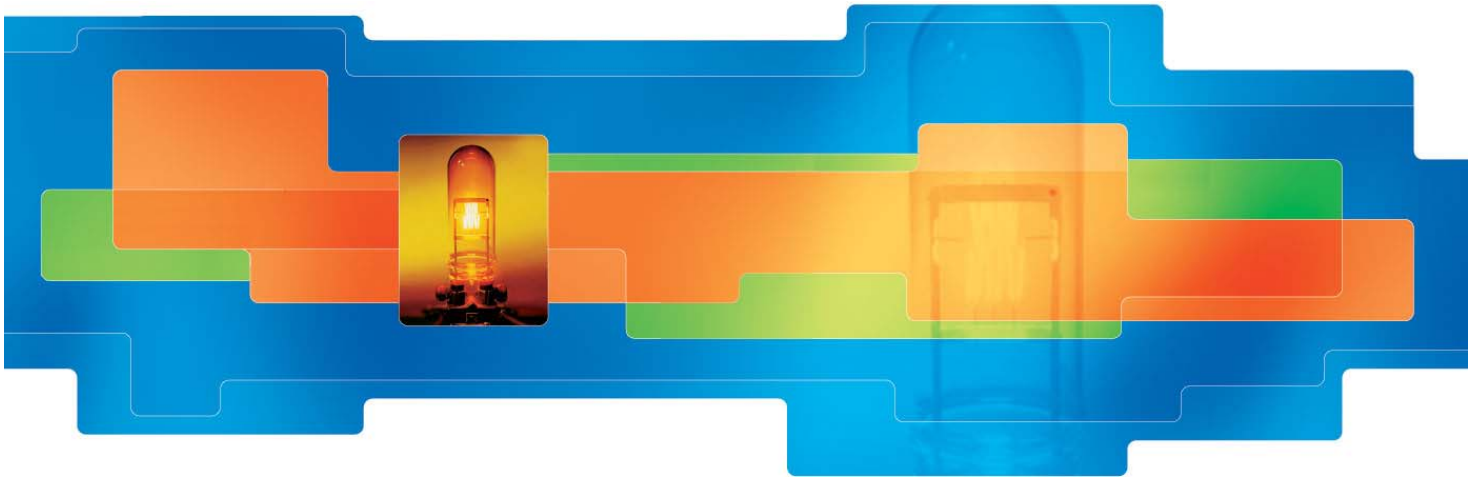

UCTE System Adequacy Forecast 2006-2015

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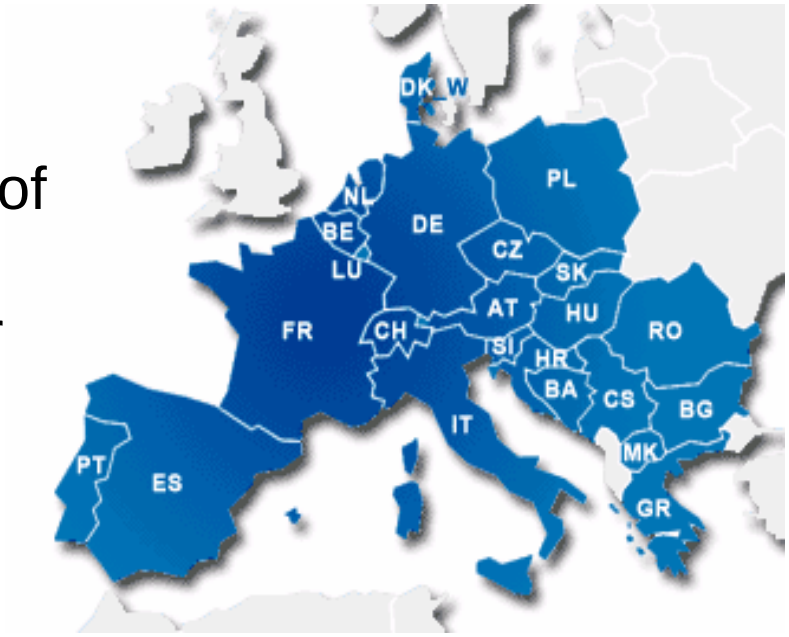
System Adequacy Forecast 2006-2015

- Introduction
- Methodology
- Main results
- Detailed analysis: geographical blocks
- Transmission system adequacy
- Conclusions

Introduction

UCTE Objectives:

Maintain the security of operation in the interconnected power system supplying



- 23 countries
- 450 Million people
- 2500 TWh: 16% of world consumption

Introduction

The UCTE System Adequacy Forecast aims at:

- providing all European electricity market players with an overall view on system load evolution, as well as on the resources available to satisfy the system load, as an early input to investment decisions.
- providing all European electricity market players with an overview on the main changes expected in the UCTE transmission grids especially interconnections.
- providing TSOs which co-operate within UCTE with a prospective view of supply reliability developments throughout the network.

Introduction

What is adequacy ?

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 standard conditions.

How to assess adequacy ?

Generation adequacy verify the capability of the available generation capacity to cover the peak load, taking into account uncertainties on generation (resulting from planned and unplanned outages, availability of primary sources...) and on load levels (resulting from weather conditions….)

System adequacy includes the flexibilities provided by the interconnected network (possibilities of import / export)

Methodology - role of system adequacy forecasts in the liberalised market

In the liberalised market,

- each supplier is responsible to supply its customers
- Market mechanisms are supposed to give proper signals for investments
- But in the present transitional phase, there is today no certainty that these individual decisions will lead to adequacy at the European level and the investments will be decided in due time

In this framework it is necessary:

- at short term to verify the capability of the existing capacity and capacity under construction or at an advanced stage of planning to cover the peak load,
- at long term to provide forecasts on additional generating capacity likely to be required to achieve generation adequacy

Methodology - role of system adequacy forecasts in the liberalised market

Efficient monitoring of system adequacy is a prerequisite for a reliable supply

These forecasts need to be international because reliability in the different countries is linked via transmission lines and trading

- The UCTE system adequacy publications are the framework for assembling reliability data for the generation and transmission system for a large part of Europe
- Extension at the whole European system is performed within ETSO

Methodology - role of system adequacy forecasts in the liberalised market

TSO's are the best placed of all industry participants to assess future developments for their area

In the previous years UCTE has made continuous efforts to adapt these forecasts to new market environment and expectations

Extension of the time frame, introduction of scenarios…

In 2005, extension at the whole European system performed by ETSO

This year it is possible

to analyse the evolution of forecasts over the years

and to initiate a dynamic monitoring of the system adequacy

Main hypotheses (1)

Forecast vision from January 2006 to July 2015.

Two scenarios are considered in order to cover the higher uncertainties on future generation capacity at such time horizon:

Scenario (A) "Conservative": only new projects considered as "firm", estimated on the basis of data available to TSOs, are taken into account, and as long as known decommissioning projects

Goal: highlighting potential unbalances without any new further investment decisions

Scenario (B) "Best Estimate": results from TSO's estimations of generation developments taking into account : national generation development plans, appliance to European directives (renewables), applications for grid connection….

Goal: estimating an estimation of potential future developments induced by market signals and adequate incentives for investments

Main hypotheses (2)

Reference points:

- 3rd Wednesdays of January and July, at 11:00 (reference points),
- 3rd Wednesdays of January, at 19: 00 (closer to synchronous peak load).

Load

- Estimated under normal climatic conditions

Other assumptions

- Long term export/import contracts or participation in power plants out of the national territory are not taken into account
- Interconnections capabilities based on ETSO definitions and calculations

Methodology - assessing generation adequacy

1. Compare the capacity effectively available with *a reasonable probability*
   with the expected load at reference point

   Remaining Capacity (RC) =
   Reliably Available Capacity (RAC) – Reference Load (RL)

Reasonable probability takes into account

- forecasted overhauls
- mean level of forced outages
- most probable energy conditions (hydro, wind)…

2. Define an indicative level of RC - Adequacy reference margin (ARM) -considered as sufficient to provide reliable supply
   => limit the risk of shortfall at 1% - 2 to 5 days par year on average for UCTE

   ARM = [5% or 10%]*National Generating Capacity
   + Margin against the peak load
   (ie difference between peak load and reference load)

Methodology

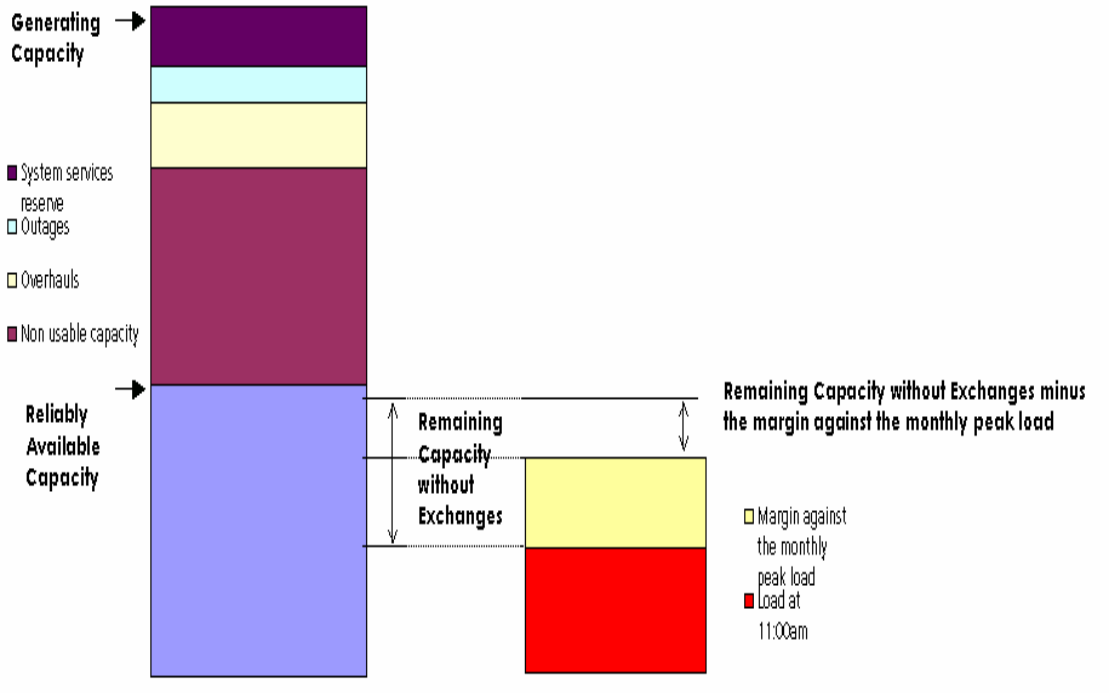
Indicative adequacy reference level (ARM)

Remaining capacity at peak load up to 5% of national generating capacity is still adequate to limit the risk of shortfall at 1%

- for UCTE as a whole and large areas
- for the following national systems: 5% - Belgium, Germany, Italy, Netherlands, Switzerland, Czech and Slovak Republics, Hungary, Poland, Romania, Bulgaria and Western Ukraine.

Remaining capacity up to 10% of national generating capacity for systems more sensitive to random factors :
10% - France, Greece, Spain, Slovenia, Croatia, Serbia and Montenegro, Macedonia, Luxembourg, Austria , Bosnia and Herzegovina, Portugal and Romania.

Methodology - components of the power balance



Margin - possibility of export or need of import

The synthetic feature is:

Remaining Capacity must be higher than the ARM to ensure the reliability of the system.

So, if:

Remaining Capacity > ARM then possibility of export

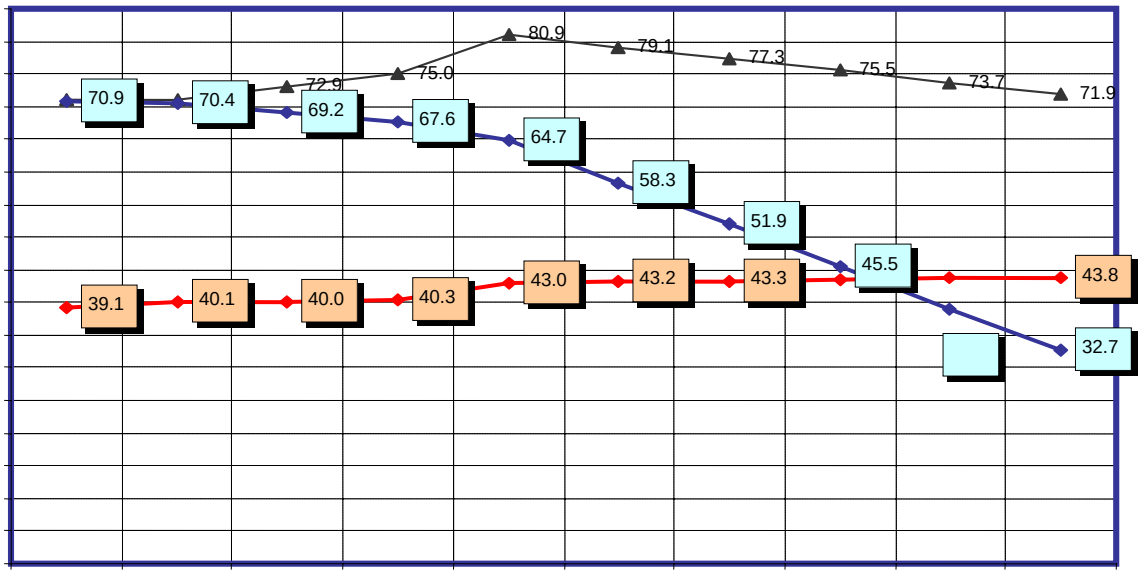
Remaining Capacity < ARM then need of import

Generation adequacy - main results

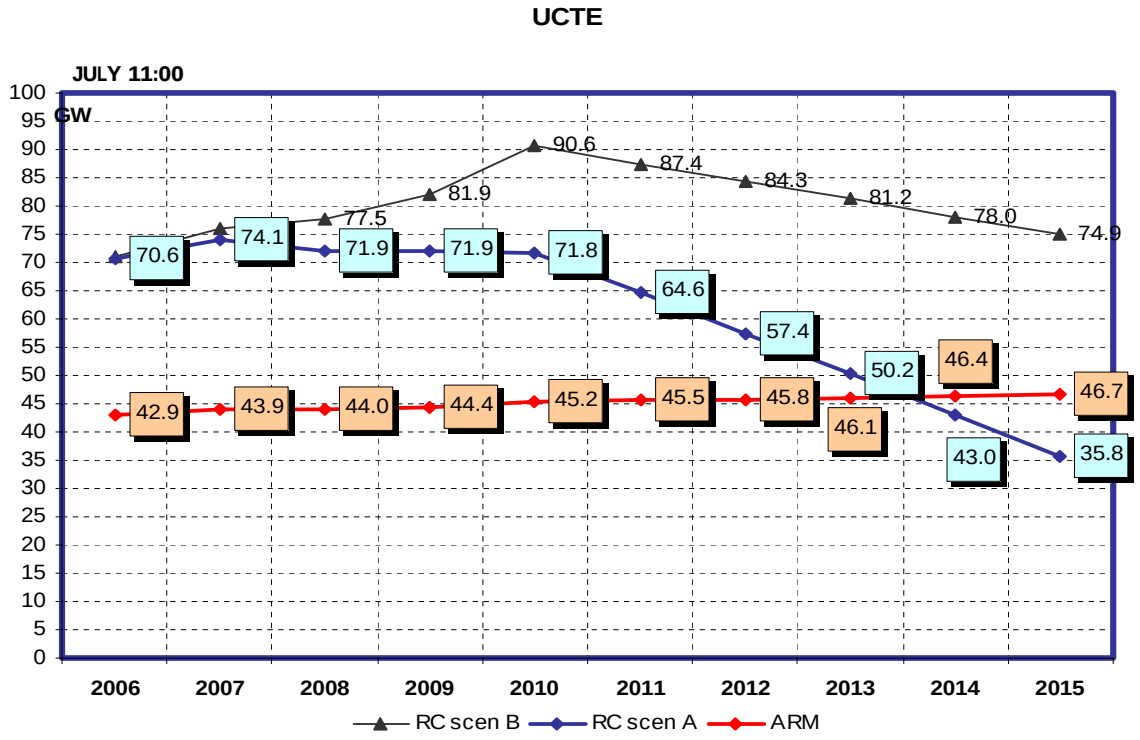
- Whole UCTE system for 2006 – 2015 period
- Detailed analysis by country
- Geographical blocks

Main results - Remaining Capacity January

UCTE



Main results - Remaining Capacity July



Main results - Remaining Capacity January

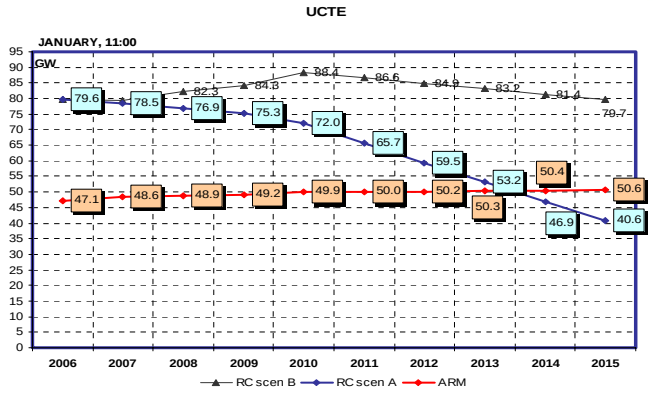
Security of supply of the UCTE system as a whole seems not to be at risk for 2006 – 2013 period.

Scenario A

- slight decrease of the security margin can be observed between 2006 and 2010
- around 10 to 12 GW firm investments in generation would be necessary in 2015 to counterbalance the potential deficit

Scenario B

- foreseen plans or projects should maintain adequate security of supply… provided that investments are confirmed.



Existing investments decisions seem sufficient to allow reasonable level of adequacy from now on to 2010.

Security will be at risk if further investments are not decided before 2013.

Main results 2006 to 2008

⇨ Installed capacity

- Increase of +25 GW over the period from January 2006 to January 2008 (630 GW)
- 15 GW from renewable energy (mainly wind)

⇨ Reliably Available Generation : only + 12 GW

⇨ Load

- Annual average increase : + 2% in winter (+2;2% in summer)
- +15 GW over the period 2006-2008 (around 400 GW at January 2008 – 19.00)

⇨ Remaining capacity

- Slight decrease : – 3 GW over the period
- But 70 GW at January 2008 – 19.00

RC represents 9% of total generating capacity that allows to face:

- A cold wave leading to 8 °C below normal temperature
- While keeping 45 GW to face real peaks of individual countries and unfavourable availability of generating units

Main results 2008 to 2010

Scenario A

⇨Installed capacity

- Increase of + 11 GW / 12 GW from renewable energy / decrease of nuclear
- Renewable : 70 GW (mainly wind)

⇨ Load

- Same rate increase as in the previous period : +15 GW over the period

⇨ Remaining capacity : 65 GW

Despite a slight decrease (– 5 GW over the period)

Investments today firmly decided or planned are sufficient to meet ARM in 2010

It is still possible to decide new investments :

scenario B brings 20GW more

- Decommissioning may occur during the period

Main results 2010 to 2015

Scenario A

⇨Installed capacity

- strong increase of renewable renewable generating capacity : + 18 GW
- decrease of fossil fuel and nuclear

⇨ Load

- rate of increase : +1.8% in winter, + 2.0% in summer

⇨ Remaining capacity: drops to 33 GW at January 19.00 (36 GW in July)

additional 11 GW necessary to meet ARM

Scenario B

Addditional commissioning brings out

- around 50 GW capacity
- half of them from fossil fuel energy sources
- effect on remaining capacity : + 37 GW

When scenario B is considered, RC accounts for 69 GW at January 19.00

Main results 2010 to 2015

⇨ On the basis of investments considered as firm:

ARM is met till 2013 but no more in 2015

11 GW would be necessary to meet ARM in 2015

⇨ When assumptions from TSO's concerning commissioning are taken into account,

RC still represents 10% of generating capacity in winter 2015

Renewable should reach 100 GW

Under these hypotheses, Remaining Capacity matches ARM from 2010 to 2015

Detailed analysis by country for 2006

Remaining Capacity at peak load compared to Adequacy Reference Margin

Belgium,

Germany,

Netherlands,

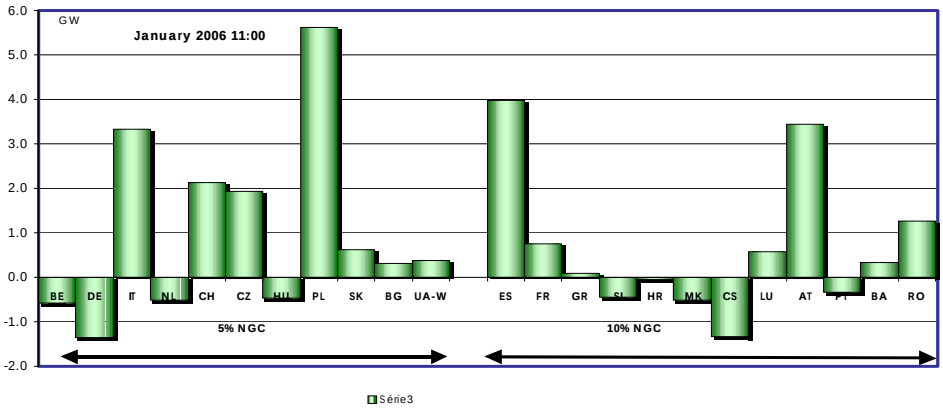
Hungary,

Serbia Montenegro,

FYR of Macedonia,

Portugal

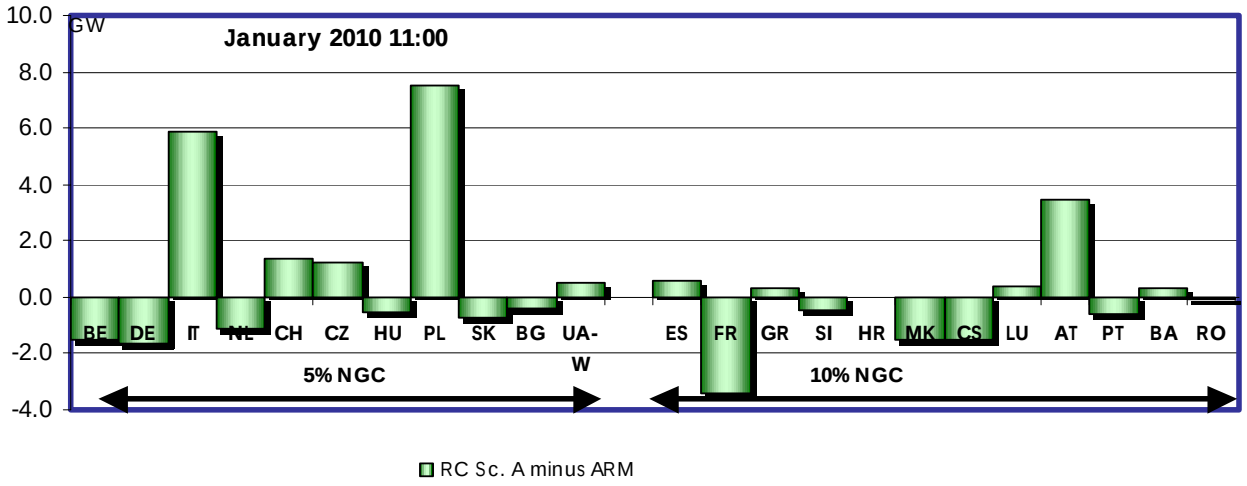
don't meet indicative ARM,



Nevertheless ARM can be a stronger objective
than the feature used for the national generating adequacy assessment.

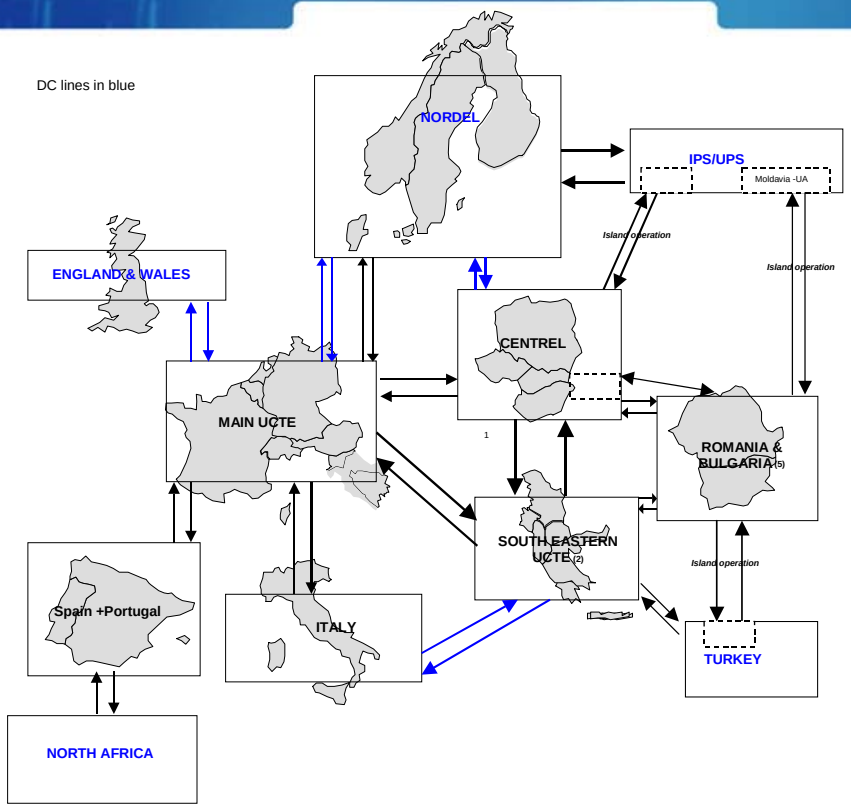
Detailed analysis by country for 2010

Remaining Capacity at peak load compared to Adequacy Reference Margin



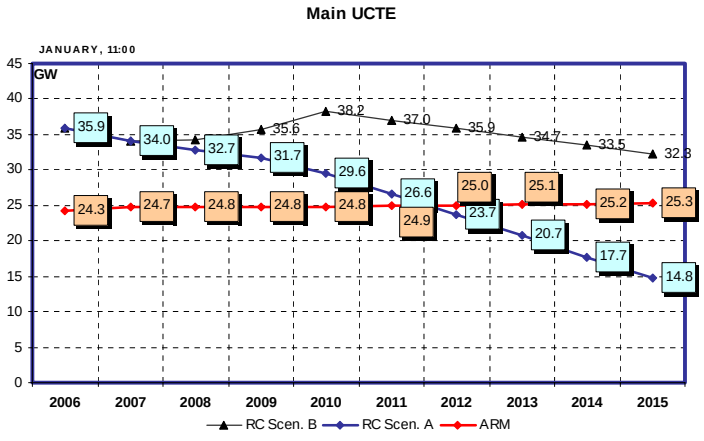
In addition Slovakia, Bulgaria and France doesn't meet ARM

Geographical blocks



Detailed analysis - main UCTE block

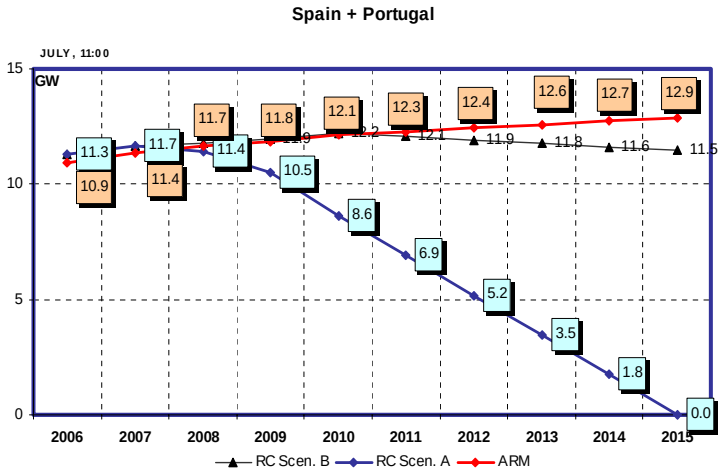
- ARM feature is met till 20
- Scenario A : lack of 11 GW / indicative
- adequacy feature in 2015
- 2006 – 2008
  - Load growth : 1.3%
  - Increase of renewables (+6 GW)
  - RAC increases only by 1.7 GW
- 2008-2010
  - Increase of renewables (+6GW), decommissioning of nuclear
  - Scenario B brings 9 GW more in 2010



- Expected decrease of the potential of export
- Potential need for imports after 2010
- in unfavourable conditions if foreseen investments are not realized

Detailed analysis - Spain + Portugal

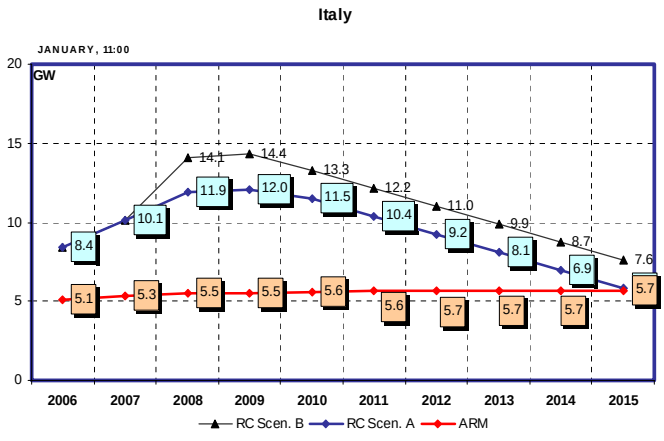
- Load growth highre than 3% in winter and in summer
- From 2006 to 2008, ARM index is respected for winter and summer reference time.
- After 2008, SC A includes only renewables : ARM feature is no longer met and a lack of about 13 GW appears in summer 2015.
- SC B : predictable future commisionning are not sufficient to achieve adequacy for summer time.



Development of local generation and reinforcement of interconnections are needed to increase the reliability of Spanish and Portuguese systems in the medium term.

Detailed analysis - Italy

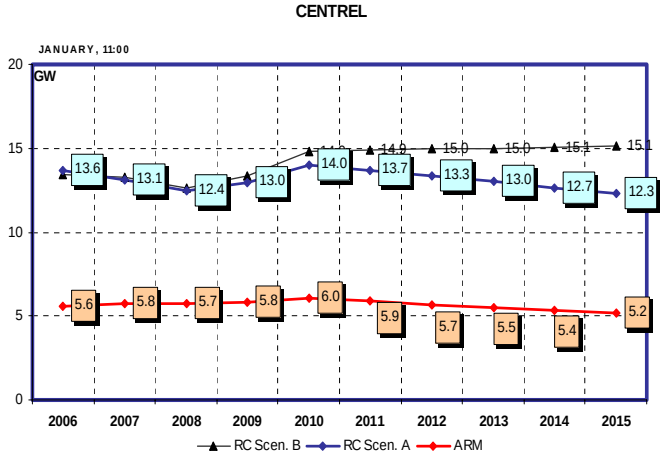
- Load growth : 2.2% in winter, 2.6% in summer
- Important investments in generation are expected (+11 GW from 2006 to 2010) as a consequence of decisions taken after 2003 Black-out
- The remaining capacity of the block is significantly improving (commissioning of conventional thermal plants)
- The ARM is met from January 2006 to January 2015. The adequacy is just achieved for summer reference time 2015.



Situation is quickly changing: margins are expected to be much more comfortable than in the past

Detailed analysis - Centrel block

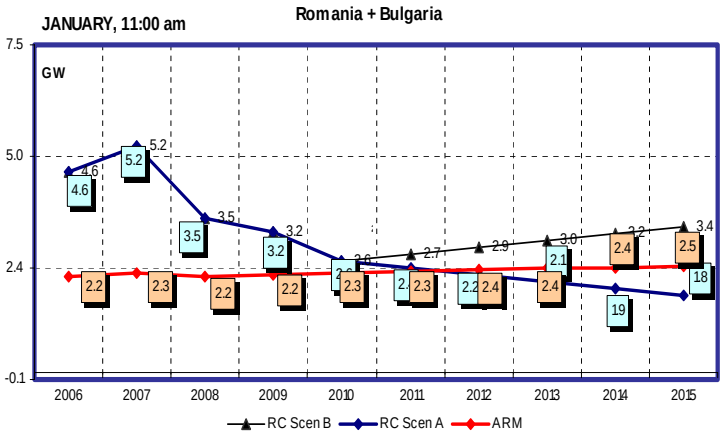
- This block presents a Remaining Capacity significantly higher than the Adequacy Reference Margin.
- 2006 to 2008 : decommissioning of some nuclear and fossil fuel units : slight decrease of RC
- improvement of the situation in 2010
- RC remains sufficient in 2015 without any extra commissioning.



CENTREL seems to have a long-term export-orientated position.

Detailed analysis - Romania + Bulgaria

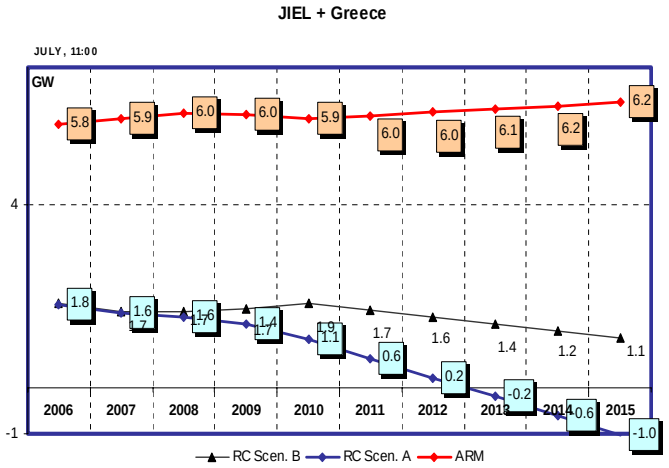
- Generation capacity is decreasing slowly from 2006 to 2010 but adequacy is achieved for this period.
- ARM is just met in summer 2010
- In 2015 the NGC remains at the same level as 2006 : additional investments up to 2 GW are needed to meet the ARM.



- Generation adequacy is achieved till 2010
- New commissionings, as expected in scenario B, should allow to achieve adequacy till 2015

Detailed analysis - South Eastern UCTE

- The remaining capacity of the block is low and reliability is not ensured over 2006 on to 2015.
- Margins are 3 GW below ARM for summer load and 1 GW below for winter peak in 2008
- The situation will be worsened if expected investments are not realised. (only 1.5 GW are planned to be commissioned from 2006 to 2010)



Import from other block will play a crucial role, especially in summer

Transmission system adequacy (1/2)

Developments on interconnection over the period

Line or equipment	Voltage level	Date of commissioning	Cross-border
Steinach – Prati	110/132 kV	2006	AT- IT
Bitola – Florina	400 kV	2006	MK – GR
S.Mitrovica – Ugljevik	400 kV	2006	CS – BA
Tarifa – Ferdioua	400 kV	2006	ES - MA
Chooz – Jamiolle – Monceau	225/150 kV	2006	BE - FR
Philippi – Turkey	400 kV	2007	GR – TR
DC Cable to Norway "Norned"	500 kV	2007 – 2008	NL – N
Second line Slavetice – Durnrhor	400 kV	2008	AT – CZ
Ernestinovo - Pecs	400 kV	2008	HR - HU
Podgorica – Tirana – Elbasan	400 kV	2008	CS – AL
Békéscsaba – Nadab	400 kV	2008	HU – RO
Stip – Cervena Mogila	400 kV	2008	MK – BG
France – Spain: eastern reinforcement	400 kV	2009	ES – FR
Valdigem – Douro Internacional – Aldeadavilla	400 kV	2009	PT – ES
Suceava – Balti	400 kV	2009	RO – MD

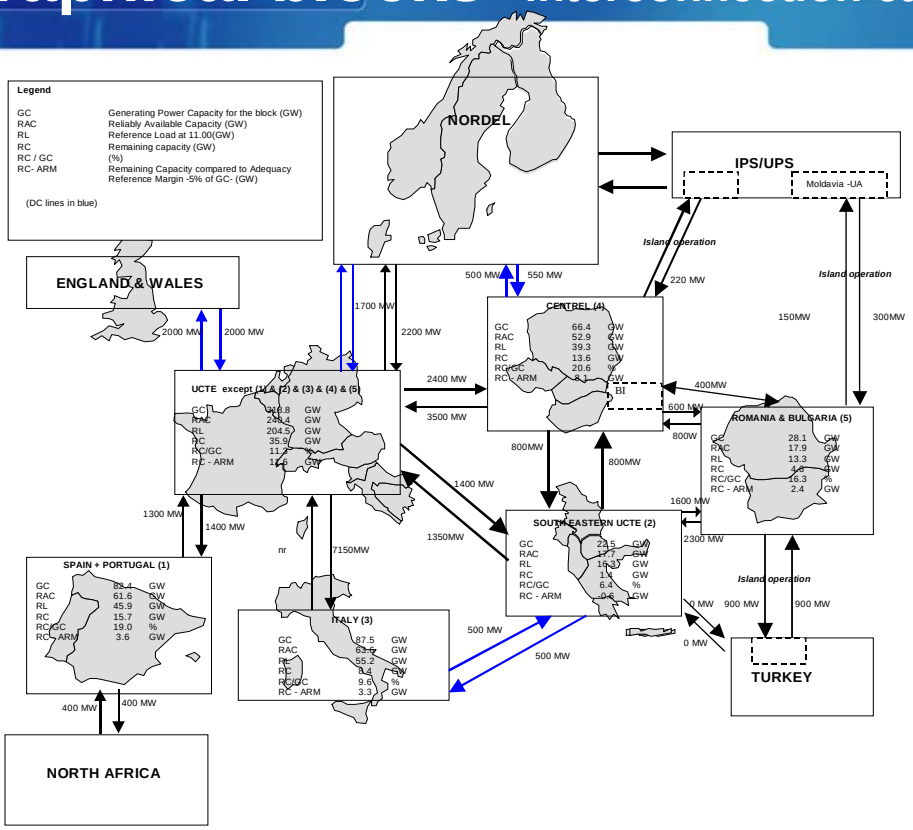
Transmission system adequacy (2/2)

Developments on interconnection over the period

Line or equipment	Voltage level	Date of commissioning	Cross-border
Skopje – Nis	400 kV	2008 – 2010	MK – CS
Nauders– Curon – Glorenza	220 kV	Before 2010	AT - IT
Bitola – Vlore	400 kV	2010	MK – AL
Timisoara – Vârset	400 kV	2010	RO – CS
Sombor – Pecs	400 kV	2010	CS – HU
Moldava or Rimavska Sobota – Sajoivanka	400 kV	2011	SK – HU
Cirkovce - Pince	400 kV	2011	SL - HU
Udine – Okroglo	400 kV	2011	SI - IT
International line to Austria	400 kV	2012	SK – AT
Lorraine – Ardennes line	400 kV	2012	BE - FR
Lemesany – Ukraine	400 kV	2013	SK – UA
Double AC Line Thaur – Bressanone through Brenner Basis Tunnel	400 kV	2015	AT – IT
DC Cable The Netherlands – United Kingdom	-	2015	NL - UK
Varin – Byczyna	400 kV	2020	SK – PL
Meliti – Bitola	400 kV	Undefined	GR - MK

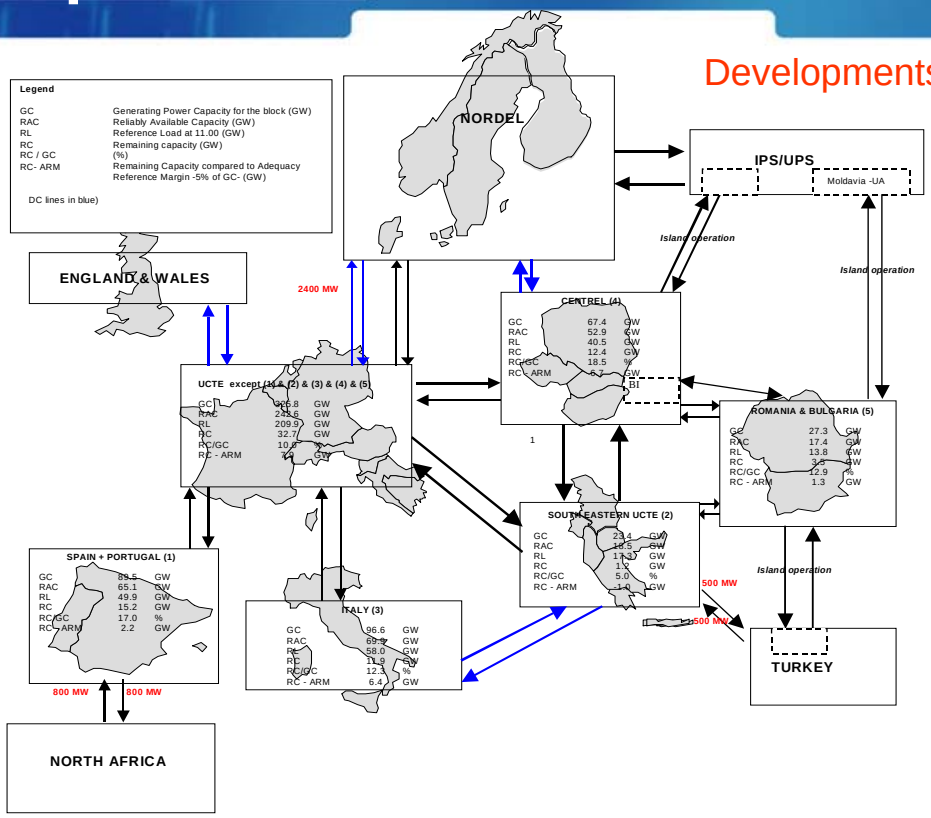
Geographical blocks - interconnection capacities

January 2006



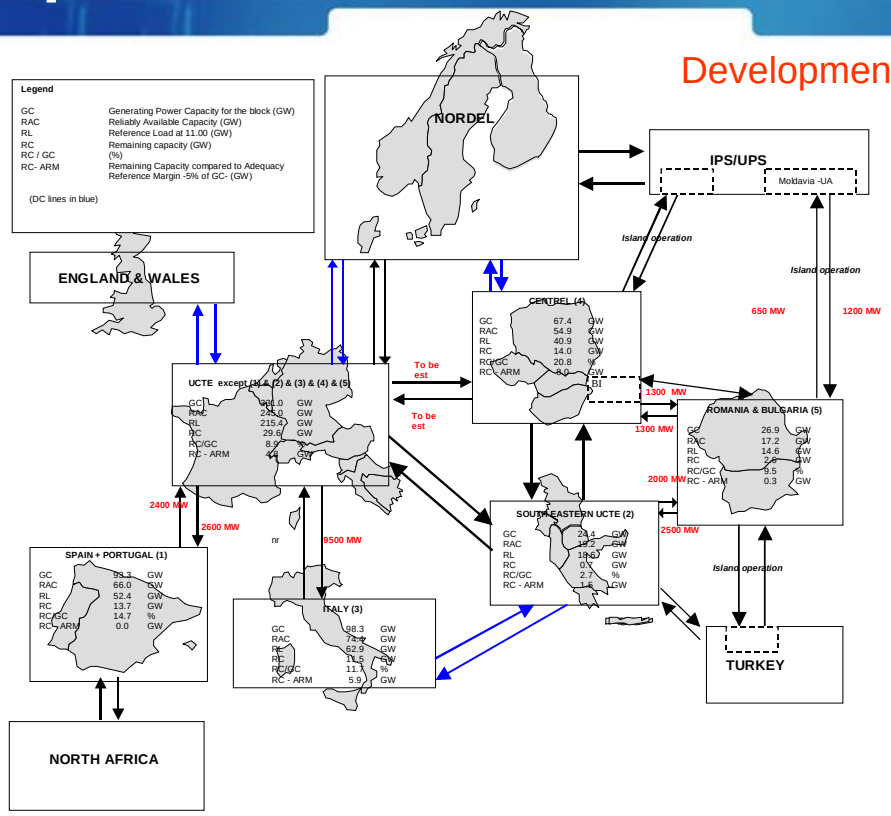
Geographical blocks - interconnection capacities

Developments 2006 - 2008



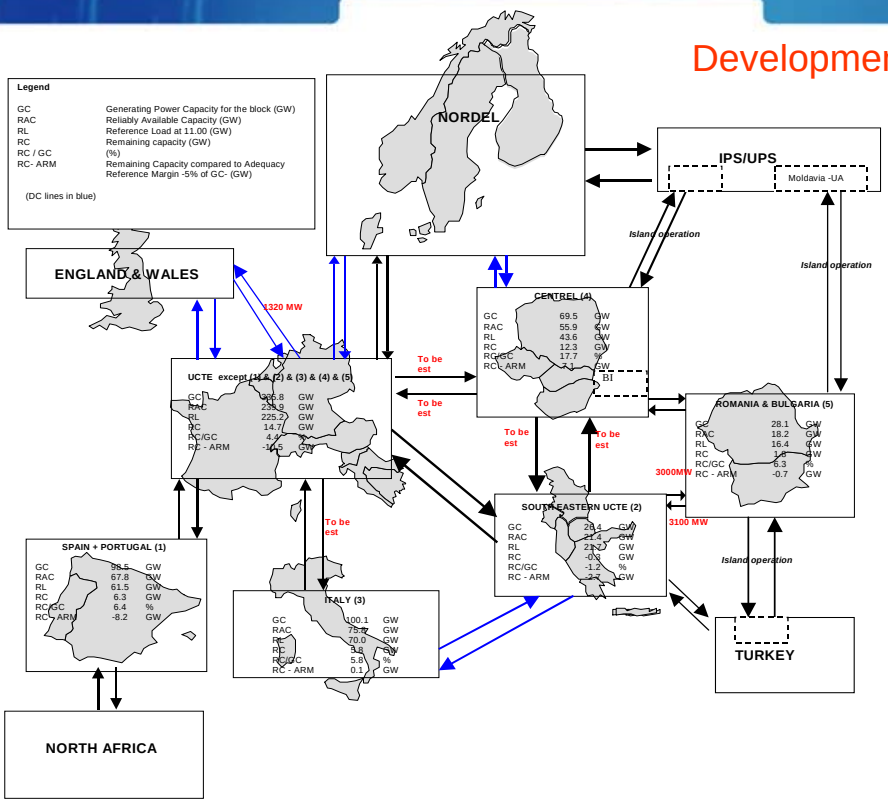
Geographical blocks - interconnection capacities

Developments 2008 - 2010



Geographical blocks - interconnection capacities

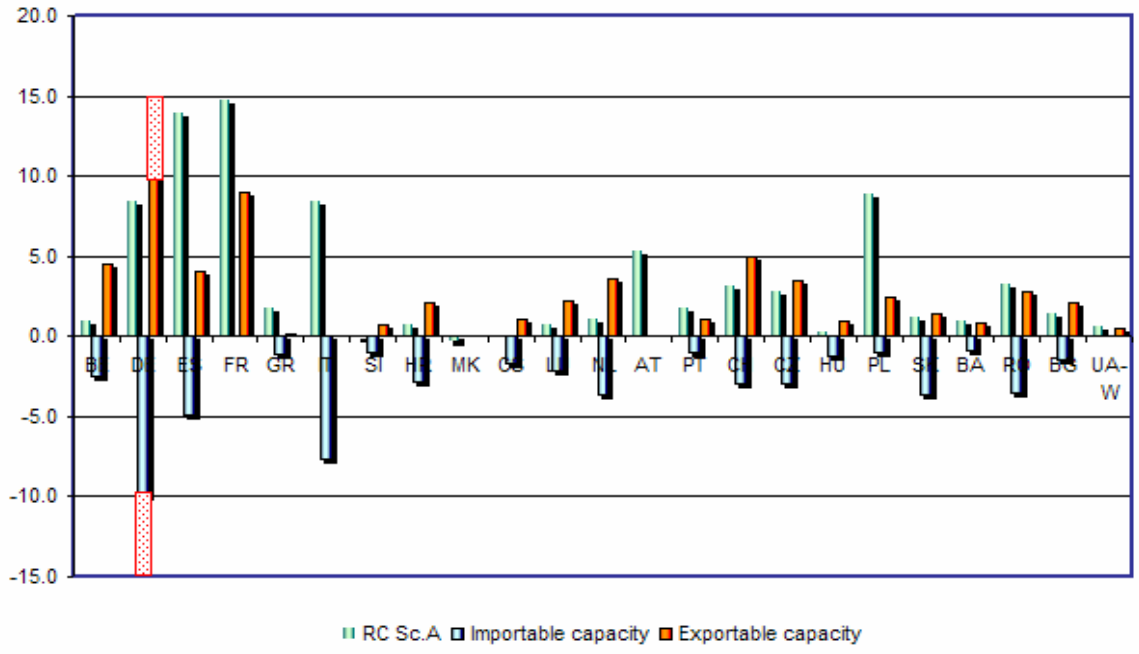
Developments 2010 - 2015



Contribution of the interconnection

Comparing Remaining Capacity to transfer capacities gives an overall view of potential congestions

January 2006 11:00



Contribution of the interconnection

Transfer capacities do not seem to be an obstacle to system security

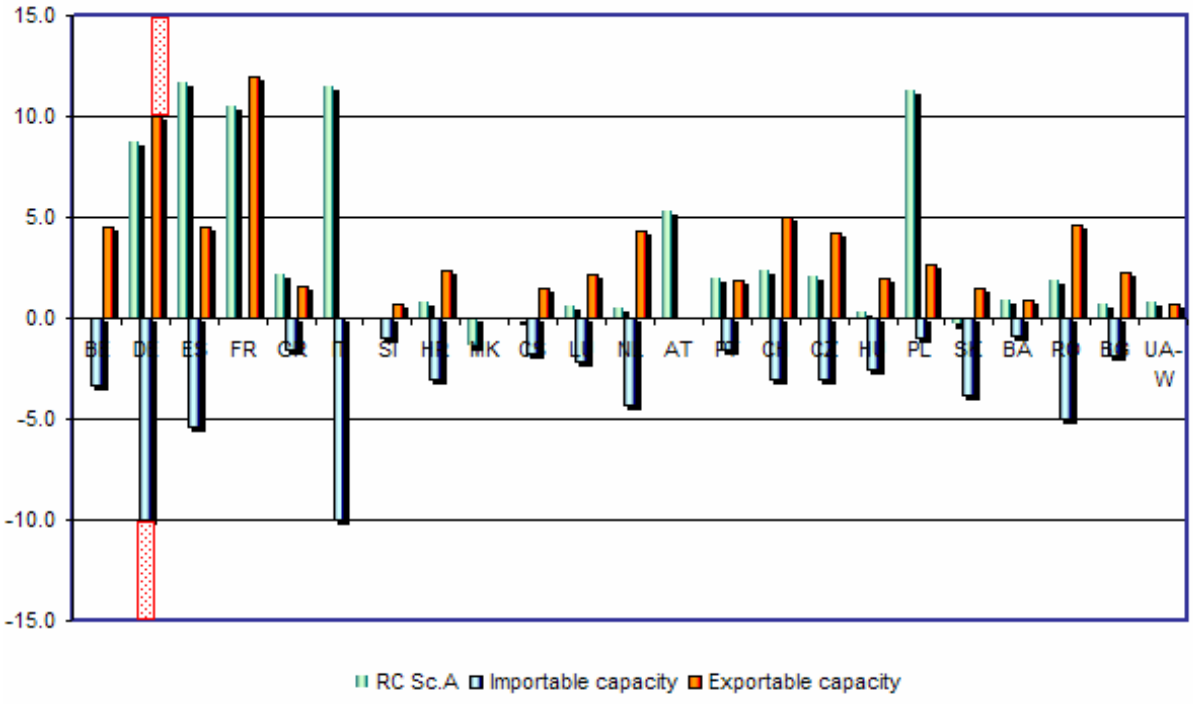
Nevertheless, some particular situations are noticeable :

- the relatively low exchange capacities of Spain and Portugal in 2006 ; the situation improves in 2010 when exchange capacities are of the same order of magnitude as the remaining capacity
- remaining capacity in France higher than the exportable capacity in 2006 ; this value is however subject to large variations but the potential for exports can be limited at some periods. The exportable capacity seems to be more adequate in 2010 after the reinforcement towards Belgium and Spain are commissioned.
- exportable capacity seems lower than the export capabilities in Poland.

This approach doesn't take into account economical aspects market: the use of available most economical sources creates additional congestions in the interconnected network

Contribution of the interconnection

January 2010 11:00



Load reduction measures (1/2)

Information not available:

- Efficiency not yet measured
- Information not notified to TSO's

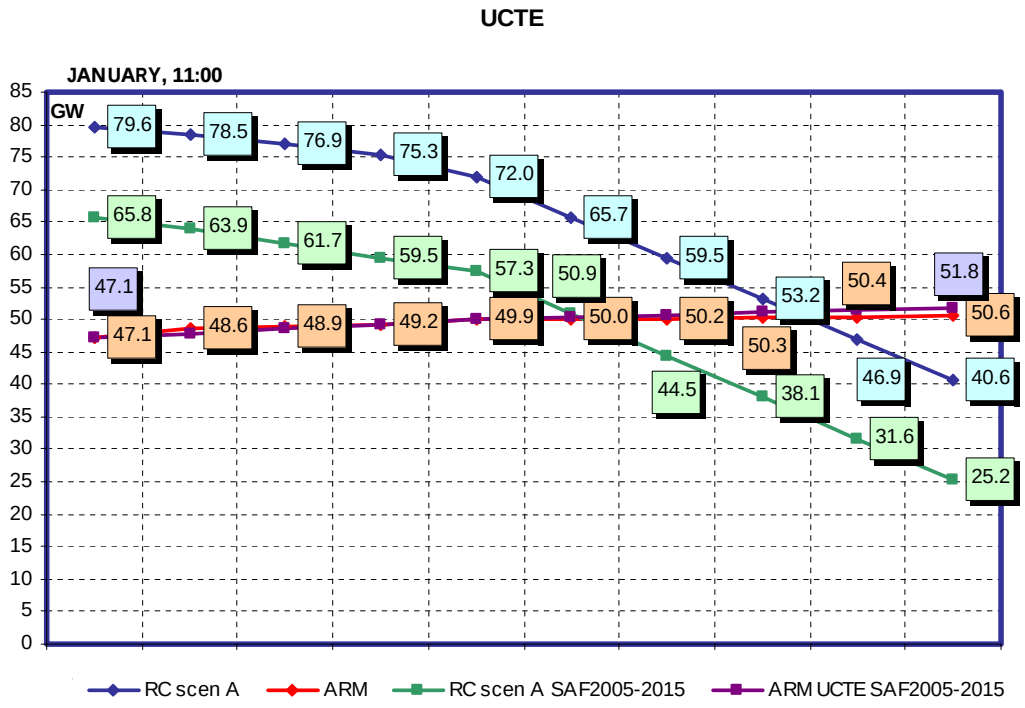
	Peak load 2005	Load Reduction Measures			
Country			2006	2010	2015
BE	13707	Yes	200	200	200
DE	77200	-	-	-	-
ES	43378	Yes	2000	3000	3000
FR	86024	Yes	3900	3000	3000
GR	8321	-	-	-	-
IT	53606	-	-	-	-
SI	1991	Yes	n.a.	n.a.	n.a.
HR	2900	-	-	-	-
MK	1487	-	-	-	-
CS	6781	-	-	-	-
LU	993.7	-	-	-	-
NL	15601	Yes	n.a.	n.a.	n.a.

Load reduction measures (2/2)

	Peak load 2005	Load Reduction Measures			
AT	9019	-	-	-	-
PT	8528	-	-	-	-
CH	9738	-	-	-	-
CZ	10157	Yes	n.a.	n.a.	n.a.
HU	6012	Yes	n.a.	n.a.	n.a.
PL	21350	-	-	-	-
SK	4349	-	-	-	-
BA	1946	-	-	-	-
RO	8508	Yes	n.a.	n.a.	n.a.
BG	6502	-	-	-	-
UA-W	1024	Yes	45	45	45
UCTE			**6145**	**6245**	**6245**

This SAF was done without taking account of load reduction measures which can increase security margins

Conclusion - comparison with last year results



Conclusion - comparison with previous forecasts

Comparison with SAF 2004-2010 and SAF 2005-2015

Mismatch between RC and ARM

- expected in 2009-2010 in SAF 2004-2010,
- postponed to the period 2010-2011 in SAF 2005 – 2015
- is delayed to 2013-2014 in this year forecast

➢ Generating capacity: Higher by approx.

- 8 GW in 2006, 13GW 2008, 8GW in 2010 and 7GW in 2015 compared to SAF 2005-2015,
- +15GW compared with SAF2004-2010 over the period 2006-2010.

➢ Load: updates lead to a decrease of approx. 5 GW all over the period 2006 – 2015.

➢ Remaining capacity: always higher

Conclusion - comparison with last year results

Changes affect the short and long term

➢ In the short term, consolidation of forecast by

- integration of additional generating capacities (Spain, Italy...)
- reestimation of availabililty (real maintenance plan/statistics)
- lower load estimations (France, Germany,...)

reflects uncertainties which affect information available for TSO's : projects, maintenance plans, decisions concerning decommisioning...

➢ In the medium long term

- expected reliability of UCTE has improved over the last three years

First sign that market mechanism deliver appropriate signals for investment decisions ?

Obviously to early to draw any definitive conclusion !

Conclusion

- Security of supply not at risk for coming years
- It should be ensured to 2013 at the UCTE level
- But adequacy needs a continuous monitoring especially in some areas :
  - South Eastern UCTE
  - Spain and Portugal
  - Main UCTE block
- Having in mind that uncertainties affect these estimations :
  - In the short term lack of precise information
  - In the medium term effects of CO2 trading and EU directive on large combustion plants on existing fossil fuel plants not completely included;
  - In the long term efficiency of market incentives for new investments still to be demonstrated