18.4%	29.5%	2.3%
UA-W	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	-	-	-
UCTE	**623.2**	**631.0**	**668.6**	**676.6**	**702.8**	**704.7**	**698.6**	**700.1**	**7.2%**	**5.2%**	**-0.6%**

Specific Remarks:

Belgium

The national generating capacity of renewable energy sources consists of 331.4 MW of generating capacity in centralized power stations.

Scenario B is constructed using for the additional installed generating capacity of centralized power stations information from specific projects announced to the TSO. The increase in installed generating capacity of decentralized power stations, was obtained from the "indicative production plan 2005-2014" of the CREG (publication date: January 2005 - http://www.creg.be/pdf/Propositions/C388FR.pdf). The indicative production plan 2005-2014 of the CREG only provides information until 2019. Hence for scenario B the data related to decentralized power stations given for 2019 in the "indicative production plan 2005-2014" was used for 2020.

Switzerland

The installed capacity of the Swiss fossil fuel plants is relatively small. The Swiss Federal Office of Energy specifies the distribution of the fuels burned in these plants only with reference to the produced energy. The capacities are not specified.

France

Net Generating Capacity is quite stable throughout the years up to 2015. Decommissioning of thermal plants is compensated by the commissioning of a new nuclear unit in 2012 and by new wind power plants. In 2015 the oldest hard coal plants are decommissioned according to the Large Combustion Plants Directive.

In scenario B additional capacities result from the development of wind power plants and CCGT.

Greece

In Greece, the approach for generating capacity adequacy is deterministic on short term, probabilistic on medium and long term. The system adequacy is reached if LOLP = 0,5%.

There is a total of 113 MW co-generation capacity installed by independent producers. In addition, three gas peaking units of total capacity of 450 MW are to be installed.

The new thermal units will use natural gas. In addition, PPC is allowed to replace the old thermal units (lignite, oil) with units of new technology, but the old ones will be available to the HTSO to use them for reserve. The liberalization of the trade of natural gas and the promotion of RES is expected to change the generation mix.

Macedonia

The plants that will be commissioned by the end of 2008, are Hydro Power Plants, according to the EU Directive.

Portugal

This forecast is not directly affected by the CO2 Directive. However the expected developments in the generation, namely in the renewable generation, are determined by the energy policy designed to allow for compliance with the directive.

The important unavailability in the coal fired power plants due to the works needed for compliance with EC 2001/80/CE are included in this forecast.

Romania

To fulfill the requirements of European Directives in Romania, there have been adopted the following main laws:

- Law 3/2001 that ratified the Kyoto Protocol. Between 2008 and 2012 Romania has to reduce the greenhouse gases emissions by 8%, compared to their level in 1989. Governmental Decision 443/2003 regarding the promotion of the renewable energy sources. It establishes the legislative framework that increases the contribution of the renewable energy sources to the electricity production.
- Governmental Decision 1535/2003 that approves the Strategy for the Usage of the Energy Renewable Sources.
- Governmental Decision 1892/2004 that settles the system that promotes the renewable sources of energy.
- Governmental Decision 1429/2004 and Order 23/2004 that approves the surveying procedure for issuing the guarantee of origin for the electricity produced by renewable sources.
- Order 33/2004 that approves the Regulation for the qualification of the priority electricity production.

However, a significant change in the generation mix is not expected immediately, but there are certain preoccupations for the wind, solar, wave and small hydro energy development.

Slovak Republic

Based on the Directive EC 2001/80/CE on large the combustion plants in the Slovak Republic several thermal units will be also decommissioned. It is determined by the fact that the allocation of funds for reconstruction, aimed to maintain the requirements of the Law on protecting atmosphere (Act. No. 478/2002) is evaluated as ineffective.

Decommissioning of two nuclear power units is a consequence of the political decision taken during the negotiations of the Pre-accession Treaty with the EU in which the Slovak Republic committed to stop operating two units of the Nuclear Plant V1 Bohunice, in the period 2006-2008.

Except the expected decommissioning of the sources of the Slovenske Elektrarne - ENEL (dominant producer), another approximately 150 MW power capacity from other independent producers will be stopped due to old-fashioned equipments.

The usable potential sum up of the individual parts of renewable sources convenient for electricity production leaded the Government of the Slovak Republic to determine a minimal target of electricity production from RES to 19% in the year 2010. Among the most prospective renewable sources belongs biomass (coal burning together with wood waste, co-generation sources burning wood waste, etc.). Even taking into account the high usage of the hydro energetic potential of the Slovak Republic (in present approx. 60%), the hydro electricity production is still prospective. Having in view various reasons, the possibilities of using wind energy to produce electricity in Slovakia are to a certain extent modest.

The structure of the installed capacity in nuclear, thermal and hydro power plants is relatively equal (approx.1/3 each one). But the production of electricity from nuclear has dominated in the Slovak Republic. The situation in share of production will probably change from the next year.

In the future a considerable change in generation mix is not expected in the Slovak Republic. The share of the thermal sources should not be changed significantly considering their role on system services providing.

Spain

Generation mix (forecast) in 2016 (energy % in average hydrologic year):

- CCGT: 41 %
- Renewable: 27 % (including big hydro)
- Nuclear: 15 %
- Coal: 10 %
- Others: 7 %

Directive 2011/77/CE, Objective for Spain: 29.4 % of renewable

Table A-1.2 **UCTE-Power Balance, Net Generating Capacity Evolution January 11:00** **GW**

Generating Capacity	2007	2007 - 2010	2010 - 2015	2015 - 2020	2007 - 2015
Hydro power stations scenario A	134.8	2.9	3.3	2.0	8.2
Scenario B	134.8	4.2	6.4	2.9	13.6
Nuclear power stations scenario A	111.4	-2.5	-1.7	-6.9	-11.1
Scenario B	111.4	-2.5	-0.8	-6.9	-10.2
Conventional thermal power stations scenario A	323.9	16.2	13.4	-12.7	16.9
Scenario B	326.1	21.0	37.4	25.2	83.6
Renewable energy sources scenario A	53.0	28.8	19.1	13.5	61.4
Scenario B	53.1	31.6	30.3	27.3	89.2
Not clearly identifiable energy sources scenario A	-	-	-	-	-
Scenario B	-	-	-	-	-
NGC scenario A	623.2	45.4	34.2	-4.2	75.4
NGC scenario B	625.5	54.3	73.4	48.5	176.1

Table A-1.3 **UCTE-Power Balance, Additional Net Generating Capacity Scenario B Compared To Scenario A** **GW**

	2007		2008		2010		2015		2020	
	3rd Wednesday		*3rd Wednesday*		*3rd Wednesday*		*3rd Wednesday*		*3rd Wednesday*	
	Jan 11:00	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**
AT	-	-	0.2	0.2	0.5	0.5	-1.5	-1.5	-1.5	-1.5
BA	-	-	-	-	0.1	0.1	0.8	0.8	0.8	0.8
BE	0.2	0.2	0.3	0.3	1.8	1.8	3.2	3.2	3.7	3.7
BG	-	-	-	-	-	-	0.1	0.7	0.7	0.7
CH	-	-	-	-	1.2	1.2	2	2	2.8	2.8
CZ	-	-	-	-	0.3	0.3	1	1	1.6	1.6
DE	-	-	-	-	-	-	1.8	2.3	4.1	4.1
ES	-	-	-	-	-	-	-	-	14.8	14.8
FR	-	-	-	-	1.9	2.1	13.3	13.3	27.8	27.8
GR	-	-	-	-	-	-	0.4	0.4	0.4	0.4
HR	-	-	-	-	-	-	-	-	-	-
HU	-	-	-	-	0.3	0.3	2.8	2.8	5.5	5.5
IT	2	1.7	1.4	2.4	3	2.6	8.4	8.9	9	9.5
LU	-	-	-	-	-	-	-	-	-	-
MK	-	-	0.1	0.1	0.2	0.2	0.9	0.9	0.9	0.9
ME	-	-	-	-	-	-	0.4	0.4	0.4	0.4
NL	-	-	-	-	-	-	5.7	5.7	7.1	7.1
PL	-	0.1	0.1	0.2	1.3	2.2	3.7	4.1	12.3	12.7
PT	-	-	-	-	0.1	0.1	4.5	4.6	8.3	8.6
RO	-	-	-	-	-	-	0.3	0.3	1	1.1
SI	-	-	-	-	-	-	1.7	1.7	1.7	1.7
SK	-	-	-	-	-	-	0.7	0.7	1.3	1.3
RS	-	-	-	-	0.3	0.3	0.1	0.1	0.1	0.1
UA-W	-	-	-	-	-	-	-	-	-	-
UCTE	**2.3**	**2**	**2.1**	**3.2**	**11.1**	**11.8**	**50.3**	**52.5**	**103**	**104.1**

A-2.1. Non-usable capacity

Non-Usable Capacity is the capacity which cannot be freely used, for reasons resulting from:

- **Deliberate decisions**, such as:
  - capacity in conservation which is commissioned only in emergency cases,
  - **mothballed** capacity that can be re-commissoned by decision of the power plant operator.
    NB: In the forecast, all mothballed plants are considered to be unavailable (conservative approach) no matter how long in advance the decision of re-commissioning must be taken (from a few weeks to several years).
- **Unintentional causes**

Table A-2.1.1 **UCTE Power Balance, Non-Usable Capacity Scenario A** **GW**

	2007		2008		2010		2015		2020	
	3rd Wednesday		*3rd Wednesday*		*3rd Wednesday*		*3rd Wednesday*		*3rd Wednesday*	
	Jan 11:00	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**
AT	2.9	2.0	2.9	2.0	2.9	2.0	2.9	2.0	2.9	2.0
BA	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
BE	0.8	1.6	0.9	1.8	1.1	1.9	1.1	1.9	1.1	1.9
BG	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2
CH	4.4	2.7	4.4	2.7	4.4	2.7	4.4	2.8	4.4	2.8
CZ	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.2	2.2	2.2
DE	25.4	28.5	28.6	31.5	34.2	36.6	43.9	45.1	53.3	53.7
ES	23.8	24.6	25.5	26.3	30.5	31.3	34.3	35.3	35.5	35.5
FR	17.8	29.1	17.1	29.2	15.9	27.7	15.9	27.7	15.9	27.7
GR	1.1	1.2	1.2	1.3	3.2	3.2	3.2	3.2	3.2	3.2
HR	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
HU	0.6	0.8	0.6	0.8	0.7	0.9	0.7	0.9	0.8	0.9
IT	15.7	16.2	15.9	16.4	19.8	20.0	20.7	21.0	22.0	23.0
LU	-	-	-	-	-	-	-	0.1	0.1	0.1
MK	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
ME	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
NL	2.6	2.6	2.8	2.8	3.4	3.4	5.9	5.9	5.9	5.9
PL	2.1	3.9	2.3	4.1	3.4	9.9	3.3	9.2	2.4	6.4
PT	2.9	4.1	3.5	4.7	4.6	5.8	5.1	6.1	5.1	6.1
RO	3.7	3.7	3.7	3.5	3.8	4.0	6.0	7.6	6.1	7.7
SI	1.0	1.7	1.0	1.7	2.0	4.1	2.0	4.1	2.0	4.1
SK	0.3	0.3	0.4	0.3	0.5	0.6	0.5	0.6	0.5	0.6
RS	1.9	2.1	1.9	2.1	1.9	2.1	1.9	2.1	2.0	2.2
UA-W	0.4	0.3	0.3	0.3	0.1	0.2	0.1	0.3	-	0.3
UCTE	**112.7**	**131.0**	**118.4**	**137.2**	**138.0**	**162.2**	**157.6**	**181.7**	**168.7**	**189.8**

Table A-2.1.2 **Non-Usable Wind Power Capacity At January Peak Load** For countries which provided values only **In proportion of wind power capacity**

BE	DE	ES	FR	GR	IT	LU	NL	PT	CH	CZ	HU	PL	RO
90%	85-90%	95%	75%	73% to 80%	75%	50%	75%	73%	100%	75%	90%	75%	60%

A-2-2. Fossil fuel and nuclear power plants overhauls and outages

Maintenance and **overhauls** is the scheduled and organized unavailability, including recharging of fuel elements in nuclear power plants.

Outages is the forced unavailability, not belonging to one of the other categories of unavailable capacity.

Maintenance, overhauls and outages concerns nuclear and fossil fuel power stations only. For renewable and hydraulic capacity, as this information is not systematically available to TSO, these reductions in capacity should be included in the "Non- Usable Capacity".

For long-term forecasts, due to the lack of precise data, overhauls and outages may also be included in the **Non-Usable Capacity**.

Table A-2.2.1 **UCTE Power Balance, Overhauls Scenario A** **GW**

	2007 3rd Wednesday		2008 3rd Wednesday	
	Jan 11:00	**July 11:00**	**Jan 11:00**	**July 11:00**
AT	-	1.0	-	1.0
BA	0.1	0.2	0.1	0.2
BE	0.2	1.0	0.2	1.0
BG	0.6	2.2	0.5	2.3
CH	-	1.0	-	1.0
CZ	0.5	3.5	0.5	3.5
DE	2.3	10.5	2.3	10.8
ES	1.0	2.0	1.0	2.0
FR	0.9	12.4	0.9	13.3
GR	0.4	-	0.4	-
HR	-	-	-	-
HU	0.2	0.5	0.2	0.5
IT	5.4	5.7	5.6	6.0
LU	-	-	-	-
MK	-	0.1	-	0.1
ME	-	0.2	-	0.2
NL	0.8	0.8	0.8	0.8
PL	-	4.6	0.3	4.9
PT	0.4	0.4	-	0.4
RO	0.8	2.5	0.8	2.5
SI	-	1.9	-	1.9
SK	-	-	-	-
RS	-	0.7	-	0.7
UA-W	0.2	0.5	0.2	0.5
UCTE	**13.8**	**51.7**	**13.8**	**53.6**

Table A-2.2.2 **UCTE-Power Balance, Outages Scenario A** **Results in GW**

	2007 *3rd Wednesday*		2008 *3rd Wednesday*	
	Jan 11:00	**July 11:00**	**Jan 11:00**	**July 11:00**
AT	1.0	2.4	1.0	2.4
BA	0.2	0.2	0.2	0.2
BE	0.6	0.5	0.6	0.5
BG	0.4	0.4	0.4	0.4
CH	1.2	1.2	1.2	1.2
CZ	0.5	0.4	0.5	0.4
DE	3.2	2.5	3.2	2.5
ES	3.6	3.6	3.6	3.6
FR	3.1	2.7	3.2	2.7
GR	0.6	0.6	0.6	0.6
HR	-	-	-	-
HU	0.3	0.3	0.3	0.3
IT	4.5	4.5	4.7	4.7
LU	-	-	-	-
MK	-	-	-	-
ME	-	-	-	-
NL	0.6	0.6	0.6	0.6
PL	0.7	0.8	0.7	0.8
PT	0.2	0.2	0.2	0.2
RO	1.1	0.8	1.1	0.8
SI	1.0	0.5	1.0	0.5
SK	-	-	-	-
RS	0.1	0.1	0.1	0.1
UA-W	-	-	-	-
UCTE	**22.9**	**22.3**	**23.2**	**22.5**

A-2-3. Reserve for system services

The reserve for system services is the estimated reserve capacity which is required one hour before real time for system operation. It is therefore the reserve capacity which is available to TSOs from power plant operators, and includes the following specific elements:

- The "secondary reserve" and the "minute reserve", which are made available to TSOs under the contractual terms of the network frequency control service, using the requisite technical facilities;
- "Other reserves", such as reserves for voltage control or the management of bottlenecks, which are managed by TSOs under the terms of contracts.

However, the reserve for system services does not include reserves for long-term outages, which are to be covered by power plant operators.

Table A-2.3 **UCTE-Power Balance, Reserve For System Services Scenario A** **Results in GW**

	2007		2008		2010		2015		2020	
	3rd Wednesday		*3rd Wednesday*		*3rd Wednesday*		*3rd Wednesday*		*3rd Wednesday*	
	Jan 11:00	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**
AT	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
BA	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
BE	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
BG	1.2	1.1	1.2	1.1	1.3	1.1	1.4	1.2	1.4	1.2
CH	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
CZ	1.5	1.3	1.5	1.3	1.7	1.5	1.7	1.5	1.7	1.5
DE	7.5	7.3	7.6	7.3	7.6	7.3	7.8	7.4	8.0	7.4
ES	1.5	1.5	1.6	1.6	1.8	1.8	2.0	2.0	2.5	2.5
FR	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
GR	0.8	0.8	0.8	0.8	-	-	-	-	-	-
HR	0.3	0.3	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5
HU	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0
IT	3.3	3.6	4.5	4.6	4.9	5.0	5.0	5.0	5.5	5.7
LU	-	-	-	-	-	-	-	-	-	-
MK	-	-	-	-	-	-	-	-	-	-
ME	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NL	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PL	1.6	1.5	1.6	1.5	1.7	1.5	1.7	1.5	1.8	1.5
PT	0.8	0.7	0.8	0.7	0.8	0.7	0.9	0.8	0.9	0.9
RO	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
SI	0.3	0.2	0.3	0.2	0.3	0.2	0.4	0.2	0.4	0.2
SK	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5
RS	0.9	0.8	0.9	0.8	0.9	0.8	1.0	0.9	1.1	1.0
UA-W	0.4	0.4	0.4	0.4	0.5	0.4	0.5	0.4	0.5	0.4
UCTE	**29.8**	**29.2**	**31.3**	**30.4**	**31.5**	**30.5**	**32.6**	**31.3**	**34.1**	**32.7**

Specific Remarks:

Belgium

The system services reserve consists of 100 MW primary reserve, 800 MW minutes reserve and 450 MW other reserves. Only 600 MW (150 MW secondary reserve and 450 MW tertiary reserve) of the minutes reserve is considered. The remaining 200 MW of the minutes reserve are load shedding contracts with industrial customers. This type of reserve in not included in the UCTE definition of system services reserve.

The 450 MW 'Other reserves' is contractly imposed by Elia on the generator with the biggest unit, but does not fall under the operational responsibility of Elia. The origin of the imposition is the Grid Code: every ARP (Access Responsible Party) is responsible for his own balance. This reserve is included because it is a part of the system services reserve as determined by the UCTE rules.

Switzerland

In winter we consider that the following capacities are not usable (the values in the parenthesis refer to the year 2007):

75% of the run of river hydroelectric power plant's capacity (2.7 GW)
10% of the capacity of the reservoir hydroelectric power plants (0.79 GW)
20% of the pump storage hydroelectric power plant's capacity (0.36 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 fossil fuel thermal power plant's capacity – mostly cogeneration of heat and electricity (0.02 GW)
100% of renewable energy sources (only 0.2 GW)
100% of the industrial plant's capacity (only 0.2 GW)

In summer we consider that the following capacities are not usable (the values in the parenthesis refer to the year 2007):

50% of the run of river hydroelectric power plant's capacity (1.8 GW)
100% of the small fossil fuel thermal power plant's capacity – mostly cogeneration of heat and electricity (0.5 GW)
100% of renewable energy sources (only 0.2 GW)
100% of the industrial plant's capacity (only 0.2 GW)

Germany

The share of German primary control reserve in the UCTE totals approx. 750 MW. Essential changes are not likely to occur.

The higher share of minutes reserve and other reserves in the generating capacity in Germany as compared to other countries is attributable to the high portion of wind power which is frequently not available at peak times.

The provision of reserves for system services of TSOs is regulated on the basis of private-law contracts. Since 2001, a tendering procedure has existed in Germany for control power and imbalance energy, respectively. TSOs are not prohibited from holding available their own generating capacity for control energy. However, this is currently not being practised.

As a result of the far-advanced unbundling process, there is a clear distinction in Germany between TSOs and electricity producers. System operators bind their power requirements through contracts which have partly been subject to international tendering since 2001.

Macedonia

Primary ,Secondary and other reserves, are calculated according to UCTE calculations of the whole UCTE zone. These values are calculated for the next year, according to the values of this year. After that the values are calculated for the JIEL Block, and then for each country separately. These calculations depend on the consumptions of the countries for the last year.

The Netherlands

The seconds reserve is fixed on basis of the UCTE-obligations, which are borrowed within our System Code.

Minutes reserve is for 65% contracted by TenneT TSO BV and must be direct available. The remaining 35% is obtained by voluntary bids within a bidding system, which is managed by TenneT TSO BV.

In case of congestions the same bidding system is used to extract power from the market to manage these congestions.

Besides of these reserves the generating companies maintain for their own purposes an unknown amount of system services reserves.

A-3. Reliably available capacity

Reliably Available Capacity is obtained by deducing non-usable capacity, overhauls, outages and system reserve from the Net Generating Capacity.

Reliably Available Capacity represents the capacity which is available to power plant operators and electricity traders to match their customers' demand.

Table A-3.1 **UCTE-Power Balance, Reliably Available Capacity Scenario A** **GW**

	2007		2008		2010		2015		2020	
	3rd Wednesday		*3rd Wednesday*		*3rd Wednesday*		*3rd Wednesday*		*3rd Wednesday*	
	Jan 11:00	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**
AT	13.7	12.2	13.8	12.3	14.9	13.4	16.9	15.4	16.9	15.4
BA	2.7	2.6	2.7	2.6	2.7	2.6	2.7	2.6	2.7	2.6
BE	13.5	11.9	13.6	12.0	14.1	12.5	13.7	11.7	12.0	10.6
BG	7.0	5.4	7.2	5.4	7.7	5.7	8.7	6.4	9.4	7.8
CH	11.0	11.7	11.1	11.8	11.2	11.9	11.3	11.9	11.3	11.9
CZ	11.8	9.2	11.9	9.2	11.5	8.8	11.5	8.8	11.5	8.8
DE	83.9	75.3	84.7	77.0	83.5	76.9	83.7	75.3	78.4	71.3
ES	46.5	46.8	49.0	47.9	53.3	53.1	66.1	66.0	67.7	66.7
FR	91.6	68.8	92.6	68.6	93.9	70.6	94.5	71.2	92.2	69.3
GR	9.0	9.5	9.3	10.1	11.4	12.5	13.0	12.9	12.9	12.9
HR	3.4	3.4	3.8	3.8	3.9	3.9	3.8	3.8	4.0	4.0
HU	6.2	5.8	6.4	6.0	6.4	5.8	4.8	4.3	3.2	2.7
IT	61.4	62.9	63.9	64.2	73.1	74.2	74.4	74.4	75.8	75.6
LU	1.6	1.6	1.7	1.6	1.7	1.6	1.7	1.7	1.7	1.7
ME	0.6	0.4	0.6	0.4	0.6	0.5	0.6	0.5	0.6	0.5
MK	1.0	0.8	1.0	0.8	1.0	0.8	1.0	0.8	1.0	0.8
NL	17.1	17.1	17.2	17.2	19.4	19.4	18.6	18.6	18.5	18.5
PL	27.9	21.7	27.8	21.5	28.3	21.9	26.2	20.6	18.0	14.2
PT	9.7	9.0	10.4	9.2	11.6	10.9	10.1	8.9	8.9	7.7
RO	10.2	9.5	10.5	9.5	9.9	8.6	12.0	10.3	11.7	10.1
RS	6.6	4.6	6.6	4.6	6.6	4.6	6.6	4.6	6.5	4.6
SI	2.1	2.1	2.1	2.1	2.5	2.4	3.4	3.3	3.5	3.4
SK	3.9	3.1	3.9	3.1	3.7	2.9	3.3	2.5	3.0	2.2
UA-W	1.6	1.3	1.6	1.3	1.8	1.4	1.8	1.4	1.9	1.5
UCTE	**444.0**	**396.7**	**453.4**	**402.5**	**474.7**	**427.0**	**489.9**	**437.9**	**473.2**	**424.5**

Table A-3.2 **UCTE-Power Balance, Additional Reliably Available Capacity Scenario B Compared To Scenario A** **GW**

	2007		2008		2010		2015		2020	
	3rd Wednesday		*3rd Wednesday*		*3rd Wednesday*		*3rd Wednesday*		*3rd Wednesday*	
	Jan 11:00	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**	**Jan 11:00**	**July 11:00**
UCTE	**3.3**	**2.8**	**2.1**	**2.6**	**7.9**	**7.6**	**36.1**	**36.0**	**75.7**	**72.5**

A-4. Load

Load is the power absorbed by all installations, in any field of activity[1], connected to the transmission and distribution systems, including the network losses but excluding the pumps of pumped-storage stations.

Normal climatic conditions, e.g. outdoor temperatures corresponding to the multi-annual average, and normal development of economic activities are assumed in the forecast.

Table A-4.1 **UCTE-Power Balance, Reference Load Without DSM Potential** **GW**

	2007			2010			2015			2020		
	3rd Wednesday			*3rd Wednesday*			*3rd Wednesday*			*3rd Wednesday*		
	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
AT	8.9	8.8	7.7	9.4	9.3	8.1	10.4	10.3	9.0	11.5	11.3	9.9
BA	1.8	1.9	1.5	1.9	2.0	1.6	2.2	2.4	2.0	2.2	2.4	2.0
BE	12.6	13.0	10.8	13.4	13.8	11.4	14.2	14.6	12.1	15.1	15.6	12.9
BG	6.2	6.6	3.8	6.5	7.0	4.0	6.8	7.3	4.2	7.2	7.6	4.6
CH	9.8	9.3	8.0	10.3	9.8	8.4	10.6	10.1	8.7	11.1	10.6	9.0
CZ	9.6	9.8	7.0	10.0	10.1	7.3	10.5	10.7	7.7	11.0	11.2	8.1
DE	74.0	74.1	66.5	75.4	75.6	67.7	76.5	76.8	68.8	77.7	78.0	69.8
ES	41.2	43.2	40.8	45.9	47.9	45.3	55.1	57.1	55.1	64.2	66.2	63.9
FR	79.4	80.6	58.6	82.5	84.3	61.6	87.8	89.1	65.6	93.1	94.0	69.7
GR	7.9	8.2	9.4	8.6	8.9	10.3	10.1	10.4	12.0	11.7	12.0	14.2
HR	2.9	2.8	2.3	3.4	3.3	2.7	4.3	4.1	3.4	5.5	5.3	4.3
HU	5.4	5.6	5.3	5.8	6.0	5.6	6.6	6.8	6.1	7.3	7.5	6.8
IT	56.2	56.4	56.8	62.9	63.2	63.8	72.0	72.0	73.0	77.0	77.0	78.0
LU	0.9	0.7	0.9	1.1	0.9	1.0	1.2	0.9	1.1	1.3	1.0	1.2
ME	0.7	0.7	0.5	0.7	0.8	0.6	0.8	0.8	0.6	0.8	0.9	0.7
MK	1.5	1.6	1.0	1.7	1.7	1.0	1.9	2.0	1.2	1.9	2.3	1.4
NL	16.3	16.1	15.3	17.0	16.8	16.0	18.0	17.8	17.0	19.1	18.9	18.1
PL	20.5	21.7	17.5	21.5	22.6	18.4	23.2	24.4	19.9	25.8	27.1	22.1
PT	7.9	8.5	7.2	8.8	9.4	8.0	10.5	11.2	9.5	12.3	13.2	11.1
RO	8.0	8.4	5.9	8.9	9.4	6.4	10.2	10.8	7.4	10.8	12.0	8.6
RS	6.5	6.7	3.8	6.8	7.0	4.2	7.3	7.5	4.6	7.8	8.1	4.9
SI	2.1	2.1	1.9	2.3	2.3	2.1	2.5	2.5	2.3	2.7	2.7	2.5
SK	3.8	3.9	3.0	4.0	4.1	3.2	4.3	4.4	3.5	4.6	4.8	3.7
UA-W	1.0	1.0	0.6	1.0	1.1	0.6	1.0	1.1	0.7	1.1	1.2	0.7
UCTE	**385.1**	**391.8**	**336.0**	**409.5**	**417.0**	**359.1**	**448.1**	**455.4**	**395.4**	**482.8**	**490.8**	**428.**

[1] such as agriculture, industry, transports, services, households, …

Table here below shows the average annual increase over the periods 2007-2010, 2010-2015 and 2015-2020.

Table A-4.3 **UCTE-Power Balance, Reference Load Average Annual Growth** **%**

	2007 - 2010			2010 - 2015			2015 - 2020		
	3rd Wednesday			*3rd Wednesday*			*3rd Wednesday*		
	January		July	January		July	January		July
	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00
AT	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
BA	1.8	1.7	2.2	3.0	3.7	4.6	-	-	-
BE	1.9	1.9	1.9	1.2	1.2	1.2	1.3	1.3	1.3
BG	1.6	2.0	1.7	0.9	0.8	1.0	1.0	0.7	1.6
CH	1.7	1.8	1.6	0.6	0.6	0.7	0.9	1.0	0.7
CZ	1.4	1.0	1.4	1.0	1.2	1.1	0.9	0.9	1.0
DE	0.5	0.6	0.5	0.3	0.3	0.3	0.3	0.3	0.3
ES	3.6	3.4	3.5	3.8	3.7	4.1	3.1	3.0	3.0
FR	1.6	1.8	1.7	1.3	1.2	1.3	1.2	1.1	1.3
GR	3.0	2.6	3.1	3.3	3.2	3.1	3.0	2.9	3.4
HR	5.0	5.1	5.0	5.0	5.0	5.0	5.0	5.0	5.0
HU	2.2	2.2	1.6	2.6	2.6	1.8	1.7	1.7	1.7
IT	3.8	3.9	3.9	2.7	2.6	2.7	1.4	1.4	1.3
LU	6.0	7.0	2.6	2.0	2.0	2.0	1.3	1.7	2.0
MK	1.6	1.4	3.0	1.3	1.2	1.2	1.0	1.0	1.0
ME	3.0	2.7	3.1	2.5	3.5	2.7	0.3	2.3	2.6
NL	1.4	1.4	1.5	1.3	1.3	1.4	1.2	1.3	1.3
PL	1.6	1.3	1.6	1.5	1.5	1.6	2.1	2.1	2.1
PT	3.5	3.5	3.7	3.6	3.6	3.5	3.2	3.2	3.2
RO	3.4	3.5	2.8	2.9	3.0	3.0	1.1	2.1	2.9
SI	1.5	1.5	3.4	1.4	1.4	1.8	1.3	1.6	1.3
SK	2.4	3.1	4.3	1.7	1.7	1.8	1.6	1.6	1.7
RS	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5
UA-W	1.1	1.0	1.7	1.0	1.0	1.6	1.0	0.9	1.5
UCTE	**2.1**	**2.1**	**2.2**	**1.8**	**1.8**	**1.9**	**1.5**	**1.5**	**1.6**

A-5. Load reduction measures

Demand Side Management (DSM) potential is the expected effect of any measures aiming at voluntarily reducing load at peak period through tariffs, contractual disposals or market mechanism. It may be considered by the TSO as a way to increase system services reserve.

Table A-5.1 **UCTE-Power Balance, Demand Side Management Potential** **GW**

	2007			2010			2015			2020		
	3rd Wednesday			*3rd Wednesday*			*3rd Wednesday*			*3rd Wednesday*		
	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
BE	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
CZ	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DE	0.1	0.1	0.1	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5
ES	2.0	2.0	2.0	2.3	2.3	2.3	2.5	2.5	2.5	3.0	3.0	3.0
FR	3.7	3.7	1.0	3.0	3.0	1.0	3.0	3.0	1.0	3.0	3.0	1.0
HU	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
NL	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
UCTE	**7.1**	**7.1**	**4.4**	**7.0**	**7.0**	**5.0**	**7.4**	**7.4**	**5.4**	**8.0**	**7.0**	**6.0**

Table A-5.2 UCTE-Power Balance, Reference Load Including DSM Potential GW

	2007 3rd Wednesday			2010 3rd Wednesday			2015 3rd Wednesday			2020 3rd Wednesday		
	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
AT	8.9	8.8	7.7	9.4	9.3	8.1	10.4	10.3	9.0	11.5	11.3	9.9
BA	1.8	1.9	1.5	1.9	2.0	1.6	2.2	2.4	2.0	2.2	2.4	2.0
BE	12.4	12.8	10.6	13.2	13.6	11.2	14.0	14.4	11.9	14.9	15.4	12.7
BG	6.2	6.6	3.8	6.5	7.0	4.0	6.8	7.3	4.2	7.2	7.6	4.6
CH	9.8	9.3	8.0	10.3	9.8	8.4	10.6	10.1	8.7	11.1	10.6	9.0
CZ	9.6	9.8	7.0	10.0	10.1	7.3	10.5	10.7	7.7	11.0	11.2	8.1
DE	73.9	74.0	66.4	75.1	75.3	67.4	76.0	76.3	68.3	77.2	77.5	69.3
ES	39.2	41.2	38.8	43.6	45.6	43.0	52.6	54.6	52.6	61.2	63.2	60.9
FR	75.7	76.9	57.6	79.5	81.3	60.6	84.8	86.1	64.6	90.1	91.0	68.7
GR	7.9	8.2	9.4	8.6	8.9	10.3	10.1	10.4	12.0	11.7	12.0	14.2
HR	2.9	2.8	2.3	3.4	3.3	2.7	4.3	4.1	3.4	5.5	5.3	4.3
HU	5.4	5.6	5.3	5.8	5.9	5.5	6.5	6.7	6.0	7.1	7.3	6.6
IT	56.2	56.4	56.8	62.9	63.2	63.8	72.0	72.0	73.0	77.0	77.0	78.0
LU	0.9	0.7	0.9	1.1	0.8	0.9	1.2	0.9	1.0	1.3	1.0	1.1
ME	0.7	0.7	0.5	0.7	0.8	0.6	0.8	0.8	0.6	0.8	0.9	0.7
MK	1.5	1.6	1.0	1.7	1.7	1.0	1.9	2.0	1.2	1.9	2.3	1.4
NL	15.3	15.1	14.3	16.0	15.8	15.0	17.0	16.8	16.0	18.1	17.9	17.1
PL	20.5	21.7	17.5	21.5	22.6	18.4	23.2	24.4	19.9	25.8	27.1	22.1
PT	7.9	8.5	7.2	8.8	9.4	8.0	10.5	11.2	9.5	12.3	13.2	11.1
RO	8.0	8.4	5.9	8.9	9.4	6.4	10.2	10.8	7.4	10.8	12.0	8.6
RS	6.5	6.7	3.8	6.8	7.0	4.2	7.3	7.5	4.6	7.8	8.1	4.9
SI	2.1	2.1	1.9	2.3	2.3	2.1	2.5	2.5	2.3	2.7	2.7	2.5
SK	3.8	3.9	3.0	4.0	4.1	3.2	4.3	4.4	3.5	4.6	4.8	3.7
UA-W	0.9	1.0	0.6	0.9	1.0	0.6	1.0	1.1	0.6	1.0	1.1	0.7
UCTE	**378.0**	**384.7**	**331.6**	**402.6**	**410.1**	**354.2**	**440.6**	**448.0**	**390.0**	**474.8**	**482.7**	**422.0**

Specific remarks:

Belgium

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

Switzerland

Thanks to the existing very good centralized ripple control systems there are no strong daily peaks in Switzerland. However, this doesn’t mean that this is a result of special market mechanisms. The existing contracts of consumers with suppliers allow this kind of load management. It can be estimated that its potential effect in the future is not very important, because it is already at its maximum.

Greece

In Greece, the bulk of electrical energy is produced in the North, while the consumption is concentrated in the South. In the past, measures for voluntary load reduction were applied in heavy load periods. In order to benefit from special prices by PPC, Eligible customers signed a contract for load reduction at peaks. Upon decision of the Ministry and the Regulatory Authority similar measures may be into force in the future, if necessary.

In full operation of the Market, the high market prices at the peaks will influence the prices contracted between purshasers and consummers, resulting in load management through the application of a tarification policy.

The Netherlands

Recent investigations of Ministry of Economic Affairs show that the market itself has a DSM potential of 1000-1500 MW directly related to market prices. There are no specific tariffs. Within the bid-system for reserve and regulation power of TenneT TSO BV part of this market potential can be used.

Actually there are some contracts in place for emergency power, which is based on sheddable load, to be used when reserve margins are too low.

Poland

Several DSM programs were implemented in the past by some of Distribution Utilities. Their impact of power system operation was negligible, as well as savings obtained at the whole system level.

In the future, implementation of new DSM programs is conditioned by development of competitive electricity market and introduction of relevant regulations and incentives.

Current load and energy demand projections show that tertiary sector (mostly services) would have higher growth than other sectors. Also bigger agglomerations would have higher growth of load due to faster economic development.

Mentioned above projections take into account further increase of electricity utilization efficiency, which is a one of key elements of national energy policy.

Portugal

A mechanism of interruptibility is available in Portugal but its potential effect is not considered in this study.

We did not consider in this study any other mechanisms that could be created in the future. Probably, in this horizon, some mechanisms will be created namely in the sequence of the future European Directive related to Energetic Efficiency in Final Consumption.

Romania

The assessment of the evolution load takes into account the geographical development concerning the economic and social factors.

There is a national energetic efficiency strategy that has impact on the load development. The increase of energy efficiency in economical and social sectors carries on an annual increasing load rate greater than the required primary energy one.

APPENDIX B: GENERATION ADEQUACY FEATURE

The table here below shows which kind of feature is used to assess the generation adequacy in the different countries. That point is interesting from the power system reliability point of view.

Country	Deterministic or probabilistic	Mandatory standards on generation adequacy
BE	For "the indicative production plan" the CREG uses a probabilistic methodology. The adequacy criterion for generation used in this publication is a LOLE of 16 hours/year.	The "indicative production plan" which is a prospective study on adequacy was the responsibility of the regulator (Commission for Electricity and Gas Regulation – CREG). As from 1th of September 2006 this is the responsibility of the Department of the Ministry in charge of Energy.
DE	Deterministic for primary control power; Probabilistic approach used by the TSOs	"Transmission Code" requirements
ES	Deterministic	"Operation procedures" requirements
FR	Probabilistic, (10% of probability of loss of load within one year, fairly consistent with a LOLE of 4h/year)	No mandatory standard but agreement with the Ministry in charge of Energy
GR	Deterministic for the short term, probabilistic for the medium and long term	Operation code, Power Exchange Code and the "Authorisations Regulation for Generation and Supply" requirements
IT	Both	-
SI	Deterministic	"System Operating Instructions for The Electricity Transmission Network" requirements
HR	Deterministic	"Annual Energy Balancing Plan" and internal documents on system operation
JIEL	-	-
LU	-	-
NL	None, left to the market on the basis of "price produces supply"	"National system code" requirements
AT	-	No mandatory standards
PT	<u>Probabilistic</u> ⇨ LOLE - less than 2.5% of the months ⇨ LOEP (in dry hydro conditions) - below 0.4% of total consumption <u>Deterministic</u> Reserve Margin enough to cover the following simultaneous contingencies: ⇨ Higher peak load due to severe temperature conditions; ⇨ Extreme lack of primary energy (wind, hydro, other) ; ⇨ Forced outage of the most rated hydro and thermal unit.	No mandatory standards, but the probabilistic feature used in long-term generation adequacy studies was established by the Ministry of Economic Affairs.
CH	Deterministic	No mandatory standards – shared responsibility between the Federal Ministry of Energy, the cantonal ministries and the Power Utilities
CZ	Deterministic – for the TSO's short term operational planning Probabilistic – for the long term planning	No mandatory standards
HU	Probabilistic, LOLE	Middle & Long Term Forecast Plan
PL	Deterministic	"Polish Grid Code" requirements
SK	Deterministic	Requirements resulting from operation.
BG	Probabilistic, LOLP and LOLE optimal value calculation	-
RO	Deterministic for short term ("largest unit"), probabilistic for medium and long term (LOLE and LOLP)	"Grid Technical Code" requirements
UA-W	-	Guide-lines for power system stability; operating rules for Transmission network and Power stations.
RS	Deterministic	Grid Code
ME	Deterministic	-
BA	-	"ZEKC Book of Rules and obligations" requirements

APPENDIX C: TRANSMISSION GRID DEVELOPMENT

Main UCTE:

Belgium

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Installation of a phase shifter in Monceau		End 2006	
Monceau - Jamiolle - Chooz	220 kV	End 2006	Upgrade of the 150kV line
Installation of a phase shifter in Zandvliet and two phase shifters in Van Eyck	380 kV	End 2007	

All these investments will increase the simultaneous import capacity of Belgium.

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

+ 300 MW in 2008

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

+ 300 MW in 2007

+ 300 MW in 2008

Germany

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
SS Goldshöfe, substitution of the 220-kV-SS	380 kV	end of 2008	
SS Niederstotzingen, substitution of the 220-kV-SS	380 kV	end of 2008	
SS Dellmensingen, upgrading of the 220-kV-SS to 380 kV	380 kV	end of 2010	
OHL Goldshöfe-Niederstotzingen, upgrading of line operation from 220 kV to 380 kV	380 kV	end of 2008	single circuit, AC line, 76 km
OHL Dellmensingen –Niederstotzingen upgrading of line operation from 220 kV to 380 kV	380 kV	end of 2008	single circuit, AC line, 67 km
SS Metzingen, upgrading of the 220-kV-SS to 380 kV	380 kV	end of 2007	
OHL section Reicheneck-Rommelsbach, additional connection of SS Metzingen to 380 kV-grid	380 kV	end of 2007	single circuit section, AC line
SS Wendlingen, upgrading of the 220-kV-SS to 380 kV	380 kV	2015	
SS Mühlhausen, upgrading of the 220-kV-SS to 380 kV	380 kV	2009	
OHL section Neckarrems-Mühlhausen, two connections of SS Mühlhausen to 380 kV-grid	380 kV	2007	two single circuit sections, AC line
SS Pulverdingen, enlargement	380 kV	end of 2012	
OHL Oberjettingen-Engstlatt	380 kV	2007	single circuit, AC line, 34 km
SS Trossingen, upgrading of the 220-kV-SS to 380 kV	380 kV	end of 2008	
Ganderkesee (DE)St. Hülfe (DE)	400 KV	2011	Ø
Diele (DE)Niederrhein (DE)	400 KV	2015	Ø
Krümmel – Görries	380 kV	2007	double circuit 75 km, AC
Lauchstädt – Vieselbach	380 kV	2008	double circuit, 80 km, AC

Vieselbach – Altenfeld	380 kV	2010	double circuit, 80 km, AC (prepared for 4 x 380 kV)
Altenfeld – Redwitz (E.ON Netz)	380 kV	2010	double circuit, 60 km, AC (partly prepared for 4 x 380 kV)
Neuenhagen – Bertikow/Vierraden	380 kV	2010	double circuit, 100 km, AC

Some of the new lines will be required to cope with the expected additional grid feed-in of renewables-based energy (mostly wind) which has to be transported from the North of Germany to the West and South of Germany (high demand regions)

Due to the upgrading of large parts of the 220 kV grid and the new development of the 380 kV line Oberjettingen-Engstlatt, impacts on NTC values have to be expected but are not specified yet.

Commissioning of the aforementioned lines fundentally increases the transmission capacity in the network of VE Transmission. This is associated with a direct or indirect impact on interconnecting lines and neighbouring networks. The line Altenfeld – Redwitz as new intra-Germany interconnecting line leads to an increase of the transmission capacity towards E.ON Netz. The transmission capacity of interconnecting lines with foreign neighbouring networks is not increased through the other new lines. To the extent that existing congestion towards neighbouring networks is attributable to circumstances in the network of VE Transmission, the new lines mentioned above may contribute to a proportionate reduction of this congestion, where necessary.

Additional network development is basically required to discharge the obligations resulting from the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz – EEG) concerning the acceptance and transport of renewables-based electricity.

Depending on the realization of new generating facilities with connection to the transmission system (renewables-based facilities, such as onshore and offshore wind farms and conventional power stations), further measures of network reinforcement and network extension, in particular construction of new lines, are required to ensure the connection of these facilities to the network and the transport of power generated by them. The German TSOs received numerous applications for connection, some of which imply already a need for further network development.

The German transmission system operators (TSOs) have already made appropriate preparations before the EC regulation 1228/2003 on network access conditions for cross-border exchanges in electricity bece effective on 1st July 2004. These preparations included in particular:

- the commitment to apply market-oriented solutions in the event of network congestion pursuant to Article 6, section 1 of the EC regulation,
- the obligation to use the proceeds from congestion for one or several of the three objectives mentioned in Article 6, section 6 of the EC regulation,
- different publication and information duties,
- information of the Federal Ministry of Economics and Labour and of the regulatory authority (German Federal Network Agency) about the application of the regulation, and support with a view to ensuring transparency in the application and functioning of the EC regulation.

The TSOs have assured that a market-based procedure (explicit auction) will be applied at interconnectors susceptible to congestion (i. e. at international interconnecting lines towards Denmark, the Netherlands, the Czech Republic, Poland as well as to France and to Switzerland since the beginning of 2005).

At the border with Austria, there are currently no relevant market procedures installed as the available interconnecting capacity on the German side is sufficient at the present time; for this reason, there has no congestion been defined and published to date.

2006/2007: Continuation of the coordinated explicit auctions within the CEER region with participation of the 5 TSOs: CEPS (Czech Republic), SEPS (Slovakia), OSE-O (Poland), E.ON Netz and VE-T (Germany).

As from 2008: Major changes scheduled; volume currently under discussion; the possibility of introducing a load-flow based explicit auction procedure is examined at the present time; participation of additional TSOs within this region: APG (Austria), MAVIR (Hungary), ELES (Slovenia); concrete information can currently not be provided.

Ongoing studies in international/cross-border interconnections:

- **Denmark – Germany interconnector:** There are ongoing planning activities concerning higher transport capacity e. g. with a new interconnector Kassö - Audorf. As part of these activities, a study is currently carried cooperatively between energinet.dk and E.ON Netz, which elaborates and evaluates short-term measures for the increase of transfer capacity between the two grids.
- **Netherlands – Germany interconnector**: Feasibility Study about possibilities to increase NTC-values.
- **Poland – Germany interconnector:** There are ongoing planning activities. Both TSOs are studying the possibilities for increasing the NTC-values.
- **Czech Republic – Germany interconnector:** There are ongoing planning activities concerning a new interconnector between the Czech Republic and Germany (Vitkov/CZ-Mechlenreuth or CZ – Pleinting). A first feasibility study of an additional 380-kV interconnection between Vitkov/CZ-Mechlenreuth was carried out. A more detailed common feasibility study implemented by CEPS and E.ON Netz with the participation of VE-T is planned to start in October 2006.
- **Austria – Germany**: There are ongoing planning activities concerning a replacement of the existing 220 kV interconnector Altheim-St. Peter (AT) by a new 380 kV interconnector St. Peter (AT) – Isar (DE) to increase the transport capacity between APG (A) and E.ON Netz (DE).

Switzerland

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Bickigen - Flumenthal	220 kV	2007	Reconstruction of the existing double circuit 132 kV line into a line with one 132 kV and one 220 kV circuit; 16.9 km
Mühleberg - Wattenwil	220 kV	2008	Reconstruction of the existing 132 kV line into a double circuit line with one 220 kV and one 132 kV circuit; 32 km
Choson – Chandoline - Chippis	380 kV	2009	Replacement of the existing double circuit 220 kV line by a new triple circuit line (2 x 220 kV + 1 x 380 kV) in order to establish a new 380 kV circuit Choson – Chippis and re-establish the 220 kV circuits in somewhat different order; 27.5 km. Intersection of one of the 220 kV circuits into the 220 kV station Chandoline.
Chippis – Mörel - Airolo	380 kV	2012	Divers constructions, reconstructions and decommissioning in order to rebuild the series of the existing 220 kV double (to the most part) circuit lines between Chippis, Mörel and Airolo into a new series of lines with one 380 kV and one 220 kV system. In that way a new 380 kV circuit Chippis – Airolo will be established; the length of the part Chippis – Mörel is 44 km
Chippis – Stalden	220 kV	2009	Hanging up of the second 220 kV circuit on the existing 220 kV line; 27.5 km
Obfelden – Thalwil	220 kV	Not before 2010	Replacement of the existing 150/50 kV line by a new single circuit 220 kV line; 10 km
Galmiz - Mathod	380 kV	2012	Divers constructions, reconstructions and decommissioning in order to establish (after having realised some other projects in preparation) a series of 380 kV circuits on the route Bassecourt – Pieterlen - Mühleberg – Mathod – Romanel with 380/220 kV transformers in Mühleberg and Romanel; 59 km
Galmiz - Schiffenen	220 kV	2014	Construction of a new double circuit line with a 220 kV circuit Galmiz – Schiffenen; 7 km - the other circuit is foreseen for the 65 kV voltage level
Connection Schiffenen	220 kV	2015	Construction of a connecting double circuit 220 kV line to the 220 kV station Schiffenen that will be intersected into the existing circuit Mühleberg – Hauterive; 2.1 km

Slovenia

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
2x 400 kV Krsko - Bericevo	400 kV	2009	Double circuit line, 70 km, AC line
2x400 kV Cirkovce - Pince	400 kV	2011	
2x400 kV Okroglo - Udine	400 kV	2011	
PST Divaca	400 kV	2009	
PST Okroglo	400 kV	2011	

After July 1st, 2007, the full implementation of 1228/2003 Regulation for Slovenia is mandatory – bilateral or joint explicit auctions on all borders will be considered for the capacities allocation.

Croatia

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Mraclin - Jajce	220 kV	2007	Single circuit line (reconstruction)
Ernestinovo - Pecs	400 kV	2008/2009	Double circuit line
Zagvozd - Plat	220 kV (400 kV)	2007	Double circuit line
Vodnjan - Plomin	220 kV	2007	Double circuit line

Tie line Mraclin – Jajce will increase NTC value between Croatia and Bosnia and Herzegovina. Tie line Ernestinovo – Pecs will increase NTC value between Croatia and Hungary. Both lines together with internal lines Zagvozd – Plat and Vodnjan – Plomin will make Croatian transmission system stronger by reducing constraints and avoiding or mitigating potential congestions.

Luxembourg

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Schifflange-CFL Berchem	220 kV	Mai 2007	Double line 2 x 220 kV; 2 x 490 MVA; 7,8 km; no effect on cross boarder capacity
Sotel-Moulaine	220 kV	?	?

The Sotel-Moulaine line will create a new transmission capacity between LU and FR; Permission for construction is not yet given.

The Netherlands

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Upgrading of 150 kV line Maasvlakte-Westerlee	380 kV	2008	2 x 1645 MVA
Construction of substation Westerlee	380 kV	2008	
NorNed cable	450 kV	2007 / 2008	DC-cable single circuit
BritNed cable	450 kV	2013	DC-cable single circuit

TenneT has agreed with the neighbouring TSO's to exchange more online information. This will enable all TSOs to have a clear overview of the relevant parts of each TSO-network and thus be of benefit for congestion and security management purposes. Besides of that will be developed a regional approach with the neighbouring TSO's which will enable a better forecast and management of congestions.

Austria

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Three Phase Shifting Transformers	220kV	2006	3*600MVA
Südburgenland (A) – Kainachtal (A)	380kV	2008	double circuit, AC, 3000MVA
Steinach (A) – Prati (I)	110kV/132kV	>2007	PST, double circuit, AC
400kV transmission line through the Brenner pass tunnel A-I	400kV	2015-2020	double circuit, AC, 2*1000MVA or 2*1500MVA
Nauders (A) – Curon/Glorenza (I)	220kV	Undefined	single circuit (cable/OH), AC

380kV transmission line from Südburgenland to Kainachtal will lead to an increase of NTC towards CZ, HU and SI and to a decrease of congestion costs.

Interconnections:

- 380kV line from Lienz (A) to Cordignano (I) (AC, double)
- additional 380kV line Wien-Südost (A) – Györ (H)

Within Austria:

- St. Peter to Salzach (upgrade from 220kV to 380kV)
- Salzach – Tauern (upgrade from 220kV to 380kV)
- Ernsthofen substation (upgrade from 220kV to 380kV)
- St. Peter substation (upgrade from 220kV to 380kV)
- Zell/Ziller – Westtirol (upgrade from 220 to 380kV)
- Bisberg substation (upgrade from 220kV to 380kV)
- Lienz – Obersielach (double circuit, 380kV)

Serious congestions in the Austrian network occur on the three 220kV lines from the north to the south of Austria. Since 2001 the (n-1) criterion was repeatedly violated especially in the winter season during the night, although extensive congestion management measures were taken. As in the last years, also winter 2005/2006 has been characterized by a high utilization of the Austrian transmission grid.

The surplus of electricity in the north and the deficit of electricity in the south of Austria combined with insufficient north-south-transmission capacity results in congestions in the transmission grid of Verbund-APG. Verbund-APG has to take counter measures in order to reduce these congestions. This is done by redispatching of power plants (including restrictions for pumping) and special switching in network operation.

Due to the decommissioning of a thermal power plant in the south by mid 2006 which was very important for congestion management and the further increase of wind power and biomass-production in the north the above mentioned bottlenecks will become even more critical in winter 2006/2007.

For permanent improvement of these structural congestions, new 380 kV lines (Südburgenland -Kainachtal, St. Peter – Tauern) are planned to be put into operation.

As the commissioning of these lines is delayed, additional congestion management measures will have to be taken.

In this context, APG decided to install three phase shifting transformers (PST). As planned in 2005, the beginning of operation will be within the next two months. All three PST will be in operation by the end of 2006. This measure will allow for a better balanced distribution of load flows and thus for higher utilization of the existing three 220 kV lines. The weak north south lines can be also protected in case of an outage of a line or system. Thus, an increase of the internal north-south-capacity ((n-1) limit) by 200 MW will be possible.

The installation of phase shifting transformers in combination with redispatching will help to handle the north-south-bottlenecks until the commissioning of the above mentioned 380 kV lines. This concept was presented at the high-level 8-TSO-meeting in Vienna on 28.02.2005, at the meeting of the System Development Group in Paris on 11.01.2006 and to all neighbouring TSOs.

France

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Lyon-Chambery	400 kV	2007	75 km AC line, double circuit
New line in the French grid : Vigy-Marlenheim	400 kV	2008 - 2009	115 km AC line, double circuit (one of them operated at 225 kV), 3x570 mm²
France – Spain : eastern reinforcement	400 kV	2010	
Cotentin-Maine	400 kV	2011	150 km AC line, double circuit

Spain and Portugal:

Spain

It seems to be impossible to give a detailed vision for grid development because there are a huge amount of new transmission lines and devices (several hundreds) to be commissioned over the period covered by present forecast.

A global overview is given hereafter:

Substations	Unit	Voltage Level		
		400 kV	220 kV	Total
New circuit bays	Number	706	1 256	1 962
New Transformer Capacity	MVA	30 650	8 660	39 310
Reactances	Mvar	2 650	-	2 650
Capacitors	Mvar	-	800	800

Circuits (km)	Unit	Voltage Level		
		400 kV	220 kV	Total
New Lines	km	5 482	2 774	8 256
New Cables	km	14	270	284
Repowering	km	3 347	3 437	6 784

Portugal

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Reinforcement of capacity in existing lines	220/150 kV	2006/2007	Increase in transmission capacities of existing lines
Paraimo substation 400/220 kV	400/220 kV	2006	400/220 kV substation
Line Pego - Batalha	400 kV	2006	81 km single circuit
Line Sines - Portimão	400 kV	2006	97 km single circuit
Phase Shifting Transformer in Pedralva	400/220 kV	2006	450 MVA capacity
Phase Shifting Transformer in Pedralva	400/220 kV	2007	450 MVA capacity
Line Valdigem-Bodiosa-Paraimo	400/220 kV	2006/2007	120 km single circuit
Phase Shifting Transformer in Falgueira	400/150 kV	2008	450 MVA capacity
D. Internacional substation	400/220 kV	2008	400/220 kV substation, initially with only 220 kV
Line Valdigem-D. Internacional – Aldeadavila	400 kV	2011	95 km single circuit
Line Valdigem-Recarei	400 kV	2009	66 km double circuit
Line Lavos – Batalha	400 kV	2010	55 km double circuit
Line Portimão - Sotavento	400 kV	2010	80 km double circuit
Interconnection Line Galiza – Minho	400 kV	2013 (in study)	118 km double circuit
Interconnection Line Algarve – Andaluzia	400 kV	2013 (in study)	175 km double circuit

The phase shifting transformers are essentially oriented to overcome some constraints in 220 kV and 150 kV internal network. The other new elements mentioned above, will have a positive influence in the interconnection capacities.

The study (not finished yet) of the two 400 kV interconnection lines mentioned above can identify other reinforcements.

Congestions in the interconnections between Portugal and Spain are solved by the exporter country with a pro-rata criteria.

Italy:

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Trino-Lacchiarella	380 kV	S/M	Single circuit line
Turbigo – Rho	380 kV	S	Single circuit line
Voghera _ la Casella	380 kV	L	Single circuit line
Udine – Redipuglia	380 kV	2011	Single circuit line
Cordignano – Lienz	380 kV	M/L	Single circuit line
Venezia Nord – Cordig.	380 kV	M/L	Single circuit line
Udine – Okroglo	380 kV	2010	Double circui line
Calenzano - Colunga	380 kV	2011	Upgrade of single circuit line (actually exploited at 220kV)
Sorgente-Rizziconi	380 kV	2010	Second AC link
Sardegna – Continente SAPEI	380 kV	S/M	AC plus DC line submarine HVDC cable
Matera – S. Sofia	380 kV	2006	Single circuit line
Udine/Sandrigo – Lienz	380 kV	M/L	Double circui line
La Casella_S.Rocco	380 kV	S/M	Single circuit line
Fano – Tero	380 kV	2013	Single circuit line
Tavernuzze – Casellina	380 kV	2008	Single circuit line
S. Barbara – Tavernuzze	380 kV	2008	Single circuit line
Chiaronte – Cimmina	380 kV	2012	Single circuit line
Montecorvino - Benevento	380 kV	2011	Double circui line
Paternò - Priolo	380 kV	L	Single circuit line
Redipuglia Padriciano	220 kV	S/M	PST
Substations	380-220 kV	M/L	60 New Substations
Lines	380-220 kV	M/L	3300 Km of total lenght
Transformers	380-220 kV	M/L	18 GVA of total power

South-Eastern UCTE:

Greece

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
EHT LAGADA	400 kV	*	3 bars, 400kv
EHT N. SANTA	400 kV	*	3 bars, 400kv
EHT KORINTHOS	400 kV	2008	3 bars, 400kv
EHT LIA	400 kV	2010	3 bars, 400kv
LINE MELITI - BITOLA	400 kV	*	UPGRADE TO 400 kV
LINE PHILIPPI-TURKEY	400 kV	*	Double circuit AC line, 208km
LINE YDAIO-PHILIPPI	400 kV	*	Double circuit AC line, 101km
LINE KOUMOUNDOUROU-KORINTHOS	400 kV	2008	Double circuit AC line, 72 km
LINE TRIKALA – AG. DIMITRIOS	400 kV	2011	Double circuit AC line, 127 km.

The new tie-line and the upgrade of the existing one will increase the total transport capacity. The reinforcements of the 150 kV network and the extension of the 400 kV network to Macedonia and Thrace will contribute to the system security. Some of these commissionings and upgradings are part of the scheduled extension of the 400 kV network that will enable the connection of RES and the interconnection Greece – Turkey.

Serbia

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Subotica 3-Sombor 3	400 kV	2006	Single circuit AC line, length of app. 56 km
SS 400/110 kV Jagodina 4	400 kV	2006	1x300 MVA
SS 400/110 kV Sombor 3	400 kV	2006	1x300 MVA
SS 400/110 kV Beograd 20	400 kV	2007/2008	2x300 MVA
Nis(RS)-Skopje(FYROM)	400 kV	End of 2009	Single circuit AC line, length of app. 195 km
SS 400/110 kV Leskovac	400 kV	End of 2009	1x300 MVA
SS 400/110 kV Vranje	400 kV	End of 2009	1x300 MVA
Novi Sad 3(RS)-Timisoara(RO)	400 kV	End of 2010	Single circuit AC line, length of app. 150 km
Sombor(RS)-Pecs(HU)	400 kV	Undefined	Single circuit AC line, length of app. 70 km

Montenegro

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Podgorica(SCG)-Tirana(AL)-Elbasan(AL)	400 kV	End of 2007	Single circuit AC line, length of app. 198 km

Macedonia

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Bitola(MK)- Florina(GR)	400 kV	2007	40 km, 1420 MVA
Stip(MK) – C.Mogila(BG)	400 kV	2007	150 km, 1420 MVA
Skopje(MK) – Nis(SCG)	400 kV	2008-2010	195 km, 1420 MVA
Bitola(MK) – Vlore (Al) + DC link to Italy	400 kV	2010-2015	230+80 km, 1000 MVA

Centrel:

Poland

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Olsztyn Matki - Olsztyn	220 kV	2006	AC – single line
Ostrow - Plewiska	400 kV	2007	AC – single line (on double tower)
Rogowiec - Ostrow	400 kV	2008	AC – 1st circuit of the double line
Trebaczew - Ostrow	400 kV	2008	AC – 2nd circuit of the double line
Patnow - Kromolice	400 kV	2009	AC – double line
Pasikurowice – Wroclaw Poludnie	400 kV	2011	AC – single line

The positive influence of implementation of “Ostrow Project” was described at page 19 of this Report.

Beginning from ca. 2010-2012 new challenge will appear for the Polish TSO related with transmission of electricity produced by wind farms from northern to central and southern parts of Poland.

In auction process TSOs allocate yearly, monthly , daily available transmission capacity on profiles PSE-Operator-CEPS-SEPS-VET to market participants. In the near future it is expected that PSE-Operator will participate in the regional auction together with 7 other TSOs from Central Eastern Europe.

Hungary

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Győr-Szombathely	400 kV	2006-2007	Double circuit, AC line
Szombathely-Hévíz	400 kV	2008-2010	Double circuit, AC line
Békéscsaba-Nadab (Oradea) (RO)	400 kV	2008	Double circuit, AC line
Pécs-Ernestinovo	400 kV	2010	Double circuit AC lines

Czech Republic

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
line V454 Cechy Stred – Bezdecin	400 kV	2008	on the common towers with the 220 kV line V209
2nd line Slavetice – Durnrohr V438	400 kV	2009	on the common towers with the existing line V437
line V480 Vyskov – Chotejovice	400 kV	2011	on the common towers with the 220 kV line V211
line V455 Chotejovice– Babylon	400 kV	2012	on the common towers with the 220 kV line V210
new substation Chotejovice	400 kV	2011	new 400 kV substation in close vicinity of existing 220kV subs.Chotejovice
the line V458 Krasikov – Horni Zivotice	400 kV	2014	single AC circuit line
2nd line V456 Prosenice – Nosovice	400 kV	2017	on the common towers with the existing 400 kV line V403

Slovak-Republic

Line or Equipment ne	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Lemesany - Moldava	400 kV	2011	double circuit line
V.Dur - Gabcikovo	400 kV	2011	double circuit line
substation Medzibrod	400 kV	2011	substation upgrade from 220 kV to 400 kV level
Bosaca - H.Zdana	400 kV	2017	double circuit line
Lemesany - V.Kapusany	400 kV	2017	double circuit line

Lemesany - Moldava can increase by 300 MW the NTC of SK-HU border.
All new devices will have positive impact for reducing constraints and increasing of reliability.

Romania and Bulgaria:

Romania

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
OHL Gutinas - Bacau upgrading of line operation from 220 kV to 400 kV	400 kV	2008	55 km, single circuit, AC line
OHL Bacau – Roman upgrading of line operation from 220 kV to 400 kV	400 kV	2008	59 km, single circuit, AC line
OHL Roman – Suceava upgrading of the line operation from 220 kV to 400 kV	400 KV	2008	99 km, single circuit, AC line
OHL Oradea - Nadab	400 kV	2008	85 km, single circuit, AC line
OHL Nadab (RO) – Bekescsaba (HU)	400 kV	2008	30 km, double circuit, AC line
OHL Nadab – Arad	400 kV	2008	30 km, single circuit, AC line
OHL Ostrovul Mare - Cetate	220 kV	2010	30 km, single circuit, AC line
OHL Portile de Fier - Cetate	220kV	2010	71km single circuit, AC line
OHL Portile de Fier- Ostrovul Mare	220kV	2010	92km single circuit, AC line
OHL Portile de Fier – Resita	400 kV	2010	117 km, single circuit, AC line
OHL Resita – Timisoara (actually operating al 220 kV, double circuit)	400 kV	2010	73 km, single circuit, AC line
OHL Timisoara - Arad (actually operating al 220 kV, double circuit)	400 kV	2010	54 km, single circuit, AC line
OHL Timisoara (RO) – Varsac(Serbia Montenegro)	400 kV	2015	~ 60 km, simple circuit, AC line
OHL Suceava (RO) – Balti (MD)	400 kV	2015	150 km, single circuit, AC line
OHL Suceava – Gadalin	400 kV	2015	260 km, single circuit, AC line

The direct impact of commissioning the new internal lines is practically the elimination of the internal congestions at the load forecast level. The investments in new interconnection lines increase the Romanian transfer capacities of import with the main UCTE block.

The development of the nuclear generation capacities will require reinforcements in the transmission network.

The commissioning of the 3rd generation unit in Cernavoda NPP require the commissioning of a new OHL 400 kV between Medgidia and Constanța or Medgidia and Isaccea.
The extension of the nuclear program will also require new OHL but, since they will be most probably not be located in Cernavoda, this will be established according with the location of the generation units.

The congestion management is achieved by:

- Half year studies which recommend the network topology, meshing measures in the distribution network, automata measures and production constrains;
- The harmonization of annual, monthly, weekly maintenance programs of transmission lines and of production units;
- The harmonization of overhaul programs of significant lines with the interconnection partners;
- The calculation of borders (bilateral) NTCs coordinated in the Romanian interface which can be aggregated and used simultaneously without endangering the security of transmission grid.
- The yearly and monthly allocation of transmission capacities only up to the limit imposed by NTC; The allocation is based on bilateral conventions with interconnection partners; The. Romanian part allocates 50% of ATC by explicit auctions;
- TransElectrica participation at UCTE DACF (Day Ahead Congestion Forecast) including exchange of forecasted models and N-1 verification in the D-1 day for the D day; detecting congestions; providing measures (meshing / unmeshing in the distribution grid, commissioning and automata logic) and system constraints (maximum/minimum production for some zones).
- The congestion is managed on the Balancing market. Using this mechanism, we pay the price of congestion at the more economically and technically suitable units. An offer is submitted for each unit and if we need this unit, we must pay the amount of the offer.

Bulgaria

Line or Equipment	Voltage Level	Commissioning Date	Main Characteristics (single or double circuit line, length, AC lines or DC lines, …)
Chervena mogila (BG) – Dubrovo (FYROM)	400 kV	2008	AC single circuit line

APPENDIX D: EXEPTIONAL TRENDS, DEREGULATION OF THE MARKET AND IMPACT ON FORECASTS

D-1. Deregulation of the market and impact on forecasts

The status of electricity market deregulation is not homogeneous over the UCTE countries.

Some significant information should be retained:

Bosnia and Herzegovina

According to their international obligations and Energy Policy statement Bosnia and Herzegovina before few years started with reform of electricity sector. The State Regulatory commission established and their responsibility is transmission, ISO and international trading. Two entities regulatory commissions also established and their responsibility are generation, distribution and domestic trading. Bosnia Herzegovina has Independent System Operator (ISO) and Transmission company (Transco) totally independent (legally, management,..) from generation, distribution and supply companies.
ISO and Transco have own tariffs according to decision of State Regulatory Commission from January 2006.

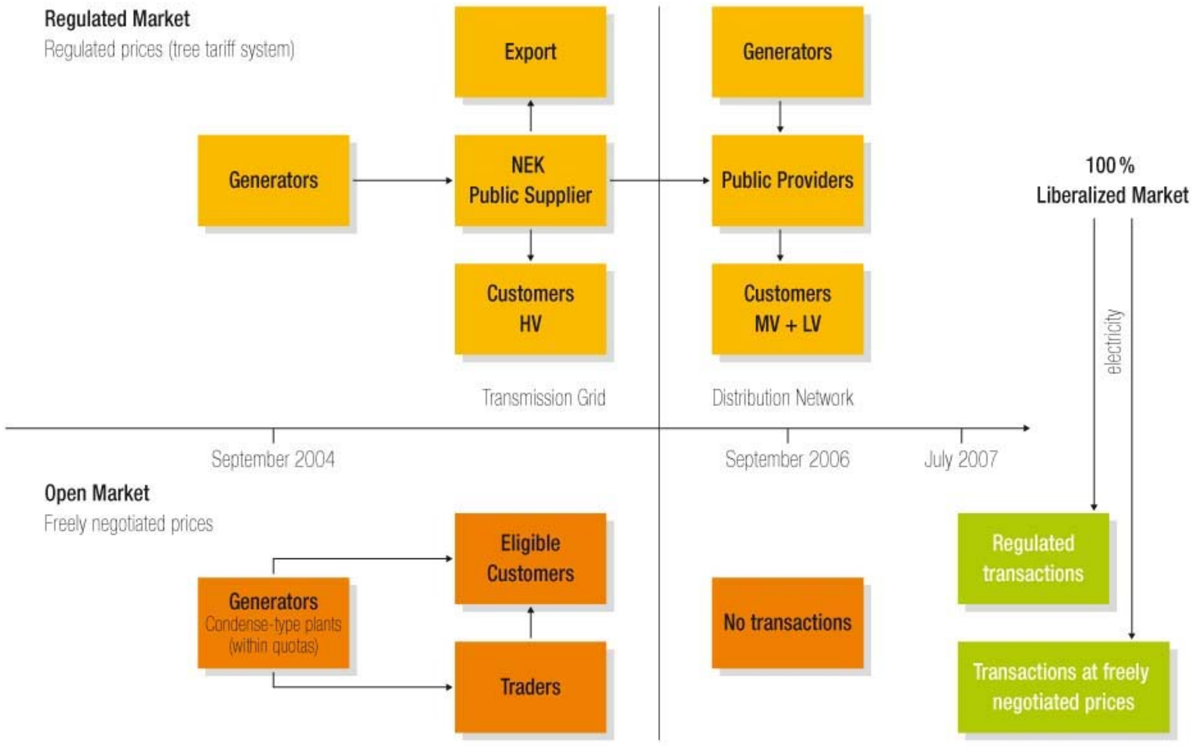
BA sign Energy Treaty and doing efforts for accession to the Regional Electricity Market in SEE. According that regulators issue decision for Market opening and from January 1st 2007 all customer with yearly consumption higher than 10 GWh have possibility to choice their supplier (33% market opening). From January 1st 2008 all customer with yearly consumption higher than 1 GWh have possibility to choice their supplier. From January 1st 2008 all customer, except households, will be eligible and from January 1st 2015 market will be 100% open.

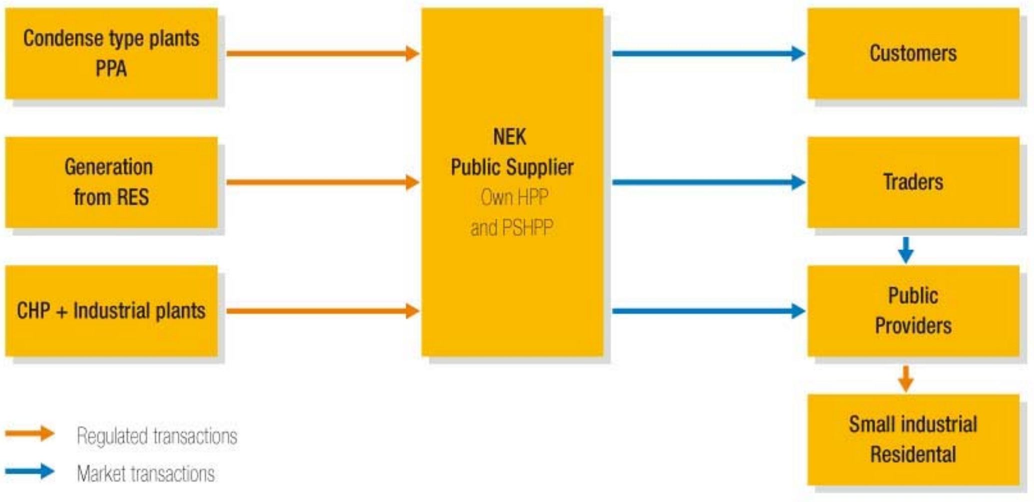
At same time according to Actions plan for restructuring existing electric utilities (cca 90% state own) will be obliged to make generation and distribution unbundling.
Many generations projects (hydro, thermal (coal), wind) are under preparation and responsible state bodies prepare relevant documentations for concessions.

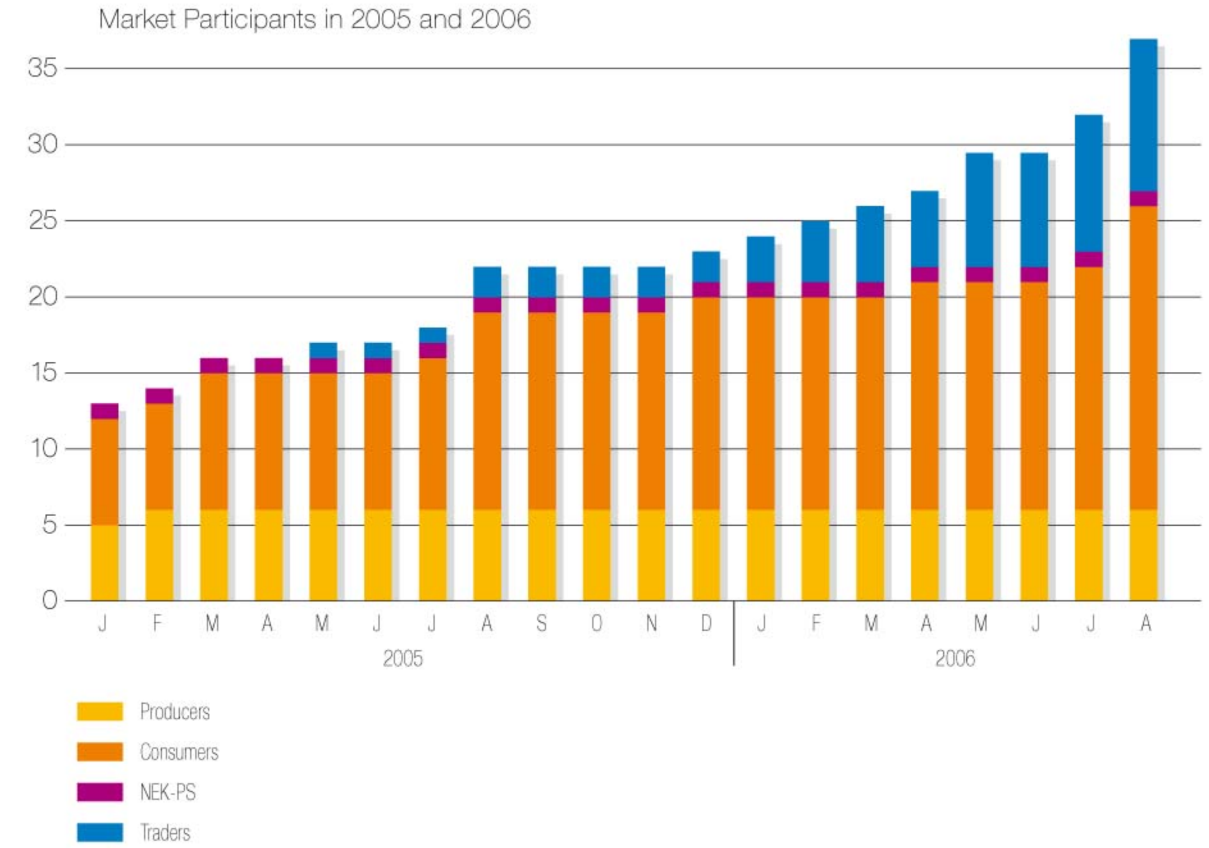
Belgium

The implementation of the nuclear phase-out and of the directive on large combustion plants are considered as firm. Hence 528 MW of installed national generating capacity of fossil fuel power stations is taken out in 2015 as a consequence of the directive on large combustion plants and 393 MW of installed national generating capacity of nuclear power stations is taken out for the outlook of July 2015 and 1395 MW of installed national generating capacity of nuclear power stations is taken out in 2020 as a consequence of the nuclear phase-out.

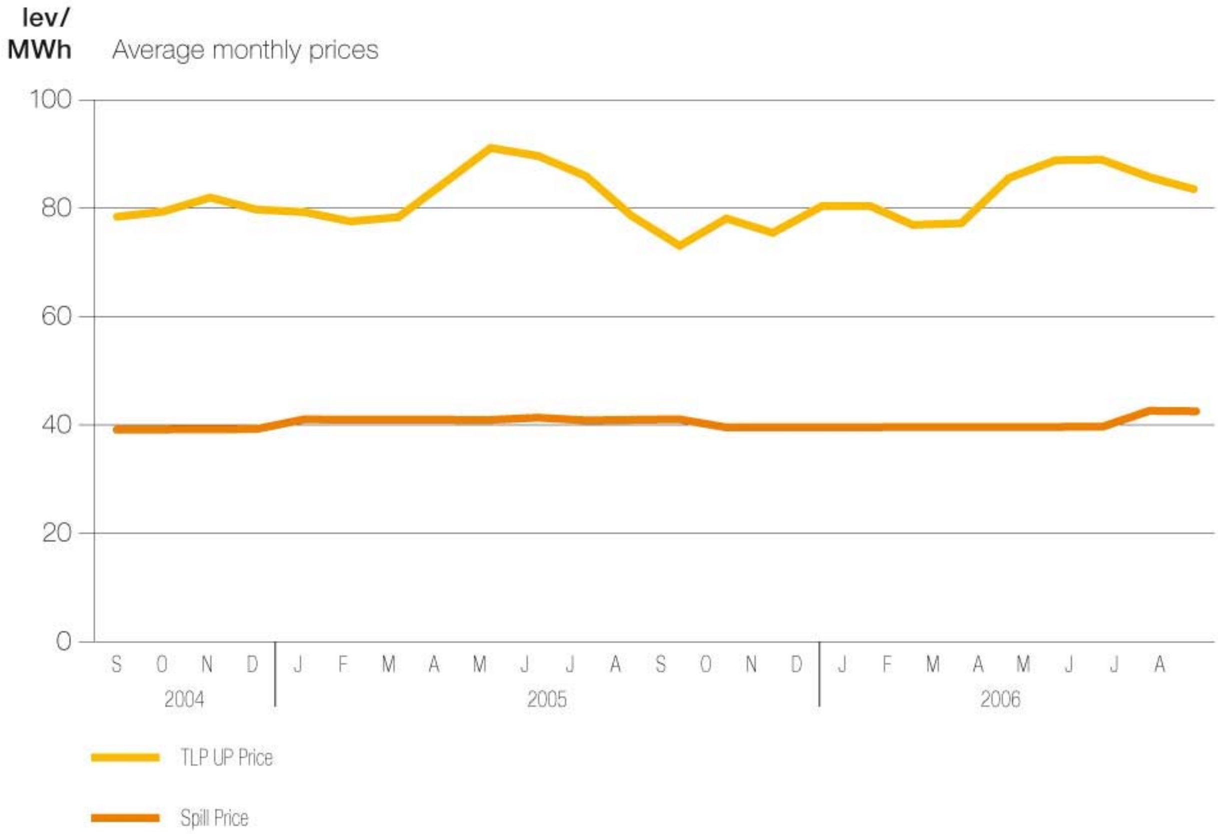
Bulgaria


Regulated Market
Regulated prices (tree tariff system)
Export
Generators
Generators
NEK
Public Supplier
Public Providers
100 %
Liberalized Market
Customers
HV
Customers
MV + LV
electricity
Transmission Grid
Distribution Network
September 2004
September 2006
July 2007
Open Market
Freely negotiated prices
Eligible
Customers
Regulated
transactions
Generators
Condense-type plants
(within quotas)
No transactions
Traders
Transactions at freely
negotiated prices


Condense type plants
PPA
Customers
Generation
from RES
NEK
Public Supplier
Own HPP
and PSHPP
Traders
CHP + Industrial plants
Public
Providers
Small industrial
Residental
Regulated transactions
Market transactions


Market Participants in 2005 and 2006
35
30
25
20
15
10
5
0
J F M A M J J A S O N D J F M A M J J A
2005
2006
Producers
Consumers
NEK-PS
Traders


MWh
Traded Quantities at freely negotiated prices in 2005 and 01–08/2006
35
30
25
20
15
10
5
0
J F M A M J J A S O N D J F M A M J J A
2005
2006
X
Y



Switzerland

The Swiss parliament and government are expected to enact the electricity market liberalisation laws that are in preparation. This will have some impact on the system adequacy evolution, but the outcome can't be predicted.

Germany

The law concerning the primacy of renewable energies and the Co-generation Act for CHP (combined heat production), decided three years ago, entail an increased development of wind power and the obligation to guarantee network access and feed-in of power generated from renewable energy sources at any time, and to secure the production of existing co-generation plants. The consensus achieved about the remaining life of nuclear power stations has led to additional effects as a result of the scheduled shutdown of nuclear plants over the period covered by this year's forecast.

As a result of unbundling (required by law) between generation, transmission and distribution, the flow of information concerning power balance data has been interrupted to a large extent between TSOs and power station operators. Individual items of the power balance have been based on model calculations and estimations of TSOs for their respective control area. The German power balance values are obtained as aggregate value by adding up the individual values of TSOs concerned. In order to obtain a realistic representation of renewable energies, the German data on the UCTE power balance forecast 2007-2020 comprise estimated and forecast values of TSOs for plants < 1 MW, which were largely not included in the German power balance data dating back more than 5 years. This means that the large coherence of data about the generating capacity and peak load with official statistics does no longer exist, as plants < 1 MW were not (or only insufficiently) taken into consideration by these statistics. This should be noted when making comparisons with former power balances.

At the end of June 2005, the German legislative assemblies Bundestag (Parliament) and Bundesrat (Federal Council) agreed on a revised Energy Industry Act which came into force on 13 July 2005. One year after the original deadline determined in the EU Electricity Directive of 2003, a regulation authority has been installed.

Its main task will be to ensure transparent and non-discriminatory access to the grid system to all market players. The subsequent regulations on grid fees and grid access were also passed in July. All grid fees will have to be examined and approved by the regulatory authority beforehand (so-called ex-ante regulation). Future regulation through incentives will be developed during the coming year 2007. It is to encourage grid operators to increase efficiency; savings are to be passed on to customers. Regulation competences have been shared among federal and regional regulatory authorities. The former will be responsible for major grid operators, the latter for smaller distribution companies with less than 100,000 customers.

France

By July 1st, 2007 any French consumers will be in a position to change for a new supplier. By then the market will be fully opened.

Greece

According to the new electricity Law, the HTSO will be responsible not only for the EHV and HV network but also for the MV and LV network in the mainland of Greece.
The new legislation concerning the electricity market, the liberalisation of the trade of natural gas, the promotion of RES, the reinforcements and the extension of the grid of 400kv, the new tie-line between Greece and Turkey and the upgrading of the line Florina- Bitola, introduced a reform in the Greek electricity market .
According to the electricity Law, the new power units, planned for commissioning in 2009-2010, will participate in tendering procedures for new generating capacity. The introduction of the capacity availability market, operated by the HTSO, via the trade of capacity certificates issued by the generators will promote the construction of the new power plants.
All the developments mentioned in this report have been taken into account into our long term plan for the transmission system development.

In accordance with Regulation (EC) 1228/2003 of the European Parliament on conditions of access to the network for cross-border exchanges in electricity, the HTSO issued the Auction Rules for setting out the conditions of governing the allocation of the Auctioning Interconnection Capacity in both directions for 2007. The Auctioning Interconnection Capacity is offered by HTSO in the form of Physical Transmission Rights (PTRs). These rules regulate all matters concerning the handling of the allocation of the Yearly, Monthly and Daily Interconnection Capacity, the conditions to access Secondary PTR Market, the capacity usage rules, the settlement and payments in respect of the PTRs.

Croatia

Electricity market in Croatia was opened at the end of 2001 in amount of 10% of total Croatian consumption. Threshold for consumers to become eligible is annual consumption larger than 40 GWh.

Presently 137 (2005) big consumers fulfill larger than 9 GWh condition.

The Market Rules are in force since December 2004. However, it should be noted that changes of Croatian legislation related to electricity sector are currently under way:

1. 10.12.2004. - eligible is annual consumption larger than 20 GWh
2. 01.07.2006. - eligible is annual consumption larger than 9 GWh
3. 01.07.2008. – total free.

Hungary

The market is expected to be fully opened by 1 July 2007. (At present, all customers except households may choose their supplier.)

Luxembourg

A new energy law is in discussion. The energy sector, mainly internal rules may be reorganized by this law. It will have low impact on the market evolution because the market rules were always applied according to the EU directives, independent of an existing national law.

Macedonia

The Macedonian power sector have been under the responsibility of the electric utility “Elektrostopanstvo na Makedonija-ESM”, a vertically integrated state-owned company which has monopoly over all significant functions in the sector (up to 31st December 2004). Electricity sector is undergoing restructuringin order to increase the efficiency and respond to the EU Directives. After the unbundling of ESM, there are 4 separate companies:

- MEPSO - system operator, grid owner and market operator, joint stock state-owned company,
- ESM-EVN – distribution company. The owner of ESM is EVN,
- ELEM - generation company, state owned company,
- TPP Negotino - heavy oil plant.

The principal responsibility for policy-making and governance in the electricity sector rests with Ministry of Economy. The Energy law (September 1997) amended later, defines the legal framework of the energy sector. In December 2002, the Energy Law was modified in order to establish a Regulatory Commision for Energy of Republic of Macedonia – ERC.
The ERC regulates the whole energy sector and have to promote the competitive energy market. ERC establishes the prices and tariff systems according prescribed methodology, gives licences for performing activities in energy sector, protects energy users rights and participates in disputes settlement.

The present Commercial Market Code is in accordance with the Energy Law. The Macedonian Energy Regulatory Commission (simply the Regulatory Commission) has approved the present Commercial Market Code.
The Macedonian electricity market is based on regulated Third Party Access model, with provision for bilateral contracts and simple balancing mechanism.
Considering the Macedonian electricity market size and characteristics, the Government has approved a general framework to allow a phased introduction of bilateral contracts with a transitory regulated balancing mechanism, which will allow for competitive bids and offers by Market Participants, if any, to be included in the Overall Merit Order.
Further, having regard to the considerations of efficiency and economic allocation of resources, the provisions of the Commercial Market Code shall allow the Macedonian electricity market to evolve from a centralized and fully regulated market to an open market, in line with the Government policy in respect of the electricity market opening.
The Commercial Market Code, on one hand, provides the rules that govern the effective functioning of the Macedonian electricity market as carried out by the Parties, and on the other hand, stipulates the rights and obligations of the Market Participants who are carrying out the Transactions in the electricity market.
The Parties to the electricity market are entities which are entrusted with the responsibility for the reliable and secure operation of the power system and functioning of the electricity market. The Parties may carry out some trading activities under regulatory procedures or approvals, as the case may be, in order to ensure the balancing regulation, the procurement of Ancillary Services including the reserve for long term security of supply, and other requirements as stipulated by the Energy Law.
The Parties to the electricity market are the following legal entities:
- the System Operator
- the Market Operator
- the Distribution System Operator

A Market Participant is a legal entity or a person who has, in accordance to the law, a license or the right to generate, supply, sell and/or buy electricity in compliance with the rules of the Commercial Market Code. The Market Participants are:
- the Generators, including independent power producers, Regulated Power Producers and Distributed Generators;
- the Wholesale Public Supplier;
- the Retail Public Supplier;
- the Traders and
- the Eligible Customers.

The tariff System for the wholesale supplier is finished.
These all activities are according to the European Directive and decisions of the Athens Forum (REM) – to have an open market in the whole region till 2015.

Poland
According to the Polish Energy Law Act, in July 2007 the electricity market will be open for the household customers when all customers will be eligible for changing electricity supplier. In this respect there are still some issues to be resolved e.g. regulated prices for electricity, that will potentially influence development of the power market. The aim of these actions is to increase customers' activity on the power market.

New draft law on the termination of national long-term supply contracts is still under legislation process in Poland and is expected to have approval by the European Commission.

In March 2006 the Polish Government approved the Program for the Electricity Sector. It provides for general directions on the Polish power market restructuring and development including establishment of two strong consolidated energy groups, and further possible consolidation of smaller generators and distributors. With reference to the market developments it is proposed in this Document:

- To introduce new market mechanism for the development of the generation investments
- To strengthen competencies of the national energy regulator
- To develop interconnections
- To promote new sustainable and cost effective power generation technologies.

The specific feature of the Polish power industry relates to the fact that 95% of electricity is generated based on coal (hard and brown). This situation leads to large implications in relation to environmental standards. Due to the requirements on greenhouse gas emissions' limits stemming from the EU law the issue of the year 2008 relating to the stringent ecological limits on pollutants emissions implicates larger investment needs in new or modernised power generation sources.

In January 2005 Polish Government adopted new "Energy Policy for Poland until 2025" . It specifies main aims of the energy policy including provision of the national energy security, increase in competitiveness of the economy and its energy efficiency, and environment protection. This document mentions a nuclear energy option for Poland as possible after 2020 due to the requirements of the energy diversification and EU limitations in the greenhouse gas emissions.

Under EC Regulation 1228/2003 the system of coordinated auctions was agreed with the neighbouring TSOs at the end of 2004, modifying the previous cross-border capacity allocation system. The current congestion management mechanism is designed as explicit cross-border capacity auction coordinated with the neighbouring TSOs. Further improvements to the auctions system are foreseen and under development. As part of regional cooperation and development of regional market, the flow based mechanism is under consideration for modification of current cross-border congestion management.

Directive no 2005/89/EC on security of electricity supply has to be transposed into the Polish law but legislative works have not been started yet.

Romania

During the period July 2005 – September 2006 a new trading platform was the basis for operating in Romania the wholesale market related electricity trading. Implementing the multi - market concept through the three segments: bilateral contracts, day ahead and balancing markets, associated with the self scheduling principle this new trading platform is ensuring the competitive electricity purchase and sell for three different time horizons. Since July 2005, the market opening degree increased to 83.5% meaning the freedom to choose the supplier for all end consumers excepting the households.

While the balancing market is operated by Transelectrica as TSO, the electricity market operator OPCOM is providing a transparent market place for long term and medium term time horizons, by offering two different products as centralized markets: the bilateral contracts market where almost 3% from net consumption is traded and the day ahead market achieving a yearly average quota of 7%. Taking into consideration the real opening degree of 50% it can be concluded that one MWh from five contracted in competitive way is traded within OPCOM marketplace. Thus OPCOM is meeting the expectancies of European Commission DG TREN and World Bank and is intending to evolve in the future towards a better standardization of their products and trading safety improvement.

But, as the recent study prepared by the SEETEC consortium is underlying, *"even if OPCOM has managed to capture a respectable 7% of the total wholesale market volume, the day-ahead markets in the region have not yet reached a degree of coordination and efficiency to fully exploit trading potentials"*. Based South East Europe Electricity Market options paper, first Athens mini forum's conclusions and previously mentioned facts evidence, it is a normal expectancy that OPCOM, supported by Romanian stakeholders and gathering other stakeholders in the region interest and related support will develop the due actions in order to capture more of the Romanian wholesale market volume and to extend the trading area by attracting for the existing day ahead market the other neighboring countries interest.

In this respect the common agreement of European associations towards hybrid solution for market based cross border capacity allocation as both explicit and implicit auctions will be implemented. The AAC related long terms contracts will be removed based EC requirements and the competition for cross border trade will become more fair and transparent.

Consequently Romanian TSO is promoting explicit auctions as current solution and is participating in the dry run experiment for a future implementation of coordinated explicit auctions. Both Transelectrica and OPCOM are proposing also an implementation of market splitting in cluster to be progressively expanded to a regional dimension by collecting the available border capacity remaining in day ahead term after the monthly explicit auctions allocation and eventually not used physical transmission rights.

As much as the physical market will become mature, the real chances to establish a financial market will increase. Based similar financial contracts definition, the IT trading platform of OPCOM can support the trading of MBI (market based instruments) as CO2 allowances and efficiency certificates.

Regarding the retail market, it is expected that mid year 2007 opening degree extension to 100% will enhance the real opening degree and the supplier's activity in wholesale market. The suppliers' existence and activity required by 54/03/EC Directive is a welcomed specificity of Romanian market within SEE framework.

Slovenia
Pro-rata capacity allocation for export to Italy and import from Austria will not be used from July 1, 2007 – explicit auctions (bilateral, joint or coordinated) will be used for the capacity allocation on all borders. This will impact the electricity market significantly.

Serbia
Draft Market design was developed by EMS (TSMO) in 2006 and defines following issues:
- the scope of competition (who is able to sell to whom, in the regulated and in the competitive sector);
- who will be the participants in the market (national participants and international participants) and codification of the participants;
- what kind of authorizations do the participants need to be player on the market;
- the role of the users of the network;
- the role and organization of the system and market operator.

A migration path from the present status to a full operating market is also defined, with the various steps to reach a full operating market. These steps are proposed, with the related goals and the schedule that the Energy Regulatory Agency and the Government want to follow, but also with the necessary schedule to follow to implement the IT system which will be necessary for each step.
The Market organizational design covers:
- the OTC (Over the Counter) market (direct contracts between suppliers and customers);
- the physical real time electricity market (Intra-day Balancing mechanism);
- the access to the interconnections with bordering countries based on market mechanism in order to address the bottleneck issue;
- the ancillary services market;
- the physical day-ahead electricity market operated by future power exchange, a specific department of the EMS Market Operation Division (if applicable).

The market model will be implemented in a three phase approach coping with the evolution of the regulated electricity tariffs in Serbia.
In the Stage 1, the prices and volumes of traded electricity remain determined by non-market mechanisms and are not determined by offer and demand. The electricity tariff and the network access tariffs are both approved by the government. The OTC contracts (bilateral contracts) are based on tariffs approved by the government. This is valid for all customers (individual tariff customers as well as potential eligible customers). There is no Balancing intra-day market in this phase.
In stage 2, the electricity tariffs agreed by the Government have reached a level above the full global cost plus approach, and therefore some OTC contracts (bilateral contracts) could be negotiated below these tariffs. The balancing mechanism may start for the tertiary reserves with EMS as single buyer.
In stage 3 (target) there are enough new players, so a power exchange can be set up within EMS. Market driven price is the reference for tertiary control power.EMS will run the day-ahead organised market through its Power Exchange. This day-ahead market shall be based on a single day ahead fixing and provide market clearing prices and volumes for every hour of the upcoming day. In this stage, market mechanisms are set up for the balancing intra-day market (tertiary reserve) and the day-ahead market. All Market Players can buy and sell on the Balancing intra-day market.

The complete technical and legal framework required for a market to be operated will be set up at stages 1 and 2, the step forwards to stage 3 (fully operational electricity market) is only linked to the level of the regulated electricity prices (the electricity tariffs approved by the Government).

Slovak Republic

Energy legislation, regulation framework as well as portfolio of generation and transmission infrastructure have the large influence on electricity market evolution in Slovakia.

Legislation framework for the participation of the Slovak Republic into European competitive electricity market already exists. The Energy Act (Act. No. 656/2004) and Regulation Act (Act. No. 658/2004) reflect relevant EU Directives to the full extent. These acts came into force on 1st of January 2005. Reference secondary legislation was also adopted.

The main purpose of the Slovenska elektrizacna prenosova sustava, a.s. - SEPS, a.s. is to ensure the electricity transmission from the main producers to distributors and large customers, as well as electricity imports, exports, and transits via Slovak territory.

With regard to the present legislation adopted, SEPS, a.s. published following documents:
- Technical Conditions for Connection, Access and Transmission System Operation (prepared in accordance with the Operational Handbook UCTE),
- Dispatch Order for Control of the Power System of the Slovak Republic,
- Trading Order SEPS, a.s.

The new Energy Policy of the Slovak Republic, laying stress on the energy savings, security of supply and environmental protection, was passed in January 2006. This policy is in compliance with the main direction of energy strategy of the European Communities (Green Paper - A European Strategy for Sustainable, Competitive and Secure Energy).

According to the new Energy Act since 1st of January 2005 the electricity market has been opened for all customers except households. Households become eligible customers since 1st July 2007 (in compliance with Directive 2003/54/EC).

The principal aim of regulation policy is to achieve non-discriminatory and transparent functioning of network industries. Since 1st January 2005 the price of basic electricity has been deregulated (except households). However, ancillary services will be further regulated.

The Slovak Republic belongs to countries with balanced mix of installed capacity, approximately one third of total installed power capacity is from nuclear a third from thermal and the last part comes from hydroelectric power plants. In previous period more than 50 % of total yearly production was generated in nuclear power plants. From 1999 the Slovak Republic belongs to electricity exporters.

In the process of access negotiations with EU, the Slovak government accepted a commitment to close down (in 2006 or 2008 respectively) two 440 MW blocks of the nuclear power plant in Jaslovske Bohunice. Because of existing environmental limits and ending of lifetime, another 700 MW of steam power plants capacity will be stopped by the year 2010. And due to these facts there will be a lack of electricity generation in the Slovak Republic from domestic power plants after 2008 and part of it will be imported.

In 2006 the Italian company ENEL took a control over 66 % of shares of the company Slovenske elektrarne, which is the dominant electricity producer in the Slovak Republic. Nowadays ENEL is preparing a study about advantages of completion of two 440 MW blocks of the nuclear power plant in Mochovce. Results of the study and consequent final resolution on completion of building the blocks in Mochovce, which are in the process of construction, should be set off in the summer of 2007.

The Slovak Republic has 400 and 220 kV interconnectors with all neighbors' countries except Austria. Due to its geographic location the Slovak Republic is significantly involved in electricity transits, especially in the north-south direction (from Poland to Hungary).

The auction allocation mechanism on the yearly, monthly and daily basis is used on all cross-border profiles. The auction mechanism on cross-border profile with the Czech Republic and Poland is the coordinated auction.

From 2004, SEPS, a.s. as a full member of ETSO has joined CBT mechanism.

END OF THE DOCUMENT

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