European Network of Transmission System Operators for Electricity

entsoe

SUMMER OUTLOOK REPORT 2015 AND WINTER REVIEW 2014/2015

27 May 2015

Content

1. Introduction

ENTSO-E adopts and publishes on an annual basis the "**Summer Outlook and Winter Review**" as required by Article 8 of the EC Regulation n. 714/2009.

These short-term adequacy reports focus on exploring the main risks identified within a seasonal period, highlighting the possibilities for neighbouring countries to contribute to the generation/demand balance in critical situations. The purpose of these reports is to provide a platform for information exchange amongst TSOs, promote discussion on transparency, and inform stakeholders on the potential system risks, so appropriate decisions can be made on topics such as maintenance schedules, postponement in decommissioning, and stakeholder awareness about levels of adequacy.

The present Summer Outlook Report adresses power balances with a national resolution between forecast generation and demand on a weekly basis for the summer period **from 1 of June 2015 (week 23) to 20 September 2015 (week 38).** This report considers uncertainties such as climatic conditions and outages, as well as other risks characteristic of the system including the evolution of load, load-management, generation capacities, and stability issues.

The Winter Review covers the period from **1 December 2014 (week 49) to 19 April 2015 (week 16).** It outlines the main events which occurred during the previous winter, according to TSOs, with reference to security of electricity supply (i.e. winter conditions, power system conditions, as well as availability of interconnections).

The purpose of this report is to present TSOs' views on any matters concerning security of supply for the forthcoming summer period. It also seeks to identify the risks and the countermeasures proposed by the TSOs in cooperation with neighbouring countries, whilst also assessing the possibility for neighbouring countries to contribute to the generation/demand balance if required.

In addition, throughout this period, an assessment of "downward regulation" issues is performed in order to provide a level of confidence regarding the effects of variable generation such as wind and solar on system operation. For this assessment, two reference points are used, aiming at identifying situations where excess inflexible generator output exceeds overnight minimum demands, and any possible downward regulation issues in a low load – high renewable (RES) infeed situation (typically a sunny weekend day).

In order to harmonise as far as practicable the assumptions on variable energy sources, bearing in mind the inherent differences between countries, two different approaches are applied: while the individual country analysis includes the data provided by the TSOs in order to take into account each country's specificities, the Pan European regional assessments include a harmonised probabilistic approach using a Pan European Climate Database1 (PECD).

Compared to the last seasonal Outlook report, continuous improvements have been implemented, especially regarding regional sensitivity analysis, as well as population weighted temperatures in the Pan European Climate Database.

The geographical perimeter for adequacy assessment within ENTSO-E seasonal outlooks is the synchronous area enclosed by ENTSO-E members, European Economic Area (EEA) countries and Energy Community Countries. The assessment is performed at two levels:

- Assessment by individual ENTSO-E member countries, as well as Albania, Malta and Ukraine West.
- Pan European regional analysis, assessing the possibility for neighbouring countries to contribute to the generation/demand balance if required.

[1]Data from Technical University of Denmark

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2. Executive summary

The ENTSO-E Summer Outlook 2015 shows that, on the whole, Europe's power system will remain balanced during the summer period under normal weather conditions. Indeed, if demand remains normal, most European countries will not require imports to maintain balance between demand and supply.

However, this changes if demand increases from normal levels because of severe weather conditions such as heat waves and prolonged periods of high temperatures. According to data submitted by TSOs, countries such as Belgium, Denmark, Hungary, the FYR of Macedonia and Poland would require imports to maintain their balance during all or nearly all the summer period.

In September, there is a risk that Belgium's import needs may exceed its import capacities. This could be the case if a low generation from renewables coincides with high level of forced outage of conventional generation. Remaining uncertainties on the amount of conventional generation capacity that will actually be available, as well as the impact of the new flow-based allocation method launched on 21 May in Central West Europe, may potentially greatly impact these conclusions.

The ENTSO-E Summer Outlook 2015 also highlights the fact that during certain weeks over the summer, it may be necessary to reduce excess generation in various countries as a result of insufficient cross border export capacity. For example, the combination of high generation from renewables and inflexible conventional generation in Ireland, Sweden and Denmark could lead to high exports to all surrounding countries overnight. Curtailing the output of renewable energy sources may be necessary under certain conditions in Bulgaria. In daytime, Denmark, Sweden, Bulgaria, Latvia and FYR of Macedonia may have to export some of their generated power to neighbouring systems during low demand periods.

The ENTSO-E Winter Review 2014/15 highlights that during the winter 2014/2015 temperatures across the whole of Europe were near average. As a result, demand was around seasonal average in most countries. In Greece, Croatia and Serbia, snow, ice and strong wind caused some difficulties and damages to the transmission network. However, no critical situation related to system adequacy occurred in Europe last winter.

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3. Methodology

3.1. Towards a new ENTSO-E Adequacy Methodology

The integration of large amounts of Renewable Energy Sources (RES), the completion of the internal electricity market, as well as new storage technologies, demand side response and evolving policies require revised adequacy assessment methodologies.

ENTSO-E is therefore working to improve its existing adequacy methodology with a special emphasis on harmonised inputs, system flexibility and interconnection assessments.

ENTSO-E published its *Target Methodology*[2], after a consultation period with Stakeholders. Generally the stakeholders acknowledged the proposed target methodology and the comments received focused mainly on the methodology that will be applied for the adequacy assessments, the assumptions made and models to be implemented for the assessments and the need for increased transparency and further details that should be published by ENTSO-E, so all stakeholders can effectively contribute to developing this methodology further. Increased focus is on economic feasibility of generation assets in relation with adequacy assessments.

3.2. Source of information for Summer Outlook and Winter Review report

The ENTSO-E Summer Outlook 2015 is based on the information provided by ENTSO-E members during February-March on both a qualitative and quantitative basis in response to a questionnaire which has been extended in order to increase the level of detail of the analysis performed. It presents TSOs' views regarding any national or regional matters of concern regarding security of supply and/or inflexible generation surplus for the coming summer and the possibility of neighbouring countries to contribute to the generation/demand balance of each respective ENTSO-E member in critical situations. The questions mainly referred to practices as well as qualitative data sent by TSOs in order to present country forecasts on a common basis.

The Winter Review 2014/2015 report is prepared on the basis of the information given by ENTSO-E members through a questionnaire in order to present the most important events occurred during the winter period in comparison to the forecasts and risks reported in the last Winter Outlook. The TSOs mainly answered if their respective power system experienced any important or unusual events or conditions during the winter period as well as the identified causes and the remedial actions taken.

3.3. Data used for the regional analysis

An extensive regional analysis is performed to complete the well-known per-country analysis in the methodology of seasonal outlooks. The aim of this investigation is to assess whether the country based adequacy still remains fulfilled or is even improved when a Pan-European scale is taken into account. In other words, it assesses whether the combination of countries with an electrical surplus and interconnection capacities between countries will be adequate at certain points in time to allow the countries with a generation deficit to import the electric power needed.

A synchronous point in time was used for all countries to allow for a meaningful analysis when determining the feasibility of cross border flows. Before starting the data collection, and using European historical load data, a study was conducted to identify the most representative synchronous time for covering the global European peak load in summer. It was concluded that Wednesday, 12:00 CET most closely represents this situation, and therefore data was requested from TSOs for this time point[3]. With regards to the regional analysis, the following data from the data collection spreadsheet was used as input:

- Remaining Capacity for **normal** and **severe** conditions;
- Simultaneous importing and exporting capacity;
- A best estimate of the minimum Net Transfer Capacity (NTC) values towards and from individual neighbouring countries.

[2] https://www.entsoe.eu/news-events/announcements/announcements-archive/Pages/News/ENTSO-E-Assessment-of-the-Adequacy-Methodology-Consultation-is-Released-.aspx
[3] ENTSO-E internal report '*Pan European peak and off-peak load study*' Peter Olofsson, Svenska kraftnät (2013)

In addition, across the period of assessment for the next summer, any European "downward regulation" issues where excess inflexible generator output exceeds demand are investigated. Similar to the peak demand analysis, it provides an indication which countries require exports to manage inflexible generation. Indeed, this involved an analysis of their ability to export this energy to neighbouring regions that are not in a similar situation. The reason for this analysis pertains to the fact that a number of TSOs expressed that they are experiencing growing problems for system operation (mainly) due to the increase of variable generation on the system (wind and solar) and the lack of more flexible generation means.

Similar to the generation adequacy analysis, to carry out a regional downward analysis, a synchronous point in time was used for all countries in order to allow for meaningful analyses when determining cross border flows. The same European load study mentioned before concluded that minimal demand conditions generally take place around 05:00 CET on Sunday morning.

In addition to this minimal demand conditions, it was concluded that these issues with inflexible generation are not only prone to happen during the night, but also during daytime when the energy production of solar panels near its maximum. To cope with this effect, an additional synchronous time point was added for Sunday 11:00 CET, when a combination of potentially high photo-voltaic infeed and reduced demand levels exist. Quantitative data for this point in time was therefore also requested from all TSOs to allow for a meaningful regional analysis.

For the regional downward analysis, the following data from the data collection spreadsheet was used as input:

- The expected inflexible generation surplus at Sunday 05:00 and 11:00 CET;
- Sum of the inflexible and must-run generation;
- Simultaneous importing and exporting capacity;
- A best estimate of the minimum NTC values towards and from individual neighbouring countries.

3.4. Renewables infeed data

For the per-country analysis, each TSO was requested to give an estimation of the highest expected proportion of installed solar, onshore wind and offshore wind capacity to be taken into account for the downward analysis. Default values of 65% for wind and 95% for solar were presented, allowing for every country to enter its best estimate. For the generation adequacy analysis the renewables infeed is handled through an estimation of the non-usable capacity in normal and severe conditions by each TSO.

For the regional analysis though, it was decided to envision building a consistent pan-European scenario for wind and solar infeed. To this end, a Pan-European Climatic Database[4] was used containing per-country load factors for solar, onshore wind and offshore wind per hour for a fourteen-year period (from 2000 until 2013). This database contains a separate capacity factor for onshore wind, offshore wind and solar per country and per hour of the complete historical period covered. Additionally, geographically averaged hourly temperatures are also included.

To create a consistent scenario throughout Europe, the following approach is adopted for a certain reference time point:

1) All "records" are retained that lie in a hour interval of 2 hours before the reference time point and two hours after the reference time point, on a date (day/month) between three days before the reference date and three days after the reference date. This yields a collection of 490 (14 years x 7 days x 5 hours) records per reference time point;

[4] Data from Technical University of Denmark

2) To achieve per country representative load factors for the generation adequacy analysis, the 50th and 10th percentile of the 490 record collections are respectively calculated for normal and severe conditions of the capacity factors per country and for solar, wind onshore and wind offshore separately. Calculated capacity factors as explained above are provided in Appendix 4.

As such, Pan-European consistent renewable infeed scenarios are created. For example the 10th percentile scenario represents a consistent worst-case scenario over the different countries and for the different primary energy sources. It needs to be noted that this approach guarantees a worst-case scenario as it does not take into account the correlation between the different capacity factors, *i.e.* renewable infeed in all countries is simultaneously assumed to be given by the 10th percentile. This scenario can then be used to detect regional adequacy issues that can consequently be further investigated in more detail and with a more realistic (and therefore less worst-case) renewable infeed scenario if necessary.

The methodology for the downward analysis is very similar to the one above, with the difference that the 90th percentile is used. Calculated capacity factors as explained above are provided in Appendix 5.

3.5. Detailed regional analysis for regions at risk

If the previous analysis shows that a certain country or region (combination of adjacent countries) could experience adequacy issues for a specific time point, this region is investigated more in detail in a next step.

The goal of this detailed analysis is to detect what the main drivers are of a certain adequacy issue (e.g. temperature in country X, wind or PV infeed in country Y, etc..), and to be able to connect an indication of probability of occurrence to it.

For every reference time point, the collection of 490 records is used to run 490 different simulations. The following high-level methodology is applied to build every one of those simulations:

1) As starting point, the qualitative data as given by the TSOs for severe conditions is used;
2) Next, the severe conditions load is replaced by the normal conditions, average load as given by the TSOs;
3) The capacity factors for onshore wind, offshore wind and solar are replaced by those of the concerned record;
4) Then the normal conditions load is scaled by use of load-temperature sensitivity relations. The difference between reference temperature and the temperature of the concerned record is translated into “increase/decrease” of load, using the methodology described in the next section.

After performing these manipulations on the base data, the simulation is run (including the simulation of cross-border exchanges with other countries), and the results are calculated. In this manner, for every simulation it is determined whether or not the considered region suffers adequacy issues or not.

3.6. Scaling the load

As previously explained, for every separate simulation, the per-country load needs to be scaled to a target temperature as given by the PECD. To this end, ENTSO-E-calculated load-temperature sensitivity coefficients were used as a basis. A detailed description on how these coefficients were determined can be found in Appendix 3. TSOs were given the possibility to modify the ENTSO-E centralized load sensitivity factors with their best estimate during the data collection.

The graph below shows how these coefficients, combined with the normal conditions load and its temperature reference as a starting point, are used to scale the load to the target temperature of the concerned record.

To this end, when temperatures are concerned, population weighted average daily temperatures are used. Population weighted normal daily average temperatures are considered since they are better suited to assess temperature dependence of demand (see Appendix 3 for details). This constitutes a methodological improvement compared to the previous Winter Outlook, when simply country averaged temperatures from the PECD were used.

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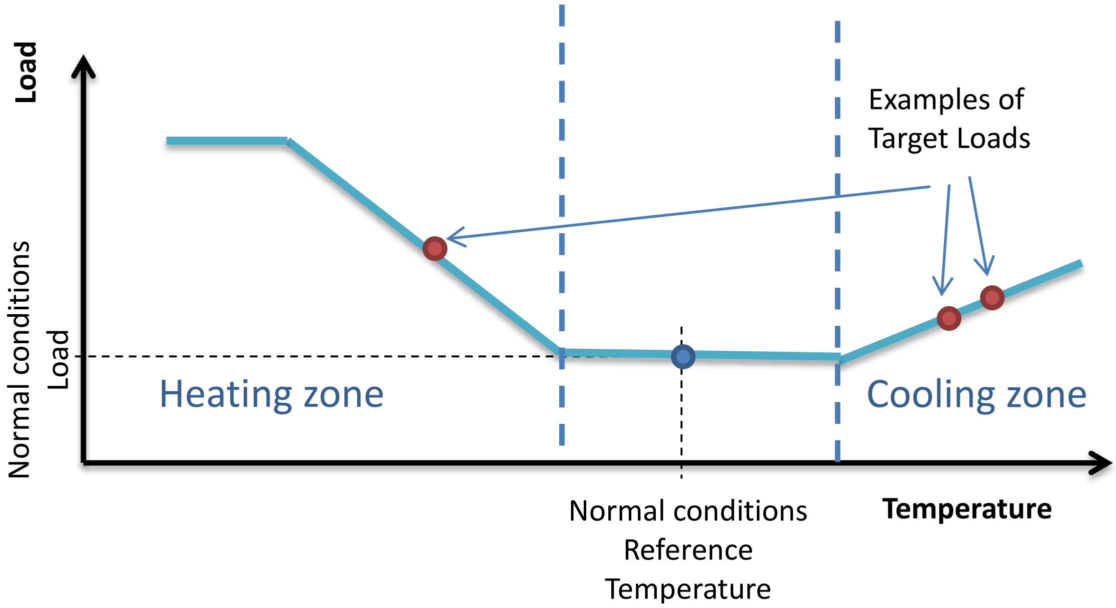

Figure 1 – Load temperature sensitivity

In case no reference temperature at normal conditions is given by the TSO, the 50th percentile of the collection of selected records is used instead.

3.7. Aims and methodology

Upward adequacy
The methodology consists of identifying the ability of generation to meet the demand by calculating the so-called "remaining capacity" under two scenarios: normal and severe weather conditions.

The methodology is schematically depicted on the figure below:

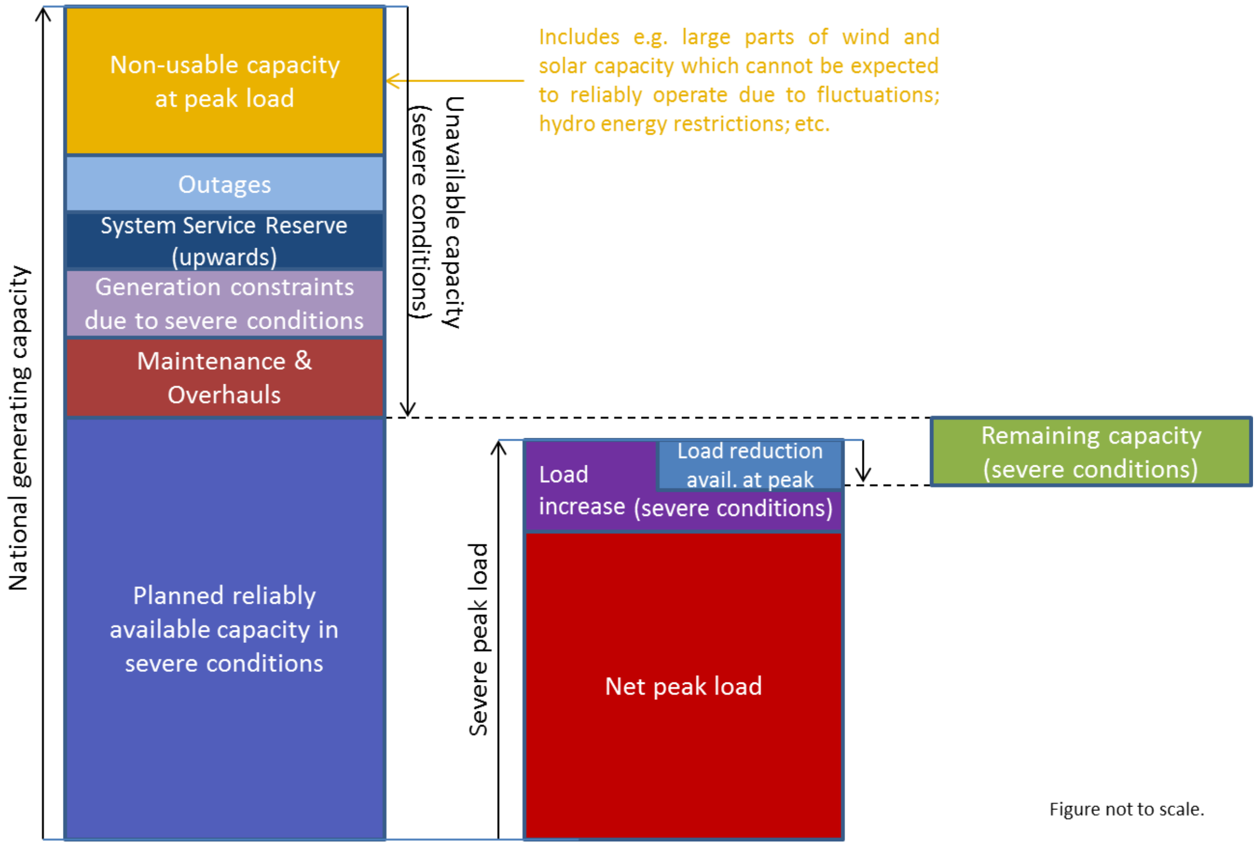

Figure 2 - Summary of upward adequacy methodology

The basis of the analysis is the situation called "**normal conditions**". Normal conditions are defined as those conditions that correspond to normal demand on the system (*i.e.* normal weather conditions resulting in normal wind production or hydro output and an average outage level). A "**severe conditions**" scenario was also built showing the sensitivity of the generation-load balance to low temperature and extreme weather conditions. The severe conditions are related to what each TSO would expect in terms of demand which will be higher than in normal conditions and in terms of generation output which is reduced (*i.e.* severe conditions resulting on lower wind or restrictions on classical generation power plants due to *e.g.* extreme cold).

The figures of the country individual responses show the "National Generating Capacity", the "Reliably Available Capacity" and the "Load at reference point" under normal and severe conditions. The remaining capacity is then calculated for normal and severe conditions.

NTC values are used to limit commercial exchanges between neighbouring countries. All participants were asked to provide the best estimate of the minimum NTC values for being able to conduct a worst-case analysis. When two participants provided different NTC values on the same border, the minimum value was taken. For the regional analysis, the choice of Net Transfer Capacity (NTC) values considers the inclusion of firm contracts to the total commercial exchanges provided by TSOs.

Regional Analysis - The basis of the regional analysis is a constrained linear optimization problem. The target is to detect if problems can arise on a pan-European scale due to a lack of available capacity. No market simulation or grid model simulation is taken into account[5]. Therefore the analysis will only show if there is a shortage on the European or regional level, it will not say which countries exactly will have a generation deficit, as this depends on the actual market price in all connected countries. The

[5] Future improvements of the existing methodology for regional assessments foresee gradual inclusion of market and / or grid modelling features.

goal is to provide an indication whether countries requiring imports will be able to obtain these across neighbouring regions under normal and severe conditions. In other words, the investigation carried out is purely a "feasibility" analysis.

The first element that is checked is whether in a "copperplate" scenario there is enough power capacity to cover the demand. Here, all remaining capacity is simply summed, and when the result is greater than zero, theoretically enough capacity is available in Europe to cover everyone's needs. No problems are expected using this approach, neither for normal conditions nor for severe conditions. As this method does not take into account the limited exchange capacity between countries, it is too optimistic to draw final conclusions based on it.

As a consequence of this, a second, more precise approach is taken. The problem is modelled as a linear optimization with the following constraints:

– Bilateral exchanges between countries should be lower than or equal to the given NTC values;
– Total simultaneous imports and exports should be lower than or equal to the given limits.

Based on this methodology, it was calculated which groups of countries would have a generation deficit for a certain week due to saturated cross-border exchanges.

Due to no information about non ENTSO-E systems, like Russia, Belarus, the Ukraine except the Burshtyn Island (part of the Ukrainian system that operates synchronously with Continental Europe), Morocco and Turkey, the following values were assumed for these systems for the regional analysis:

– The balance (remaining capacity) of these systems was set at **0 MW**.
– A best estimate of the minimum NTC comes from neighbouring systems belonging to ENTSO-E.

This approach will result in a possibility to "wheel" energy through these bordering countries, without them adding to or subtracting from the total generation level of the region.

Downward adequacy

Under minimum demand conditions, there is a potential for countries to have an excess of inflexible generation running. Every TSO is likely to have varying levels of "must-run" generation. This may be CHP or generators that are required to run to maintain dynamic voltage support etc. In addition there will be renewable generation such as run of river, solar and wind whose output is inflexible and highly variable. At times of high renewable output *e.g.* wind, the combination can result in generation exceeding demand and the pumped storage capacity of the country. In that case, the "excess" generation is either exported to a neighbour region or curtailed.

The regional analysis takes the data submitted by TSOs and alters the renewables infeed to a representative European scenario as was described in the section above. For countries that have an excess of generation, the optimisation tries to export to neighbouring regions based on the best estimate of the minimum NTC values submitted, and via a constrained linear optimisation.

The analysis will highlight periods where groups of countries cannot export all of their excess generation. It should be again stressed that this analysis is not a market simulation. Rather, it conducts a feasibility analysis to indicate countries which may be required to curtail excess generation due to limited cross border export capacity.

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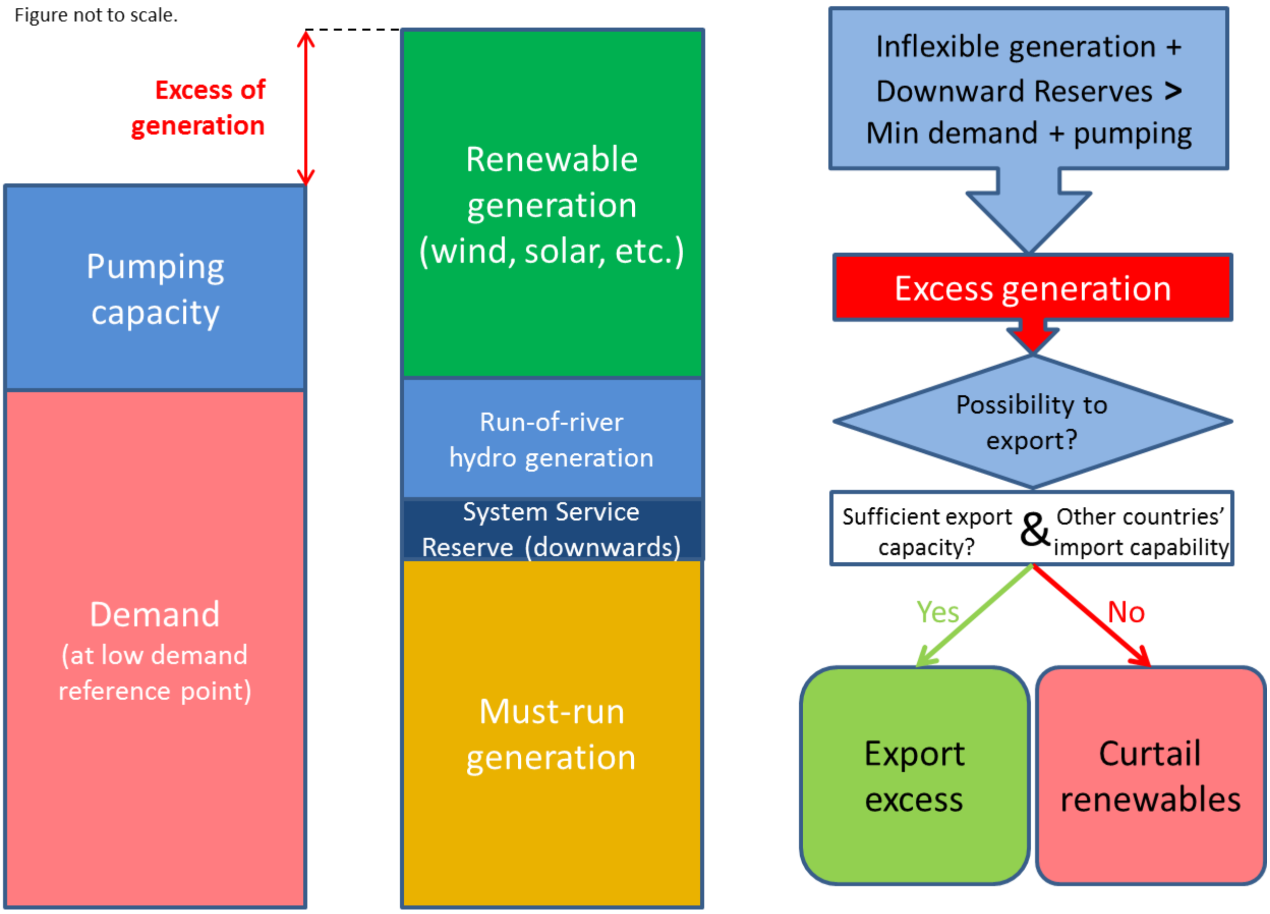

Figure 3- Summary of downward adequacy methodology

4. Winter review

Across the whole Europe, winter 2014/2015 was mild with average monthly temperatures near or slightly below the average values. As a result, demand was around the seasonal average in most countries, with just a few exceptions, in cases where demand is related to the higher industrial activities.

Snow, ice and strong wind in some parts of Croatia, Greece and Serbia caused some difficulties and damage in transmission network. Beside this, only few isolated events could be mentioned:

- All-time high wind feed-in on few days in Germany, caused a high level of system stress and was mainly solved by measures of redispatch;
- OHL 400 kV Albertirsa – God, tripped on 02.12.2014 due to heavy icing. Large number of pylons have been seriously damaged;
- January 2015. Was the windiest in 22 years in Republic of Ireland.

Except for faults caused by snow and heavy ice, no critical situation related to system adequacy occurred in Europe during winter 2014/2015.

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5. Summer Outlook

5.1. General overview

The coordination team which developed the Seasonal Outlook Report is comprised of experienced experts from various TSOs across Europe. The data submitted has been inspected by team members with a focus on those regions on which they have extensive knowledge and have determined that the main conclusions from the analysis are valid.

It should be noted that the analysis was based on data submitted by each TSO. A synchronous point in time was requested for all data in order to allow for a comparison between regions. Hence, a feasibility test to determine that there is enough generation to meet demand under normal and severe scenarios was enabled.

The summer outlook analysis, carried out by ENTSO-E, shows that Europe has sufficient generation for both normal and severe demand conditions. While various countries may require imports to cover the expected demand, cross border capacity is expected to be sufficient to accommodate them. However, if the trend in the decrease of programmable capacity is confirmed in the next years, adequacy tension may appear more often.

An illustration of the evolution of generation capacity throughout Europe[6] is depicted below in Figure 4. The capacity from controllable units strongly decreased compared to last year (-12 GW), while the Renewable Energy Sources (RES) capacity increased (+15 GW), causing the total net generation capacity to slightly increase (+3 GW).

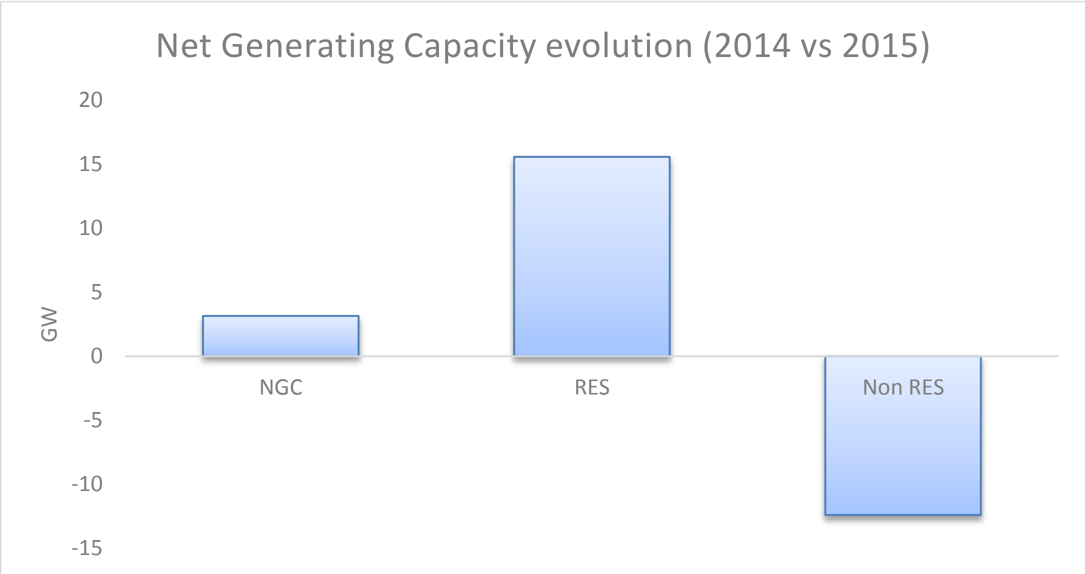

Figure 4 - Evolution of net installed generation (compared to previous Summer Outlook report, data in GW)

It needs to be noted that the quoted quantities are installed capacities; outages or the availability (of renewables) are not taken into account in the above illustratory graph.

Furthermore, the situation at the end of the coming summer could be potentially stressed for the Belgian system.

5.2. Individual country perspective analysis

Generation adequacy

Considering *normal conditions*, the majority of countries are expected to be able to balance load without the need of imports, as shown in green in Table 1. For weeks shown in yellow, the concerned country has to rely

[6] Explain perimeter of seasonal outlook

on imports in order to meet its demand and reserve requirements. The table does not give an indication on the level of imports needed; this information can be found in Chapter 7.

Table 1: Import needs under normal conditions

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
AL																
AT																
BA																
BE																
BG																
CH																
CZ																
DE																
DK																
EE																
ES																
FI																
FR																
GB																
GR																
HR																
HU																
IE																
IT																
LT																
LU																
LV																
ME																
MK																
NI																
NL																
NO																
PL																
PT																
RO																
RS																
SE																
SI																
SK																
UA																
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Under severe conditions (defined as 1 in every 10 years), the picture is significantly different (see Table 2 below): the individual country's demand increases mainly for countries in the Southern part of Europe where air-conditioning has a significant impact; on the other hand renewables infeed decreases and the estimated level of outages increases. The analysis indicated that under severe conditions (approached as ones expected to occur once in every 10 years) across all of Europe, more countries require imports over several weeks to ensure their demand being covered. Therefore, the transmission of power through the cross border interconnectors becomes more vital for system security.

Table 2: Import needs under severe conditions

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
AL																
AT																
BA																
BE																
BG																
CH																
CZ																
DE																
DK																
EE																
ES																
FI																
FR																
GB																
GR																
HR																
HU																
IE																
IT																
LT																
LU																
LV																
ME																
MK																
NI																
NL																
NO																
PL																
PT																
RO																
RS																
SE																
SI																
SK																

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
UA																
CY																
MT																

The countries that need to rely on imports at the day peak load in case of low renewable (wind and solar) infeed during (almost) all weeks are Belgium, Denmark, Hungary and FYRO Macedonia.

Most countries did not communicate an increased risk of generation adequacy issues for the coming summer.

Belgium

For the first time, a potentially increased risk of encountering adequacy issues might occur at the end of the summer period. Due to high maintenance levels of conventional generation, and when situations of low renewables infeeds coincide with a significant number of units in Forced Outage, the amount of energy that needs to be imported might surpass available interconnection capacity.

Given the fact that before summer the new Flow-Based allocation method will enter in force it is difficult to provide very accurate estimations of the available importing capacity to be expected given the grid infrastructure works planned for the summer period. However optimized to maximally limit the impact on interconnection capacities, these works are absolutely necessary to strenghten the grid and maximally ensure the importing capacity under extreme conditions for next winter period. For the assessment at hand, NTC best estimates were made applying the currently active ATC-method.

Worth noting is the fact that the assessment that was performed is highly dependent on the maintenance plans of the conventional generation units. Especially for the nuclear units, some uncertainties on those periods remain which could significantly change the results, even leading to different conclusions depending on the extent of the changes encountered.

Downward regulation margin

Table 3 and Table 4 below show the exporting needs at the Sunday, 11 AM and 5 AM synchronous time points respectively. It should be noted that the renewables infeed from the data collection was used, which represents a worst-case situation for every country separately.

Table 3: Export needs at the daytime minimum

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
AL																
AT																
BA																
BE																
BG																
CH																
CZ																
DE																
DK																
EE																
ES																
FI																
FR																

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
GB																
GR																
HR																
HU																
IE																
IT																
LT																
LU																
LV																
ME																
MK																
NI																
NL																
NO																
PL																
PT																
RO																
RS																
SE																
SI																
SK																
UA																
CY																
MT																

The countries that need to export or curtail an excess of inflexible generation at the daytime minimum in case of high renewables (wind and solar) infeed during (almost) all weeks are Bulgaria, Germany, Denmark, FYRO Macedonia and Sweden.

Table 4: Export needs at the nighttime minimum

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
AL																
AT																
BA																
BE																
BG																
CH																
CZ																
DE																
DK																
EE																
ES																

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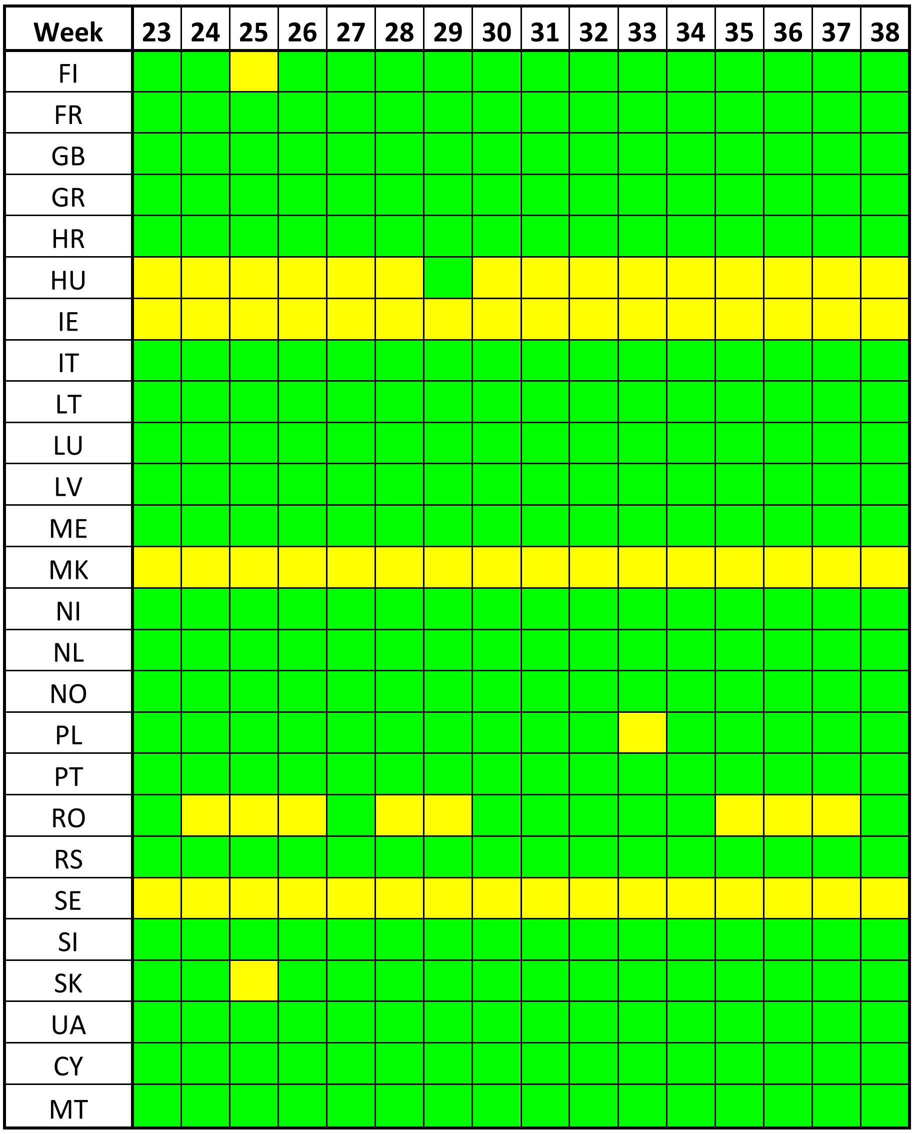

During the overnight minimum, the picture is more or less similar, now reflecting mainly the countries with large amounts of wind generation installed. The countries that need to export or curtail an excess of inflexible generation in case of high renewable (onshore and offshore wind) infeed during (almost) all weeks are Bulgaria, Denmark, Hungary, Ireland, FYRO Macedonia and Sweden.

Most countries did not communicate an increased risk of downward regulation issues for the coming summer.

5.3. Regional assessment – deterministic weekly analysis

In this section, a regional assessment of generation adequacy and downward regulation margin is performed. For this analysis, the infeed from renewable energy sources (notably wind and solar) was modified to obtain a more consistent scenario of renewable infeed over Europe. To this end, the methodology described in paragraphs 3.3 and 3.7 was used.

It is important to underline that the scenarios evaluated in the regional assessment (for both upward and downward analysis) represent conditions that are significant and realistic for the European system as a whole, therefore they may differ from the scenarios evaluated in each individual country perspective analysis, which corresponds to conditions significant and realistic for each country. For example, the severe conditions of the whole European System do not correspond to the "simple envelope" of each individual severe condition. The results described in the paragraphs below could consequently differ from the ones presented in previous paragraph.

Generation adequacy

Based on normal conditions for generation and demand, the majority of countries do not require imports as shown pictorially in Table 5. Where a country is coloured green, it has excess capacity to meet demand and reserves. The countries which are coloured in orange can cover their deficit with imports, whereas for the countries in red the regional analysis revealed that their deficit cannot be covered with imports due to insufficient reported cross-border exchange capacities or a lack of energy.

Table 5: Import needs under normal conditions

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
AL																
AT																
BA																
BE																
BG																
CH																
CZ																
DE																
DK																
EE																
ES																
FI																
FR																
GB																
GR																
HR																
HU																
IE																
IT																
LT																
LU																
LV																
ME																
MK																
NI																
NL																
NO																
PL																
PT																
RO																
RS																
SE																
SI																

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
SK																
UA																
CY																
MT																

While the majority of regions do not require imports for adequacy reasons, markets will determine the economic energy transfers based on the respective price differentials between regions, and hence various borders may be transmitting power at their maximum capacity. As indicated in the description of the methodology, this analysis is not a market simulation and hence real physical flows resulting from commercial exchanges are not indicated. Although some regions – including Belgium, Denmark and Hungary – do require imports for generation adequacy reasons, there is ample interconnector capacity from neighbouring regions to cover their demand.

Under severe conditions (cfr. methodology description: this is a worst-case envelope, representing an extreme scenario for the purpose of detecting regions potentially at risk), the picture is somewhat different: the demand of certain individual countries increases due to air-conditioning needs, whilst generation availability might be lower due to unfavourable meteorological conditions. The analysis indicated that even under severe conditions across nearly all of Europe, demand is met and reserves can be maintained thanks to energy surpluses in most regions, and available interconnector capacity to supply the regions depending on imports.

However at the end of the investigated period (in September), a potential risk occurs for Belgium. For this reason, a more extensive analysis is carried out for Belgium in the next section. No other countries were identified warranting such further investigation.

Table 6: Import needs under severe conditions

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
AL																
AT																
BA																
BE																
BG																
CH																
CZ																
DE																
DK																
EE																
ES																
FI																
FR																
GB																
GR																
HR																
HU																
IE																
IT																
LT																

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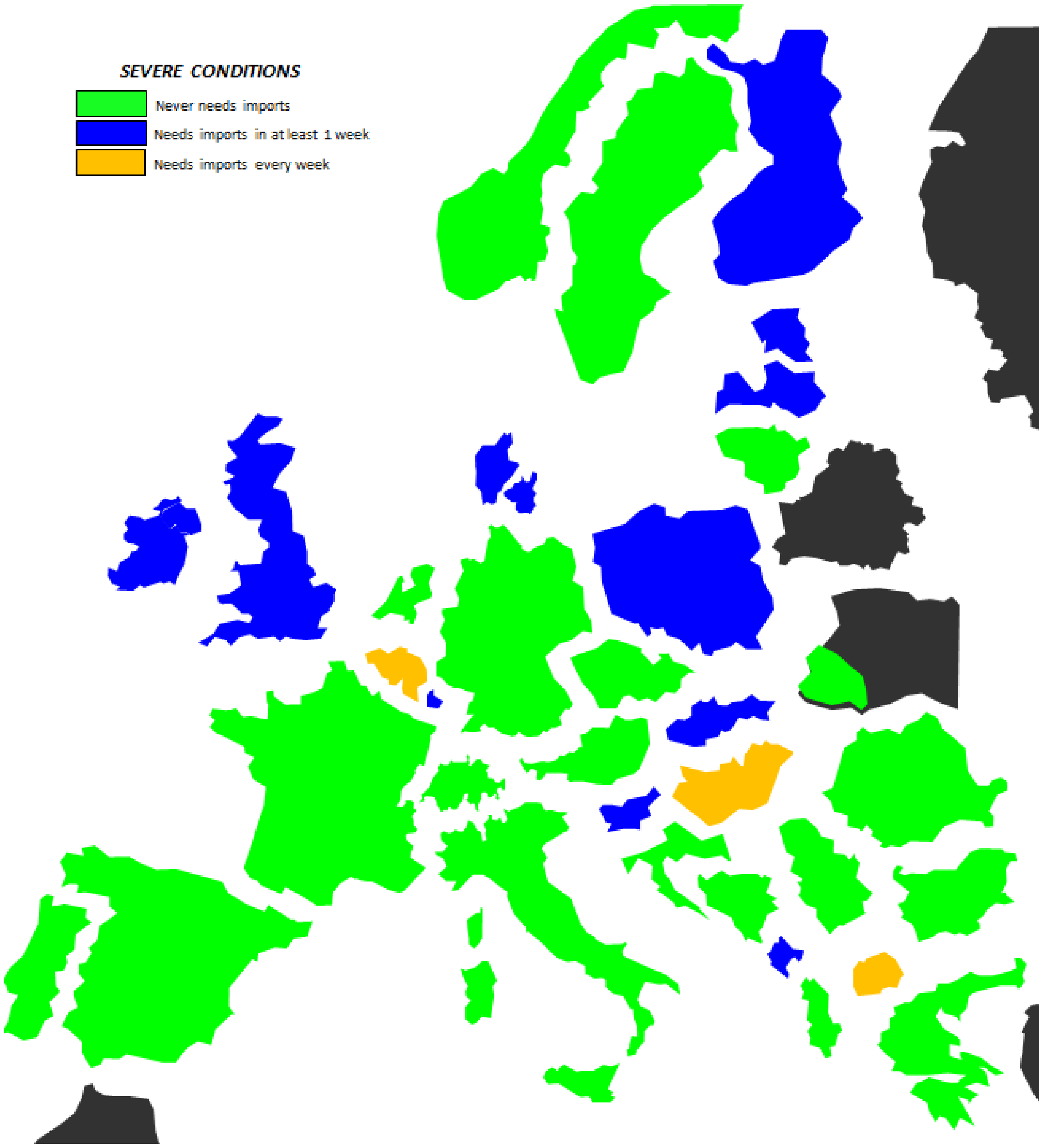
Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
LU																
LV																
ME																
MK																
NI																
NL																
NO																
PL																
PT																
RO																
RS																
SE																
SI																
SK																
UA																
CY																
MT																

The map below gives another view on the data shown in Table 6. It indicates the countries expecting a need for imported energy in at least one week of the considered period or in all weeks of the considered period respectively. As can be seen on this map, the need for importable energy is quite limited and geographically distributed, resulting in a low probability of potential issues regarding generation adequacy for the coming summer period.



Downward regulation margin

With increasing renewable generation in Europe, the output of the analysis is shown below in Table 7. Where a country is coloured green, it has sufficient downward regulation margin. The countries which are coloured in orange can export their excess energy, whereas for the countries in red the regional analysis revealed that their excess cannot be entirely exported considering the reported NTC values.

Table 7: Export needs at the daytime minimum

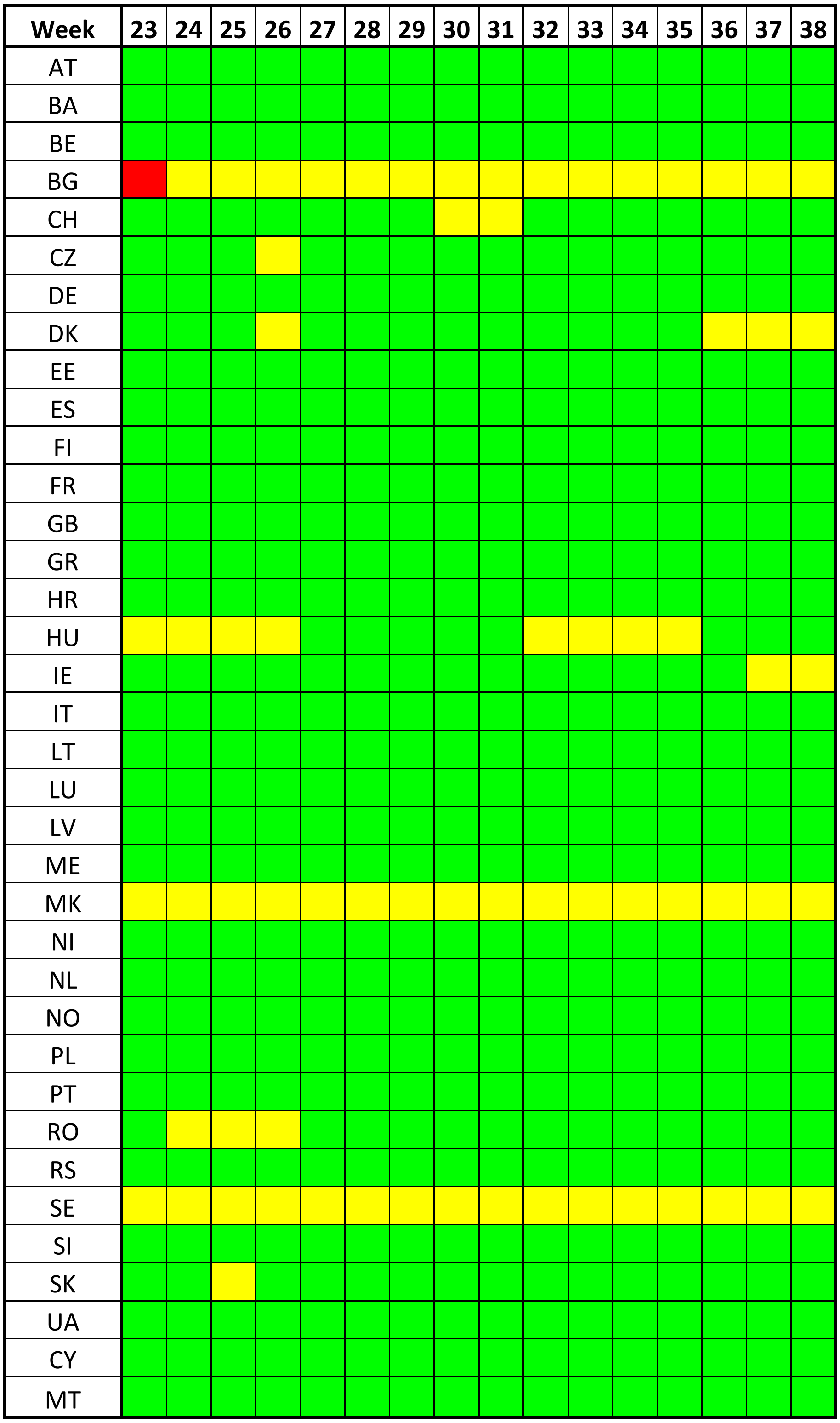
Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
AL																
AT																
BA																
BE																

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
BG																
CH																
CZ																
DE																
DK																
EE																
ES																
FI																
FR																
GB																
GR																
HR																
HU																
IE																
IT																
LT																
LU																
LV																
ME																
MK																
NI																
NL																
NO																
PL																
PT																
RO																
RS																
SE																
SI																
SK																
UA																
CY																
MT																

It can be observed that with a wind and solar output set at a representative level across the ENTSO-E region (see Appendix for the load factors used), there are some countries that would be required to export excess inflexible generation under minimum daytime demands to neighbouring regions. For all countries, the estimated minimal NTC's in combination with the possibility for neighbouring countries to absorb excess energy result in a feasible ENTSO-E wide situation.

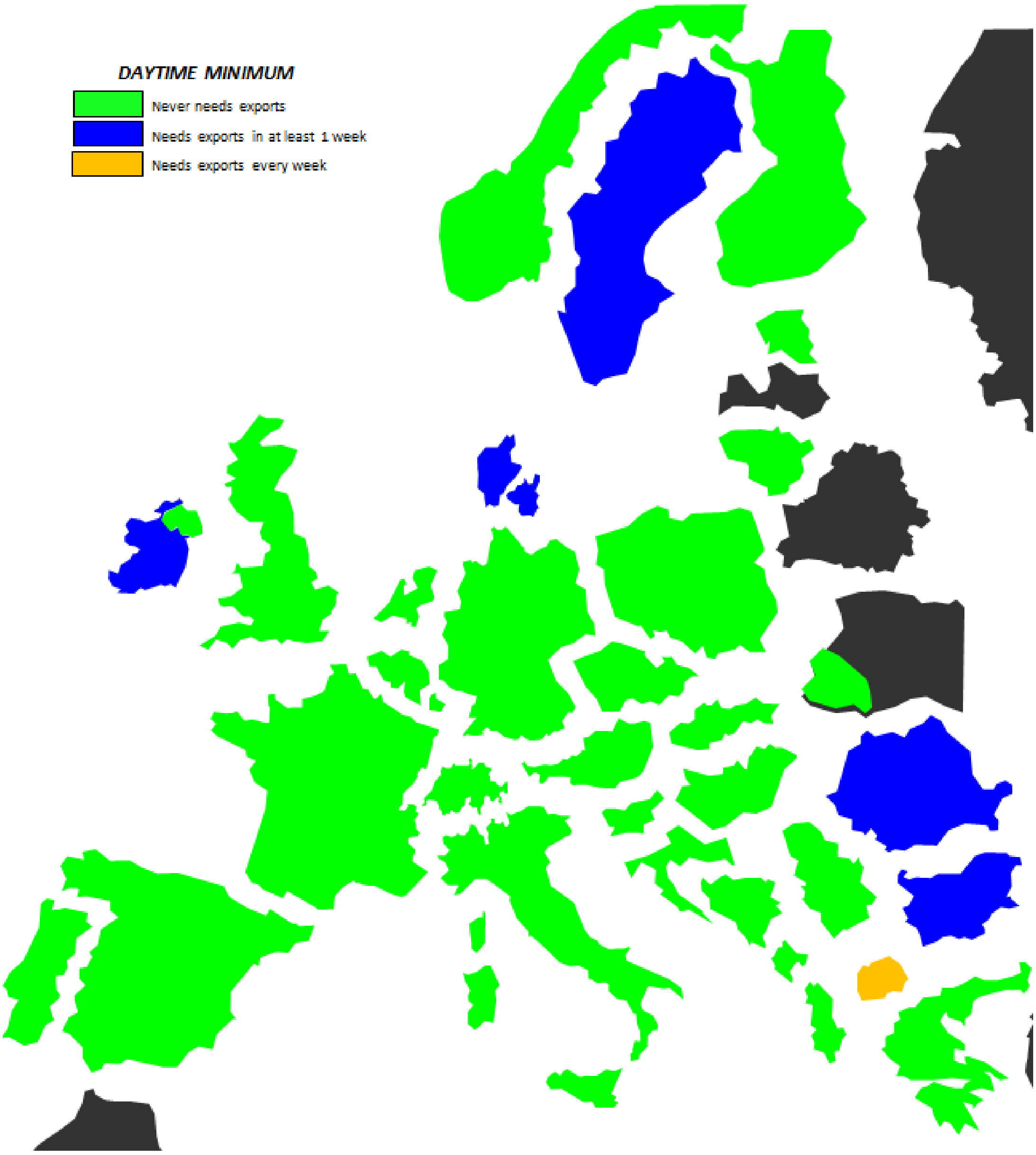
Table 8: Export needs at the nighttime minimum

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
AL																



An analysis of the overnight minimum demand scenario yields the same results and conclusions as for the daytime scenario: sufficient interconnection capacity is available to export excess inflexible generation to neighbouring countries under the investigated hypotheses. In this scenario, Bulgary has an excess of inflexible generation throughout the summer period. Volumes are still quite limited though, and the excess energy that cannot be exported in Week 23 is only a few tens of MegaWatts, again making further analysis of the situation unnecessary.

The maps below give another view on the data shown in Table 7 and 8. They indicate the countries expecting a need for exported energy in at least one week of the considered period or in all weeks of the considered period respectively. As can be seen on these maps, the need for exportable energy is quite limited, resulting in a low probability of potential issues on a pan-European scale regarding an excess of inflexible generation for the coming summer period.



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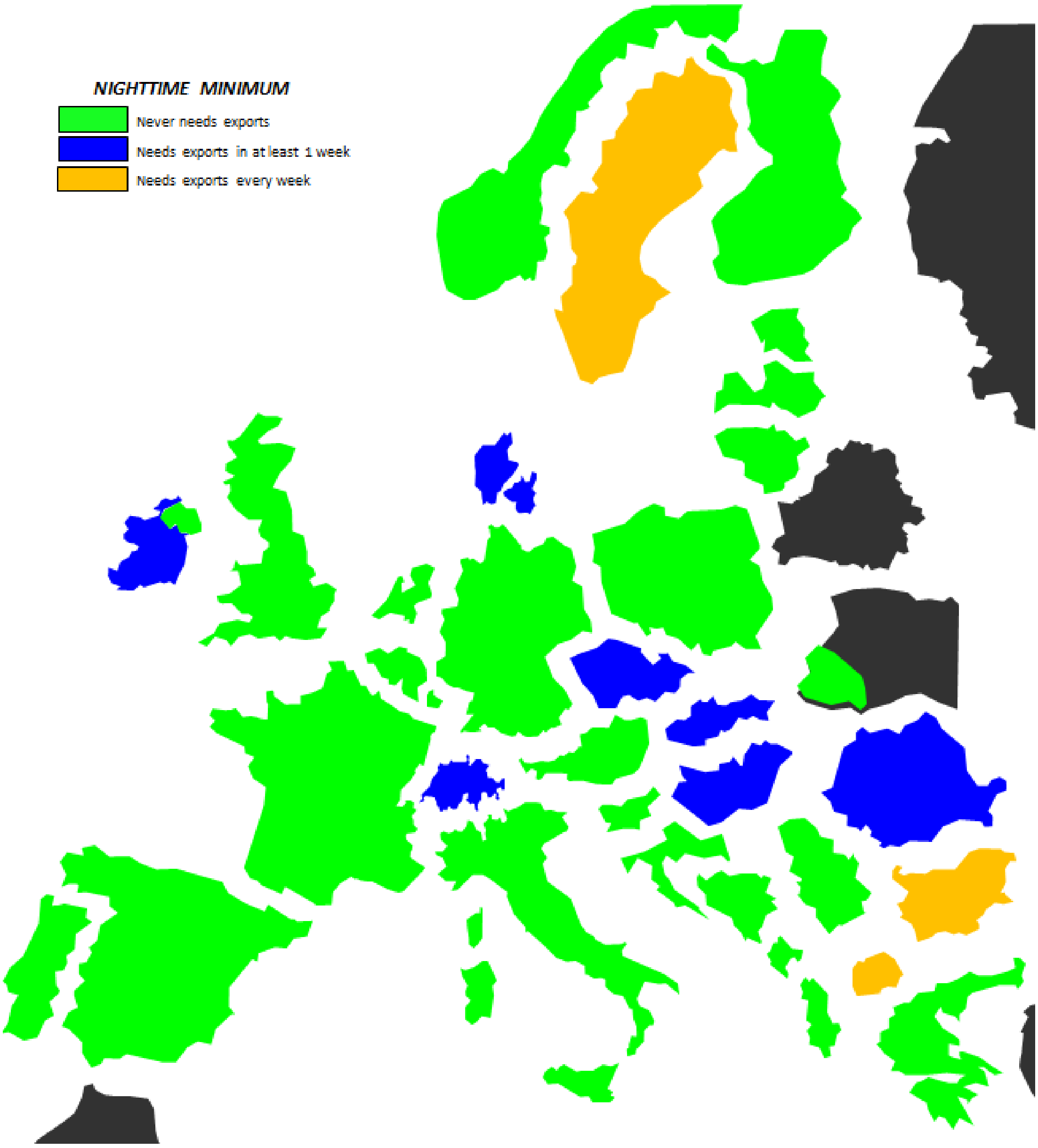


5.4. Regional assessment – probabilistic sensitivity analysis

In the previous section a worst-case scenario was taken to identify the countries or regions that potentially might be at risk. Every as such identified country or region will be further analysed in this section, taking into account correlations between renewables infeeds and temperatures, hence creating realistic simulation scenarios.

For the downward analysis, no countries were identified to be futher investigated.

For the upward analysis, Belgium was identified to be further analysed.

Belgium

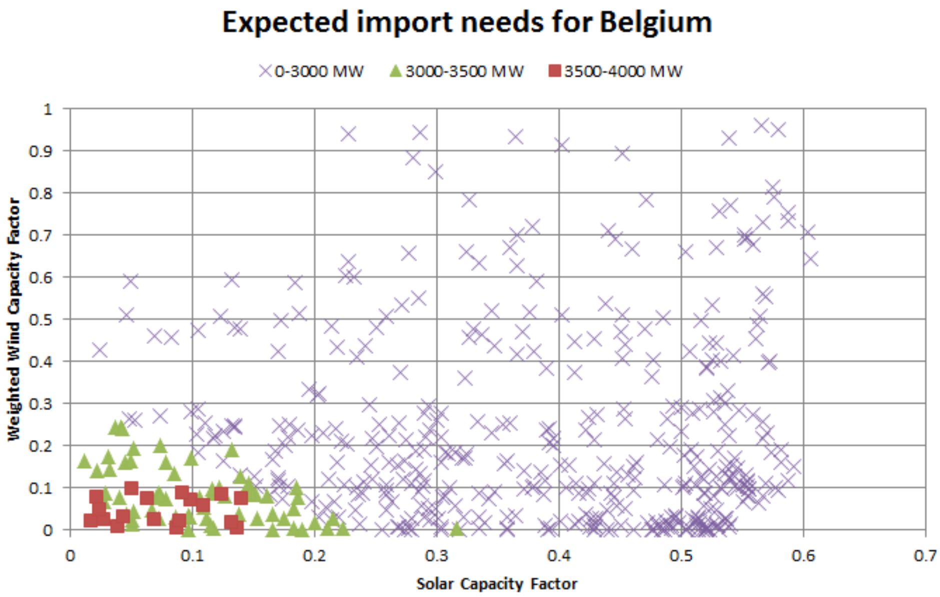
Opposed to the investigated situation for the most recent Winter Outlook report, for summer the potential adequacy risk is isolated for Belgium alone, without any expected limitation on the provision of the necessary energy from the neighbouring countries.

For this reason, the choice was made for the analysis to focus on the import needs under the different renewable infeed scenarios. For this elaborated analysis, the time reference point leading to the worst simulated situation was selected, and corresponds to week 37.

For the summer reference point, three main parameters define each simulation scenario:

- Solar Capacity Factor
- Onshore and Offshore Wind Capacity Factors, summarized in a single value representing a weighted average capacity factor for wind infeed
- Daily Average Population Weighted temperatures

The graphs below give for each combination of two parameters an overview of the import needs for every simulated data point, and classified in three intervals of importing capacity required. For reference, Elia's best estimate minimal importing capacity lies in the interval 3000-3500 MW. Potentially stressed situations can therefore be expected in the ranges above 3500 MW.



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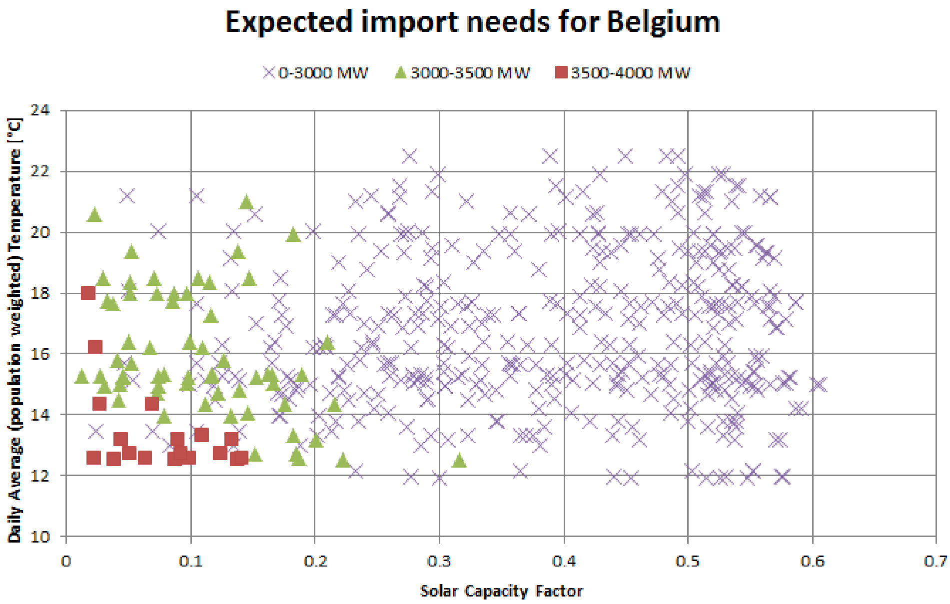

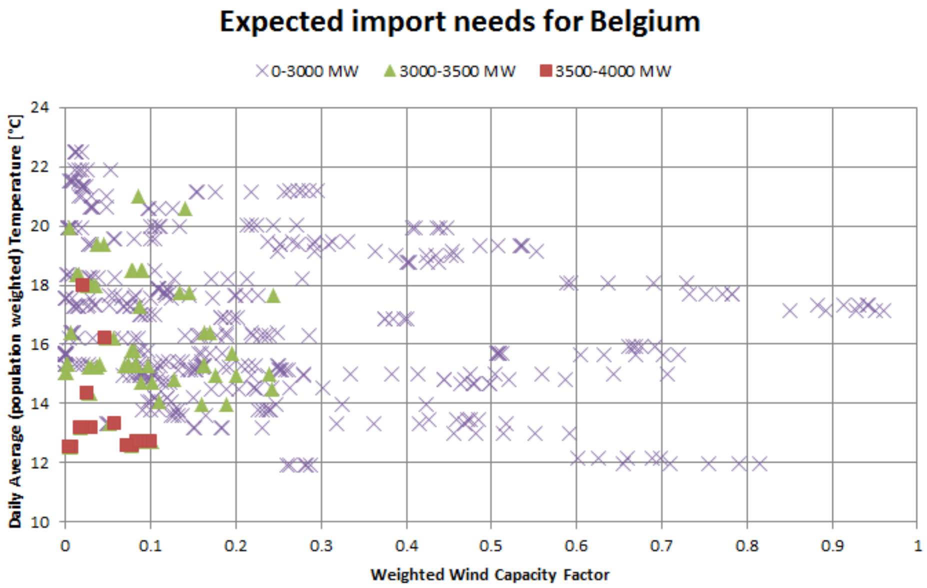

As can be seen in the graphs, the most differentiating and significant parameters are both Solar and Wind Capacity Factors. Temperatures are less decisive for the resulting import needs, which could be expected due to the relatively lower Belgium temperature dependency of load in the summer period.

From the simulations, it could be concluded that importing requirements above 3500 MW could be needed only when Solar and Wind Capacity Factors descend roughly below 0.15 and 0.1 respectively, of course also given the Severe Conditions Forced Outage rate as used for all simulations.

In order to try to develop an indication of the probability of occurrence of such situations, the following simplified – and therefore approximating – reasoning could be made:

For the investigated reference point, about 4% of the simulations lead to import needs above 3500 MW. If this probability is combined with the probability of encountering the level of Forced Outage as reported, which is 10%, and assuming that in summer forced outages and low renewable infeeds are uncorrelated, the combined probability is about 0.4% for one day.

If we assume that such a situation is representative for all weekdays in the selected week, the probability that on at least one day of that week import levels surpassing 3500 MW are required (assuming independent days) rises to about 2%.

Judging from the simulation results for the other weeks, it could be roughly estimated that a similar situation also exists in one or two neighbouring weeks, leading to an estimated probability of encountering at least one day at the end of the summer period with import needs above 3500 MW of 4% to 6%. The previous probability figures should be understood within the assumptions taken for the assessment.

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Appendix 1: Individual country comments to Summer Outlook

Albania

For the coming summer the balance between generation and load will be managed by using our hydro power plants and imports. Considering the firm import contracts, the adequacy and security of the Albanian power system will not be threatened. In Albania there is no installed wind generation yet, and we do not expect to face inflexible generation at times of minimum demand. The cross border capacities will be sufficient to make possible planned import and transit.

General situation
Most of the maintenance works in generation – transmission system will be performed during summer period from April till October. The most critical period remains during months of July and August, depending on the temperatures, and due that the maintenance schedule of units and transmission elements in that period is set to minimum. This period is also characterized by low hydro levels. Unfortunately, Albania has not TPP with gas and fulfilment of our needs for covering the demand is based on the electricity imports.

Most critical periods
The most critical period lays on months of July and August, depending on the weather conditions, due to strong relation between temperatures and electricity consumption. Based on the experience of last years, the most critical weeks are from 28 till 33.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export
In general the interconnections are sufficient for fulfilling the need of electricity imports, and also for exports if it will be the case, and they are used as well for transits, mainly towards Greece. The maintenance of the interconnectors is arranged to be in the period of April – May and September – October, when the demand is relatively lower, also in the neighbouring TSOs, thus the adequacy will be maintained.
Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods
The export capacity of our interconnectors normally is around 500 MW, and on the other hand, Albania has not yet inflexible generation, thus it is not expected to have any problem with demand minimum periods.

Framework and methodology of the assessments
According to the Grid Code, OST's regular operation planning horizons are: year (Annual Operation Study, AOS), month, week and day. The AOS is based on a model combining stochastic and deterministic approach, and make use of information provided by grid users. In medium and short term, OST conducts studies concerning the Generation Adequacy Assessment. The studies include load forecasts and multiple scenarios on energy management using probabilistic and deterministic methods. The energy management studies aim at checking the actual energy situation and the level of hydro reserves. These studies are regularly revised to include mainly variations in hydro-levels, demand and/or the availability of the power plants. The monthly peak load is calculated for both normal and severe conditions. The severe demand scenario is built considering a temperature 5°C higher than the seasonal normal temperature, which is about 28°C. A statistical approach is followed based on recorded hourly load and temperature data covering the period of last 10 years. The dependency of load to temperatures is 10 MW/°C, and the load for severe conditions is increased by about 50 MW mainly in the period of July – August. In this assessment, the thermal power of 90 MW, is put at non-usable capacity due to information from generation company KESH-Gen, that intend to use it only in case of a very dry period.

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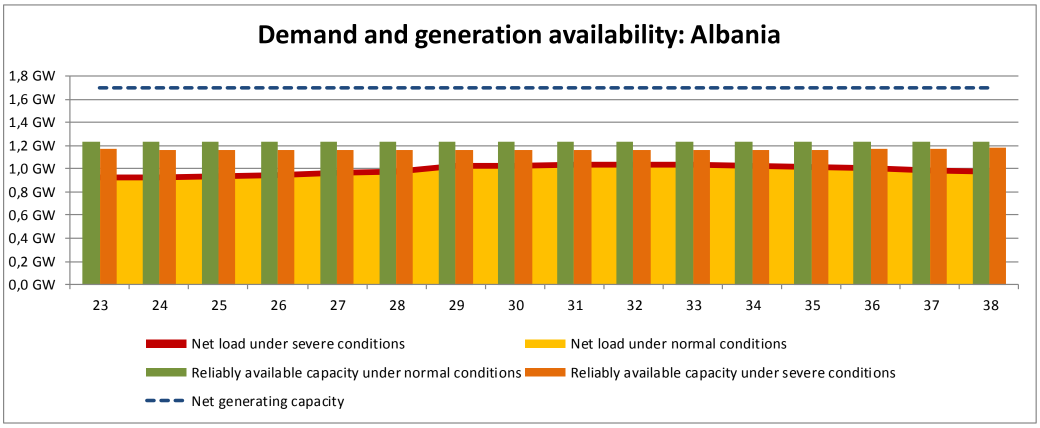
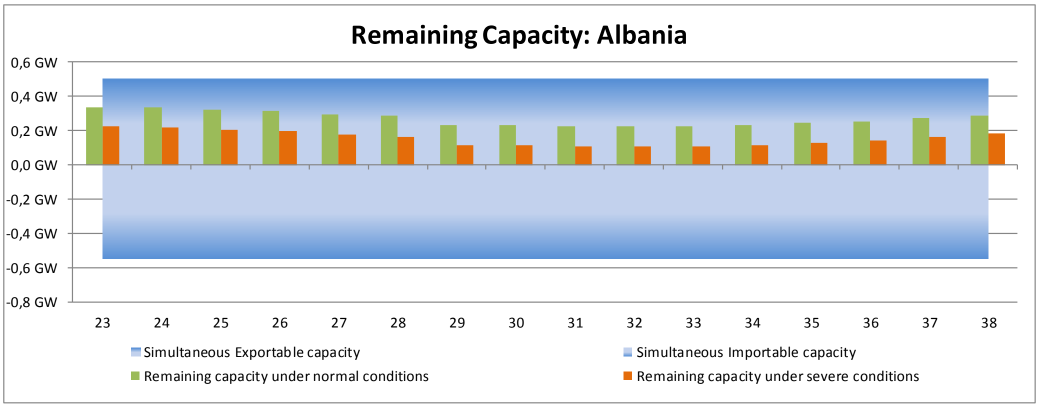
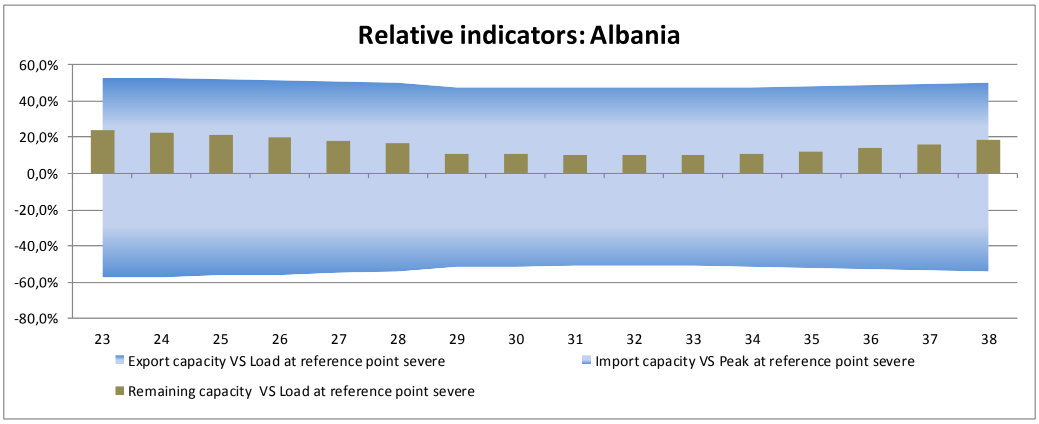
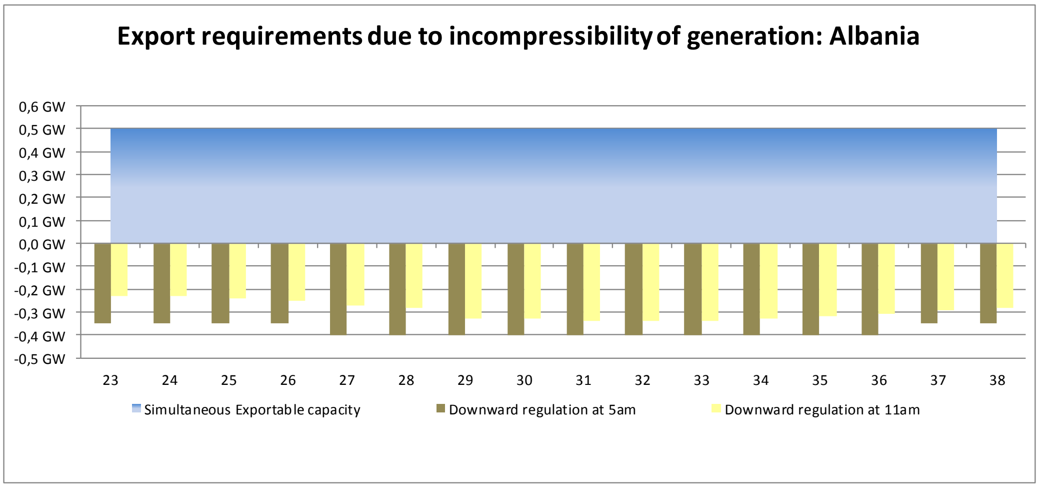

Demand and generation availability: Albania
1,8 GW
1,6 GW
1,4 GW
1,2 GW
1,0 GW
0,8 GW
0,6 GW
0,4 GW
0,2 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Albania
0,6 GW
0,4 GW
0,2 GW
0,0 GW
-0,2 GW
-0,4 GW
-0,6 GW
-0,8 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Albania
60,0%
40,0%
20,0%
0,0%
-20,0%
-40,0%
-60,0%
-80,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Albania
0,6 GW
0,5 GW
0,4 GW
0,3 GW
0,2 GW
0,1 GW
0,0 GW
-0,1 GW
-0,2 GW
-0,3 GW
-0,4 GW
-0,5 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Austria

For the upcoming summer no increase of load is expected. Wind power plants and solar power plants are treated as "100% non-usable capacity". A new pumped storage power plant (Reisseck II, 430 MW) will start operation before summer. It is expected that only industry thermal units will be available in summer time. As in summer 2014 all other thermal units are considered to be temporary mothballed. As a consequence remaining capacity is low compared to installed capacity. Therefore APG is forced to find solutions in order to ensure having sufficient power units in place for congestion management measures in the upcoming summer.

General situation
No major specifics are foreseen during summer 2015.

Most critical periods
From a present-day perspective no critical periods are expected.

Framework and methodology of the assessments
The net generating capacity of the “Kraftwerksgruppe Obere Ill-Lünersee” (1.7 GW) is considered as firm export to Germany as it is directly connected to the German TSO TransnetBW. Since it is located in the control area of the Austrian Power Grid AG (APG), the net generating capacity has been considered in the APG data sheet as part of the installed Hydro Power capacity (line 4).

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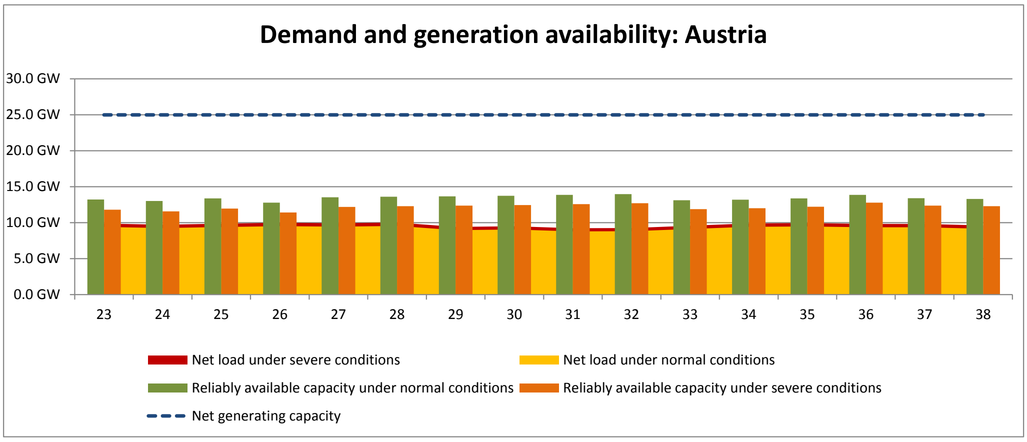
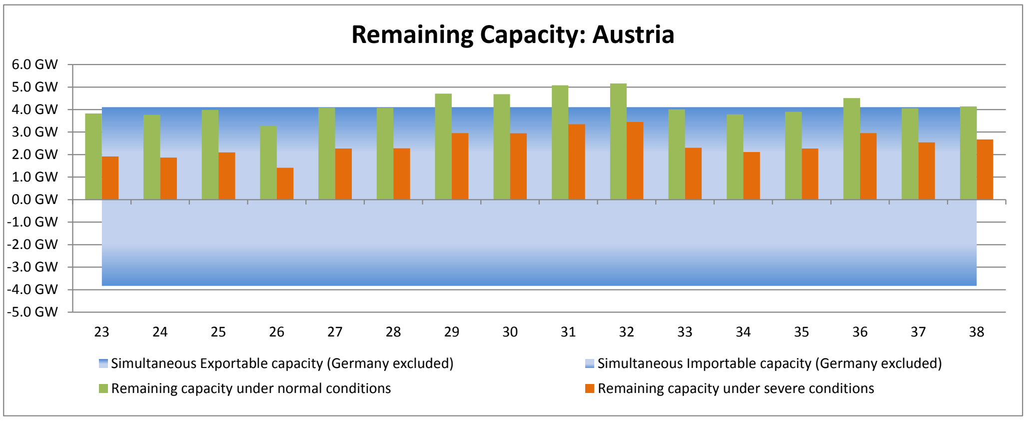
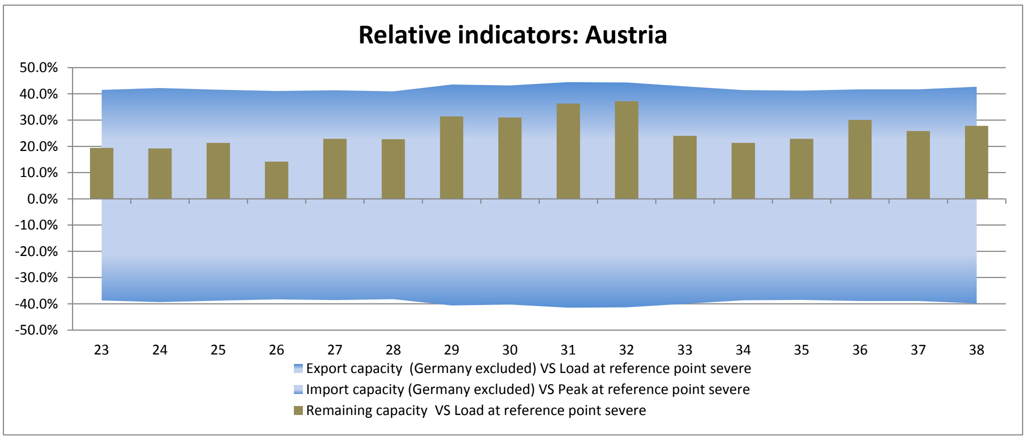
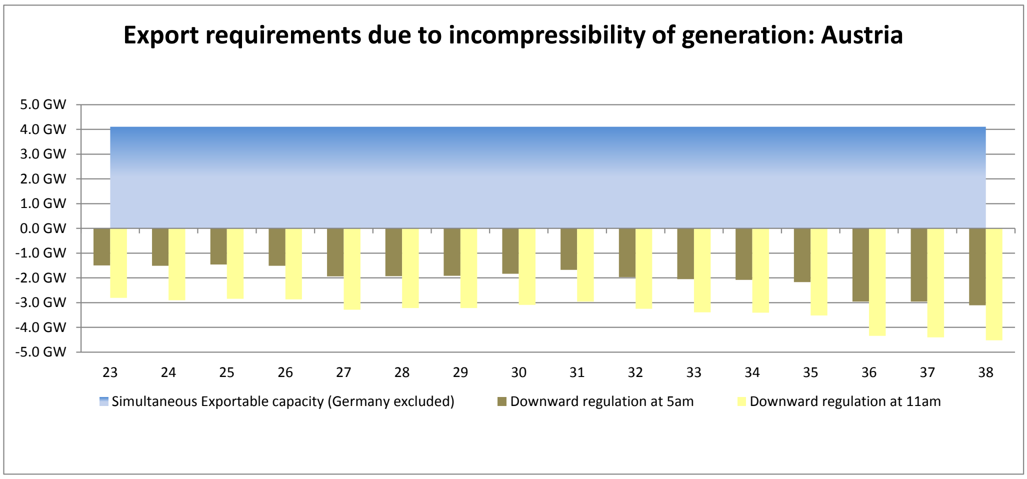

Demand and generation availability: Austria
30.0 GW
25.0 GW
20.0 GW
15.0 GW
10.0 GW
5.0 GW
0.0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Austria
6.0 GW
5.0 GW
4.0 GW
3.0 GW
2.0 GW
1.0 GW
0.0 GW
-1.0 GW
-2.0 GW
-3.0 GW
-4.0 GW
-5.0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity (Germany excluded)
Simultaneous Importable capacity (Germany excluded)
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Austria
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
-10.0%
-20.0%
-30.0%
-40.0%
-50.0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity (Germany excluded) VS Load at reference point severe
Import capacity (Germany excluded) VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Austria
5.0 GW
4.0 GW
3.0 GW
2.0 GW
1.0 GW
0.0 GW
-1.0 GW
-2.0 GW
-3.0 GW
-4.0 GW
-5.0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity (Germany excluded)
Downward regulation at 5am
Downward regulation at 11am

Belgium

For the first time, a potentially increased risk of encountering adequacy issues might occur at the end of the summer period. Due to high maintenance levels of conventional generation, and when situations of low renewables infeeds coincide with a significant number of units in Forced Outage, the amount of energy that needs to be imported might surpass available interconnection capacity. Given the fact that before summer the new Flow-Based allocation method will enter in force it is difficult to provide very accurate estimations of the available importing capacity to be expected. For the assessment at hand, NTC best estimates are made applying the currently active ATC-method.

Concerning downward regulation, for the reasons mentioned before, no significant risks for the summer period are detected for Belgium.

General situation
Due to the identification of an increased adequacy risk in the past winter period, maintenance works for conventional generation units were maximally planned outside of the winter period. This leads to increased levels of maintenance throughout the summer period. The same holds for infrastructure works on the high-voltage grid, which reduces the available interconnection capacity throughout most of the summer period.

Worth noting is the fact that the assessment that was performed is highly dependent on the maintenance plans of the conventional generation units. Especially for the nuclear units, some uncertainties on those periods remain which could significantly change the results, even leading to different conclusions depending on the extent of the changes encountered.

Most critical periods
The most critical period for the investigated weeks will probably occur in September, when the amount of conventional generation in maintenance peaks.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export
Belgium is structurally dependant on imports from other countries. Even under normal conditions (limited) amount of imports are most of the time needed to support the Belgian system. Apart from what is needed from an adequacy point of view, generally following the economic situation import levels in Belgium often greatly surpass those adequacy needs. With import capabilities of at least about 25% of the peak load, Belgium is a well interconnected country. Before summer, Central-Western Europe will switch from an ATC-based capacity allocation in Day-Ahead to a Flow-Based allocation. This new way of allocating capacity should ensure maximal usage of interconnection capacity in a coordinated way between multiple countries to allow an optimal flow of energy throughout Central-Western Europe.

Throughout summer, important works on high-voltage grid elements are scheduled that reduce the available importing capacity. However optimized to maximally limit the impact on NTCs, these works are absolutely necessary to strenghten the grid and maximally ensure the importing capacity under extreme conditions for next winter period.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods
Because of the high levels of conventional generation - including inflexible nuclear units - in maintenance throughout the summer period, no extended issues concerning the evacuation of excess generation are to be expected.

Framework and methodology of the assessments

For the Belgian Total Load, the forecasted average load (for normal conditions) was estimated using a demand forecasting tool, and is based on historical values. Afterwards this average load was scaled to a severe conditions load by taking high temperatures (P95) into account (a method based on equivalent daily average temperatures measured in Brussels was used). As the Cooling Zone temperature dependency of load in Belgium is very limited, differences between normal and severe conditions loads are small compared to the winter period.

Concerning renewable capacity factors, historical profiles were used to calculate a correlated 5th percentile (therefore leading to a 1-in-20 infeed of all renewables together).

Forced Outage levels in normal and severe conditions were estimated based on historical values leading to Forced Outage levels up to 500 MW and 1200 MW for normal and severe conditions respectively.

NTC values are linked to temperatures insofar those ambient temperatures change the physical capacity that can flow over the transmission infrastructure. Also the availability and distribution of excess energy throughout Central-Western Europe has a significant impact on the distribution of flows through the Belgian system, therefore also impacting the global importing capacity into Belgium. Given values are best estimates based on the ATC capacity allocation method currently in place. Before summer, the Flow-Based capacity allocation will enter into force for Central-Western Europe; this could lead to interconnection capacities that might deviate from the best estimates given.

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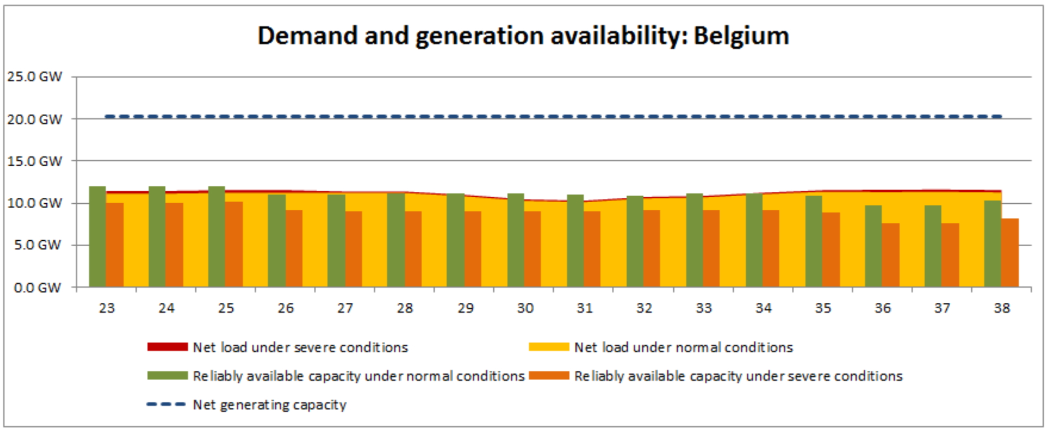
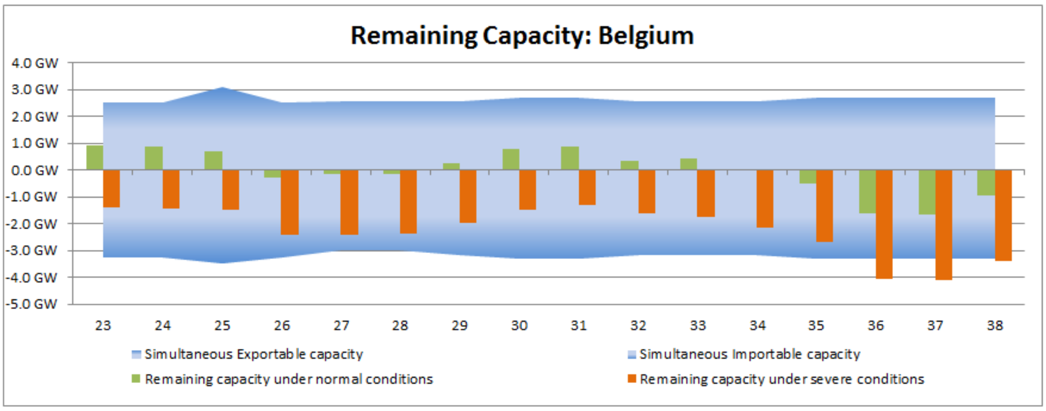
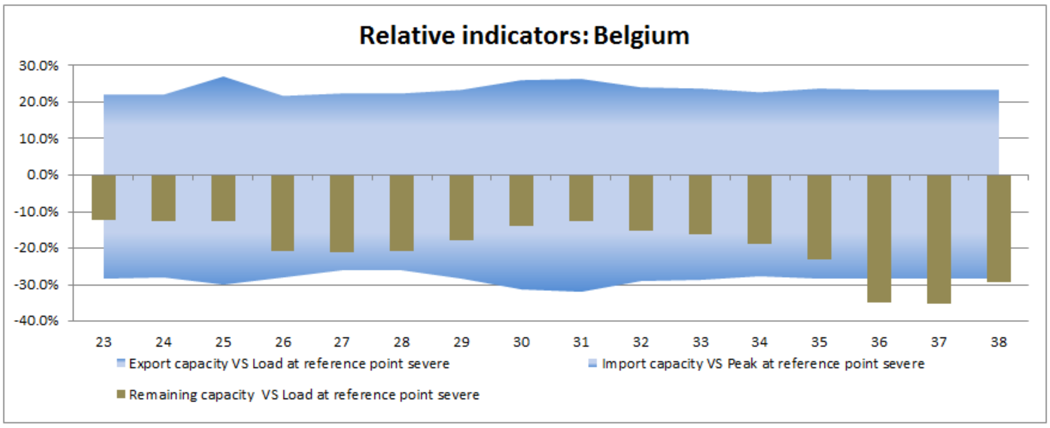
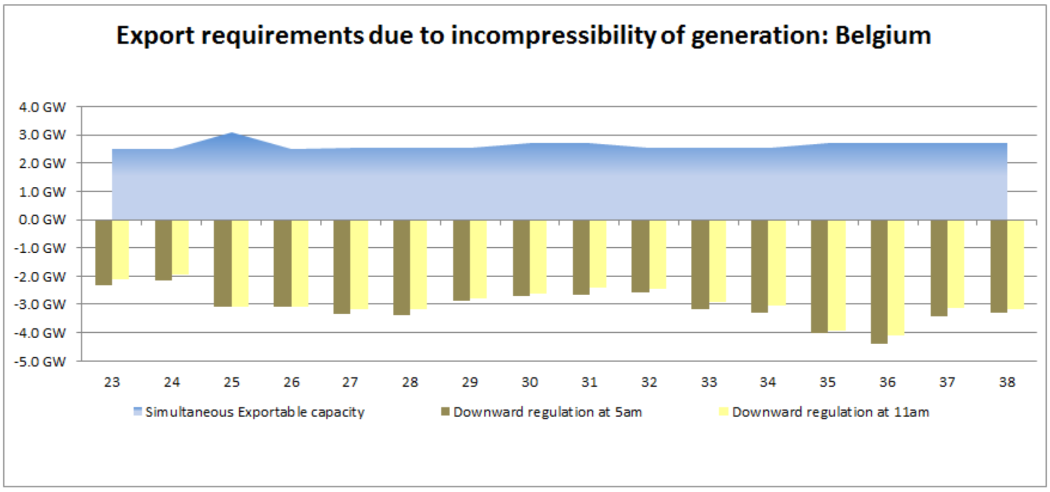

Demand and generation availability: Belgium
25.0 GW
20.0 GW
15.0 GW
10.0 GW
5.0 GW
0.0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity

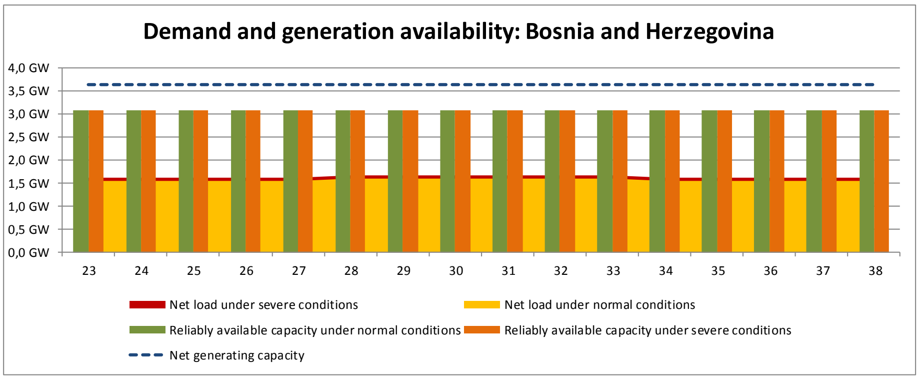

Remaining Capacity: Belgium
4.0 GW
3.0 GW
2.0 GW
1.0 GW
0.0 GW
-1.0 GW
-2.0 GW
-3.0 GW
-4.0 GW
-5.0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions

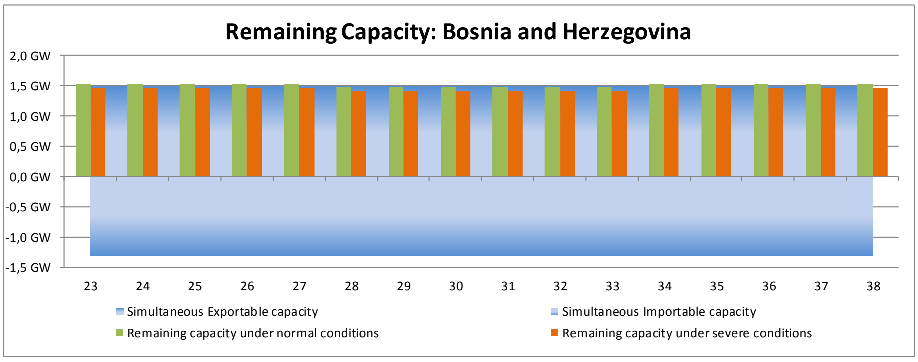

Relative indicators: Belgium
30.0%
20.0%
10.0%
0.0%
-10.0%
-20.0%
-30.0%
-40.0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe

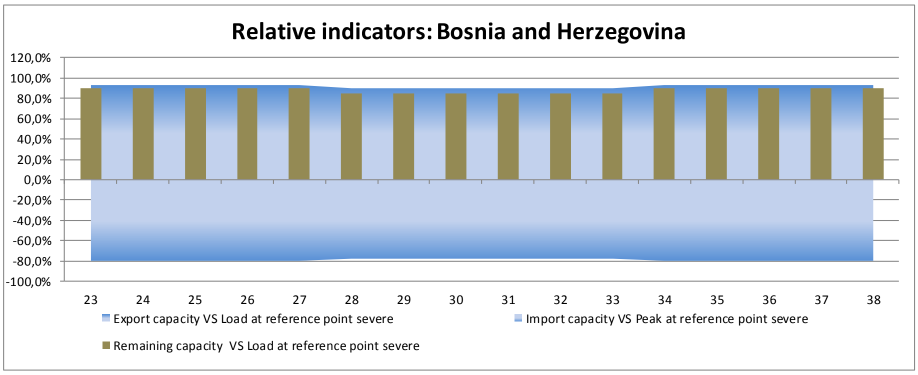

Export requirements due to incompressibility of generation: Belgium
4.0 GW
3.0 GW
2.0 GW
1.0 GW
0.0 GW
-1.0 GW
-2.0 GW
-3.0 GW
-4.0 GW
-5.0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

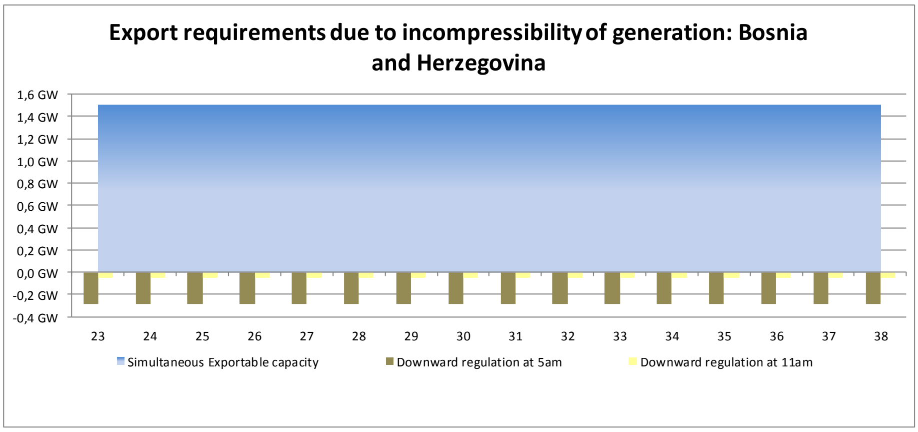
Bosnia and Herzegovina

There are not any particular problem regarding power system adequacy in Bosnia and Herzegovina expected for the summer 2015.









Bulgaria

The high level of penetration of RES (mostly PV) combined with the probability of low demand and low exports could cause balancing problems during some clear sky days.
The water levels in the big reservoirs are expected to be well above target levels and therefore no limitations of hydro plants operation is expected.
The approved maintenance program does not suggest any problems for the forth-coming summer period.

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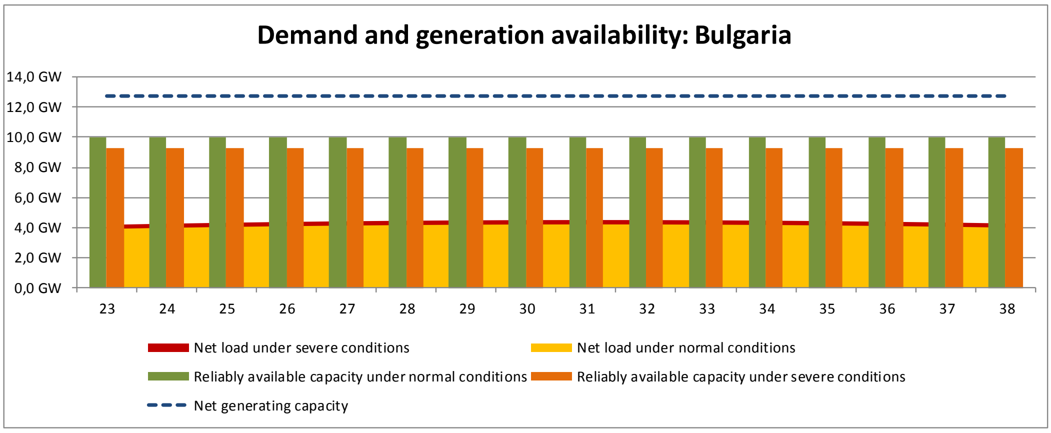
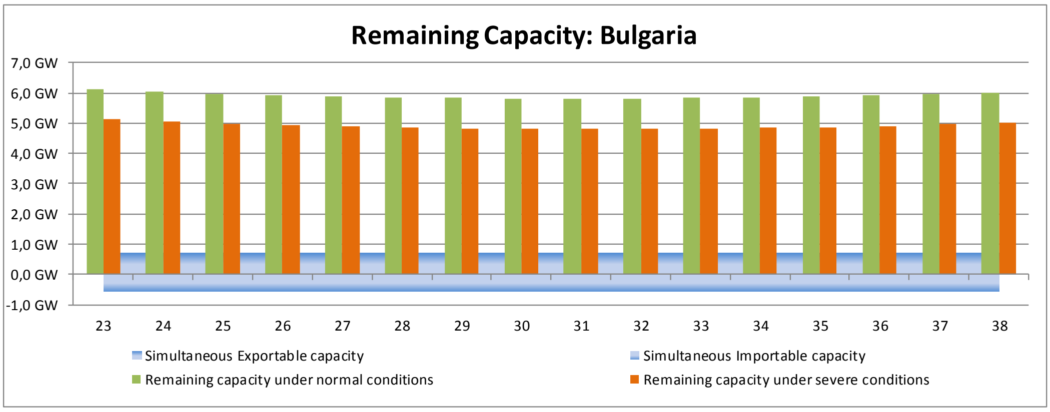
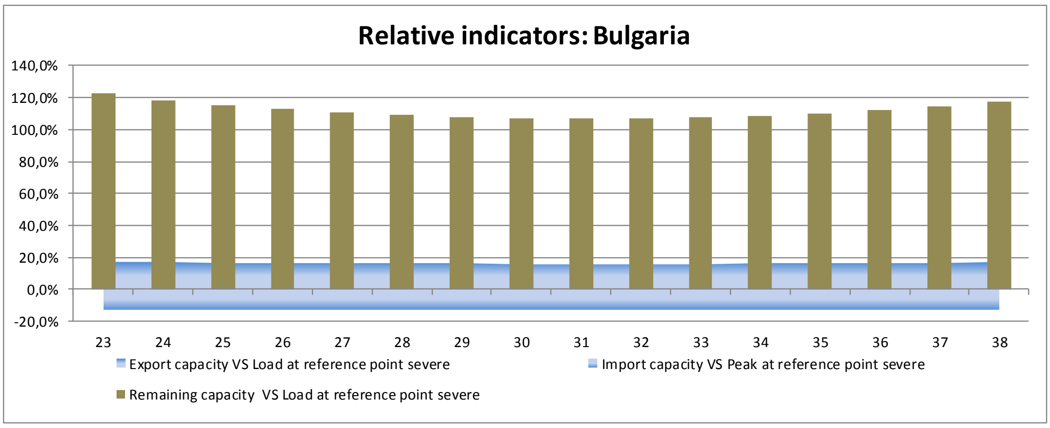
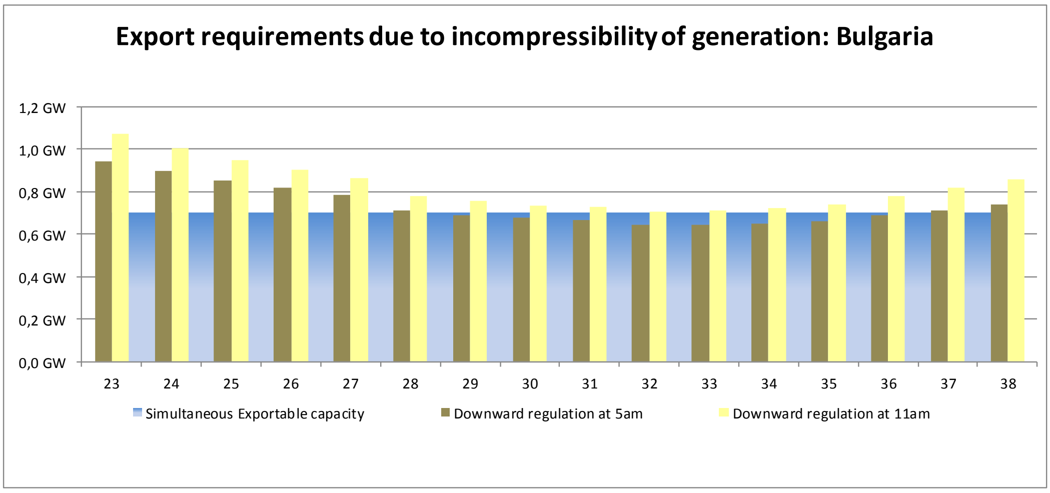

Demand and generation availability: Bulgaria
14,0 GW
12,0 GW
10,0 GW
8,0 GW
6,0 GW
4,0 GW
2,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Bulgaria
7,0 GW
6,0 GW
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Bulgaria
140,0%
120,0%
100,0%
80,0%
60,0%
40,0%
20,0%
0,0%
-20,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Bulgaria
1,2 GW
1,0 GW
0,8 GW
0,6 GW
0,4 GW
0,2 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Croatia

Hydrological situation in Croatia at the beginning of March 2015 seems to be very beneficial. Hydro storages contain enough water for the production above average. In spite of this, Croatia will have to import the electrical energy as the engagement of the majority of the thermo power plants is not expected. Some hydro power plants will be also included into regulation of cross border electricity exchange.

General situation
There is not any new production unit to be commissioned this summer. Maintenances are planned carefully so that the important units can be available at the stress periods.

Most critical periods
Generally, periods with extremely high temperatures are most critical.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export
Croatian power system is connected with the systems of following four countries: Bosnia and Herzegovina, Slovenia, Serbia and Hungary. All of these systems export significant amounts of energy to Croatia, and on the other side Croatia exports energy mainly to Bosnia and Herzegovina and Slovenia. Beside regularly planned cross border exchanges between traders, Croatian transmission system operator can provide or obtain emergency help to or from Serbian and Hungarian system on the base of special agreements.
Remarkable is that the values of NTC-s are much higher than realised electricity exchanges.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods
In summer 2015 it is still not expected to have problems at demand minimum periods.

Framework and methodology of the assessments
The data for the Summer Outlook 2015 are used from the data base of Croatian power system operator. It is recognized that there is some lack of the data regarding production of renewable energy sources that are connected to the network of voltage level lower than 110 kV.

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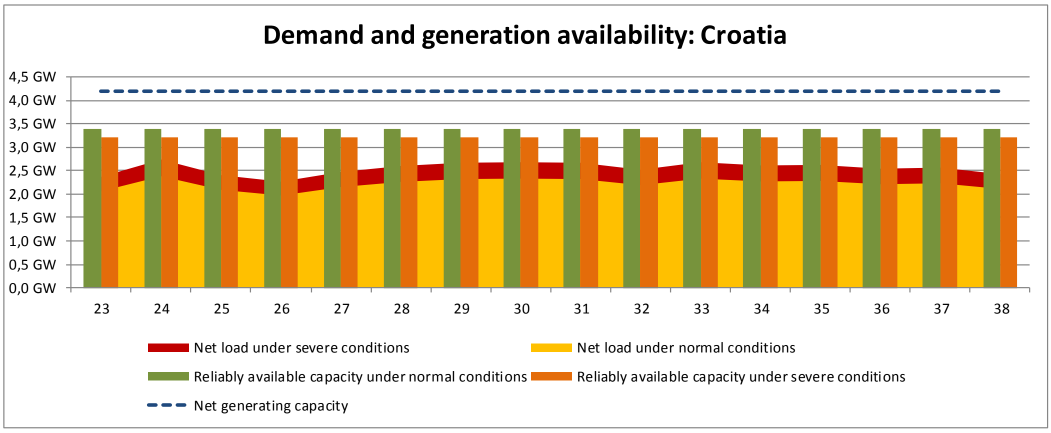

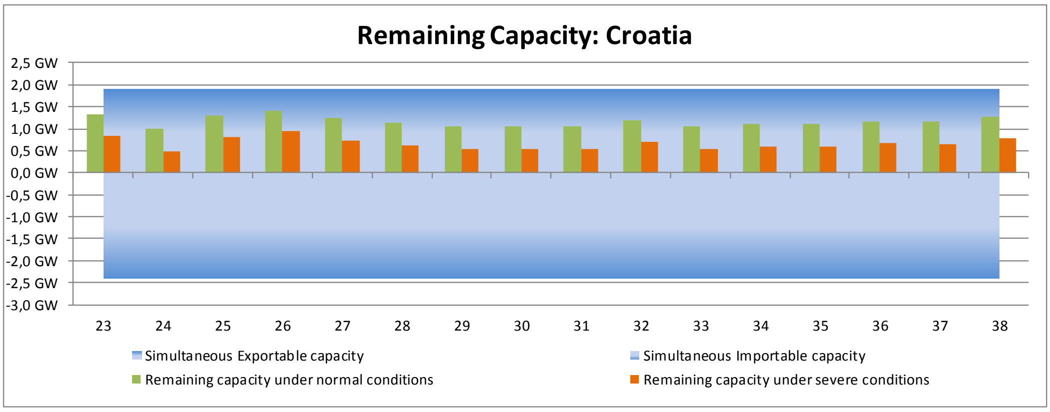

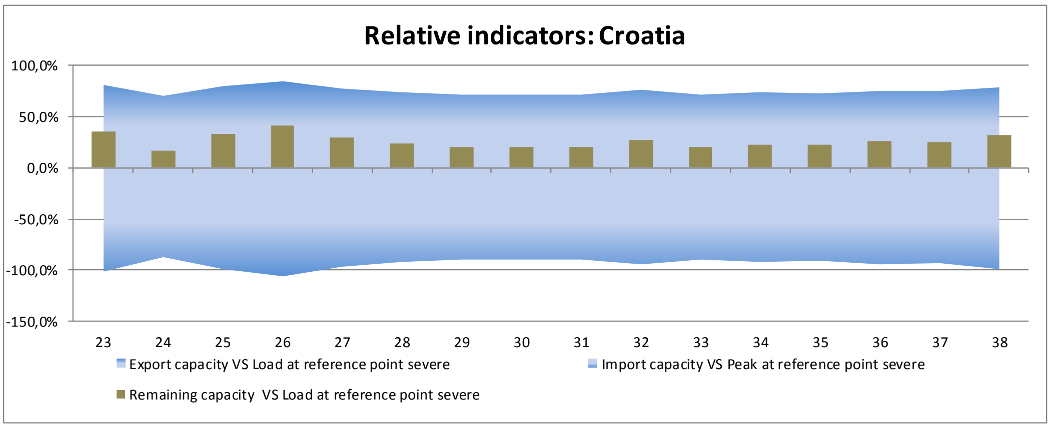

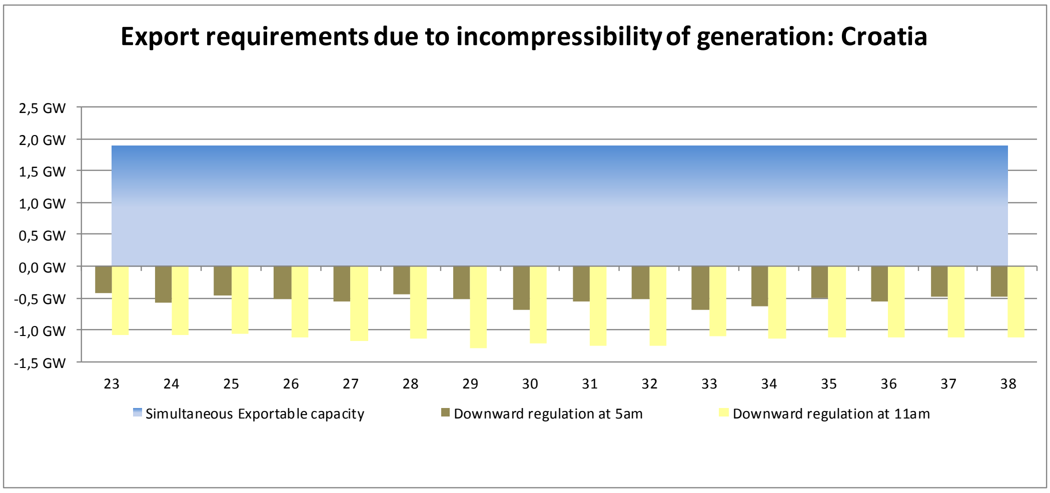

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<u>Cyprus</u>

There is sufficient generation adequacy to meet the expected load demand. The expected Capacity Reserve Margin will be about 38%. No other problems are anticipated on the electrical system to meet the load demand.

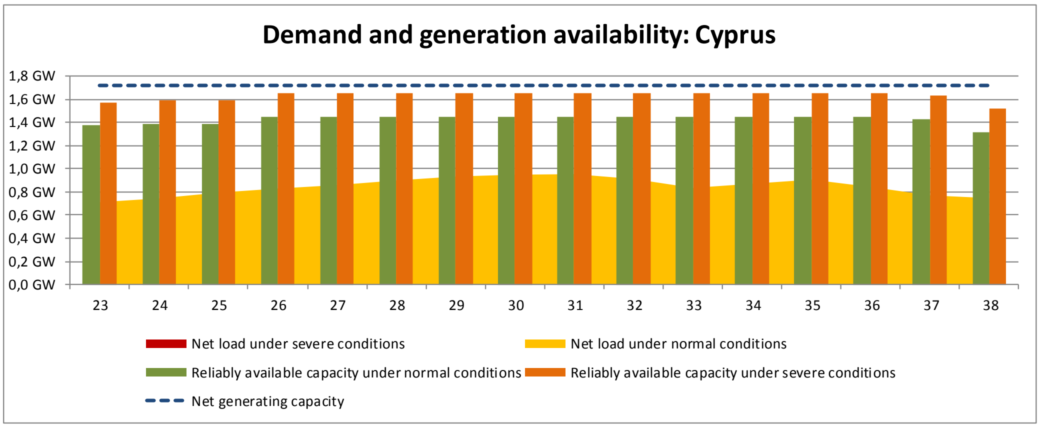
General situation
No maintenance work is scheduled during summer. No other adequacy related problems are anticipated.

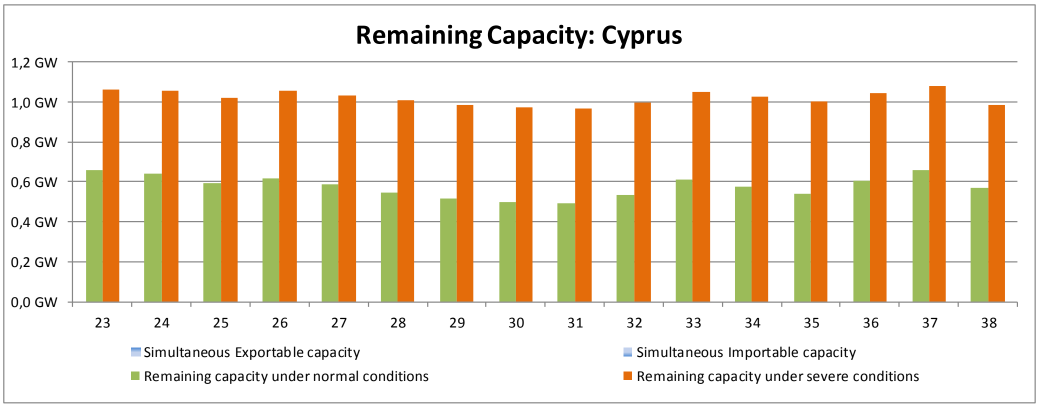
Most critical periods
No specific period is considered critical.

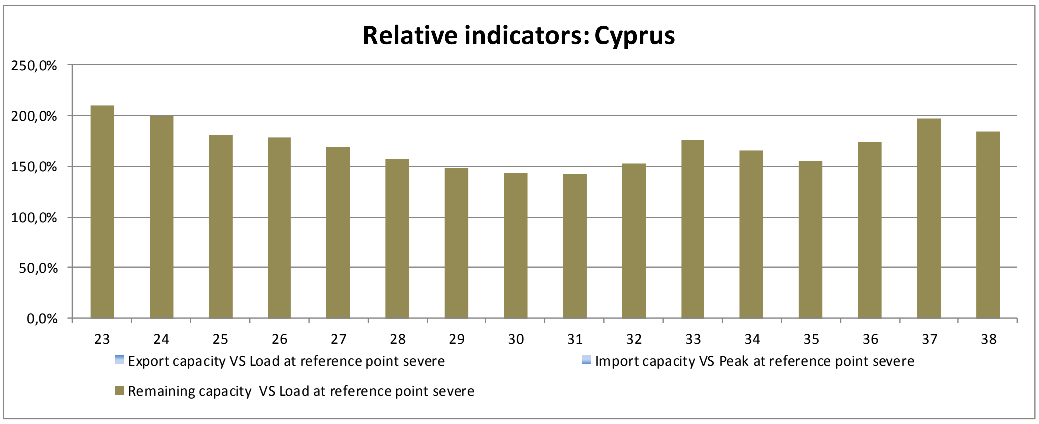
Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export
Not Applicable

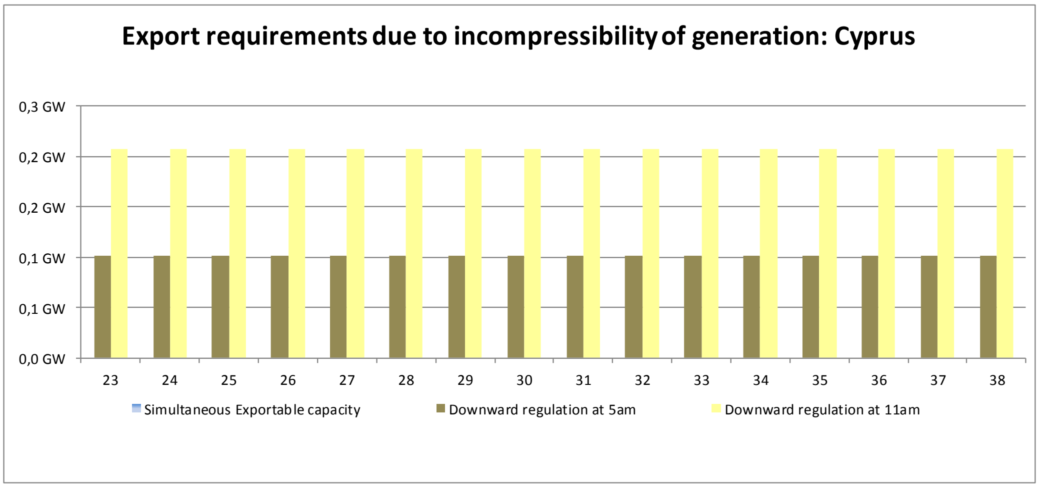
Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods
Not Applicable

Framework and methodology of the assessments
National generation adequacy is reviewed on a weekly basis by taking into consideration the unit availability and the approved maintenance programme.


Demand and generation availability: Cyprus
1,8 GW
1,6 GW
1,4 GW
1,2 GW
1,0 GW
0,8 GW
0,6 GW
0,4 GW
0,2 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Cyprus
1,2 GW
1,0 GW
0,8 GW
0,6 GW
0,4 GW
0,2 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Cyprus
250,0%
200,0%
150,0%
100,0%
50,0%
0,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Cyprus
0,3 GW
0,2 GW
0,2 GW
0,1 GW
0,1 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Czech Republic

Expected load development and availability of generation capacities are in balance during whole summer period. Reserve margin capacity is positive from 1.17 GW up to 3.33 GW for Normal conditions. Reserve margin capacity is positive from 0.95 GW up to 3.14 GW for Severe conditions. This value is the result of a slight decrease in electricity consumption in the Czech Republic.

General situation

Standart level of maintenance is expected during the summer, therefore no problems with limited availability are foreseen.

Most critical periods

Yearly load minimum can be considered as the most critical period in the summer and is expected during the weeks 23 and 29. Sufficient amount of ancillary services for downward regulation is reserved. Export is a neccessary condition for securing enough downward regulation.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

Ability to import or export shouldn't be limited.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

In order to secure the security of supply at demand minimum periods it is necessary to export electricity through the interconnectors.

Framework and methodology of the assessments

We use methodology of ENTSOE.

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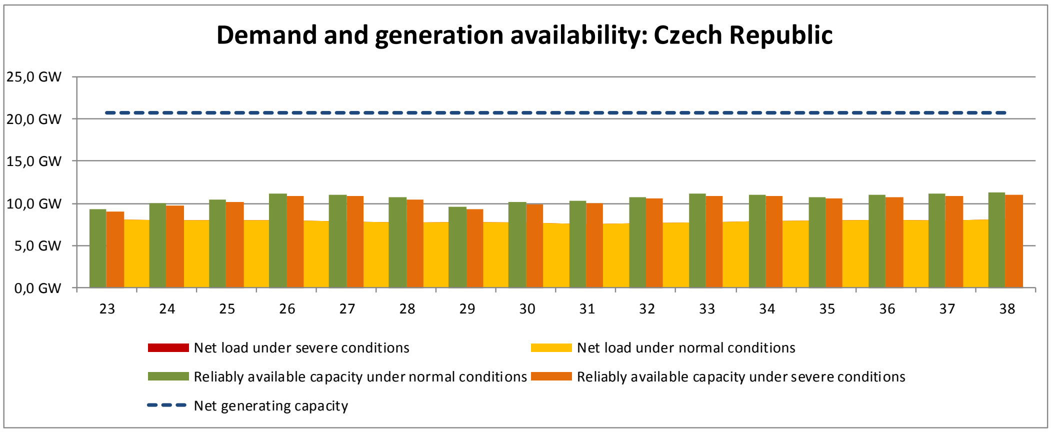
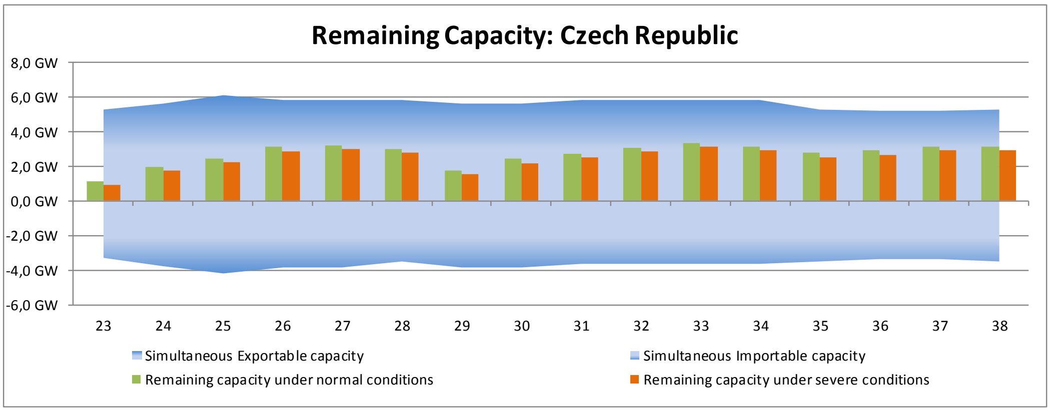
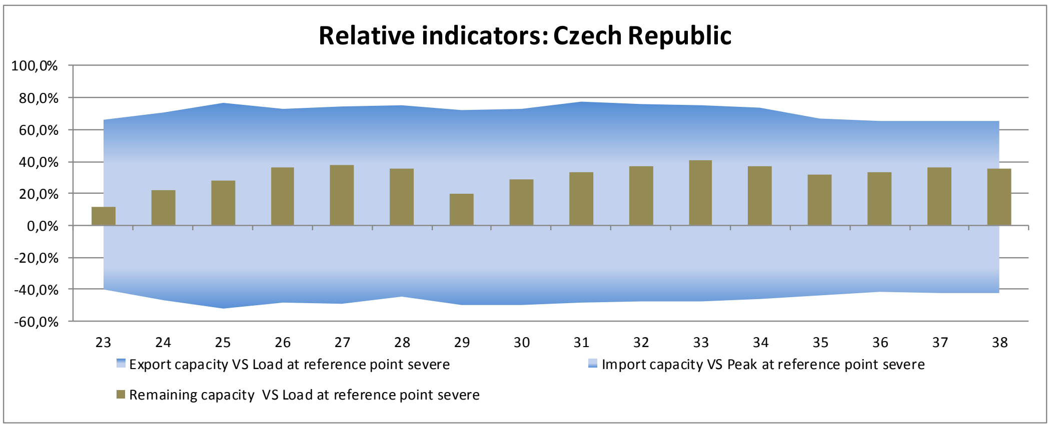
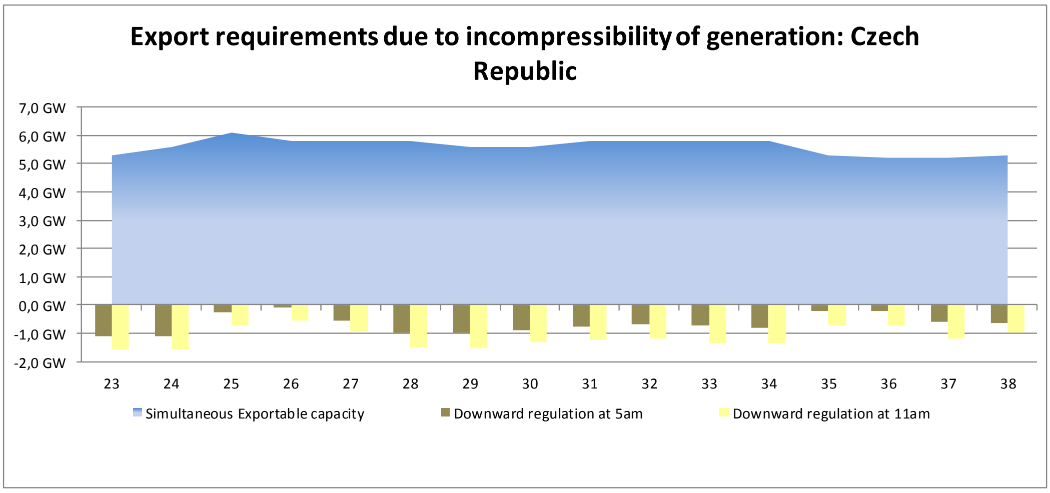

Demand and generation availability: Czech Republic
25,0 GW
20,0 GW
15,0 GW
10,0 GW
5,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Czech Republic
8,0 GW
6,0 GW
4,0 GW
2,0 GW
0,0 GW
-2,0 GW
-4,0 GW
-6,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Czech Republic
100,0%
80,0%
60,0%
40,0%
20,0%
0,0%
-20,0%
-40,0%
-60,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Czech Republic
7,0 GW
6,0 GW
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Denmark

The expectation for the summer is many overhauls and a new project, which will demand disconnection. At this time there are many enquiries for outage time and the inspection and maintenance plan is already comprehensive.
The conveyance for the 132 kV grid on Zealand continues until June. Afterwards, the 132/ 150 kV grid will be transferred to Energinet.dk.
The visual enhancement project at Vejle Aadal will likewise demand disconnection over the summer but the magnitude is yet unknown.

There is a long-term overhaul for the power stations coursed by conversion to biomass. This means, that there will only be few power stations available for a period, but this will not give any reason for issues.

It is expected that the period will give a strained power balance if the inspection and maintaince plan slips. The problem it will course is not bigger than it can be handled. The power balance will be in focus over the summer but will not cause worry.

There's not expected large limitations on interconnections to neighboring areas. It's expected there still will be large limitations against the border to TTG in the southbound direction caused by a large amount of wind in the grid and modification of the Northern Germany grid.

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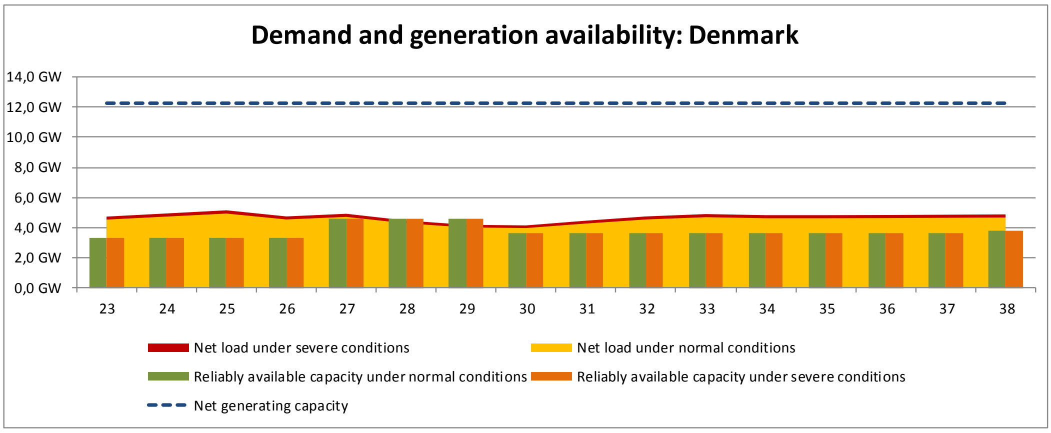
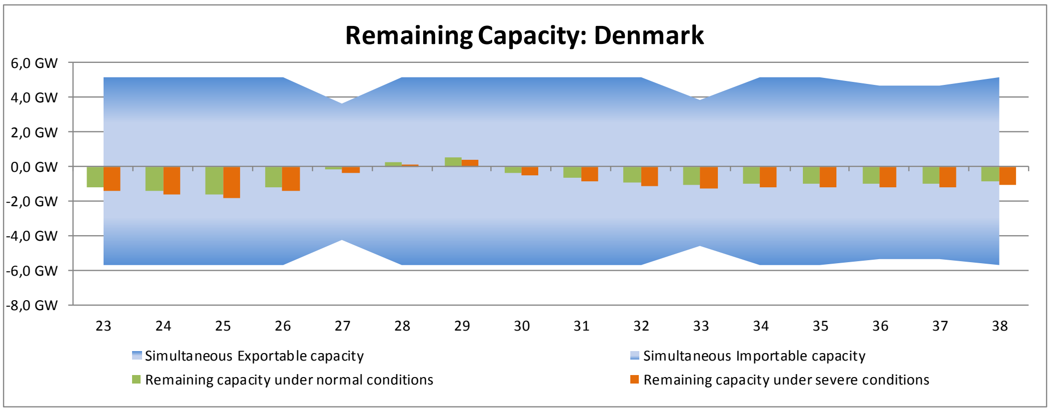
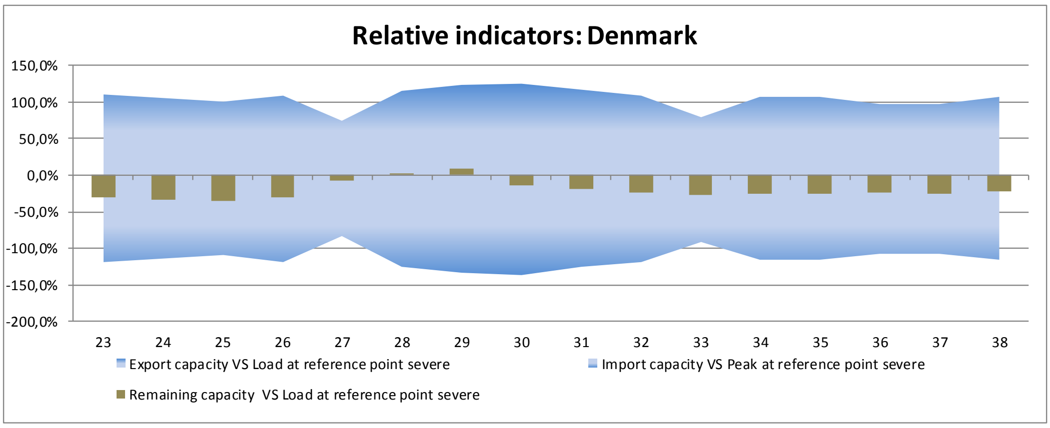
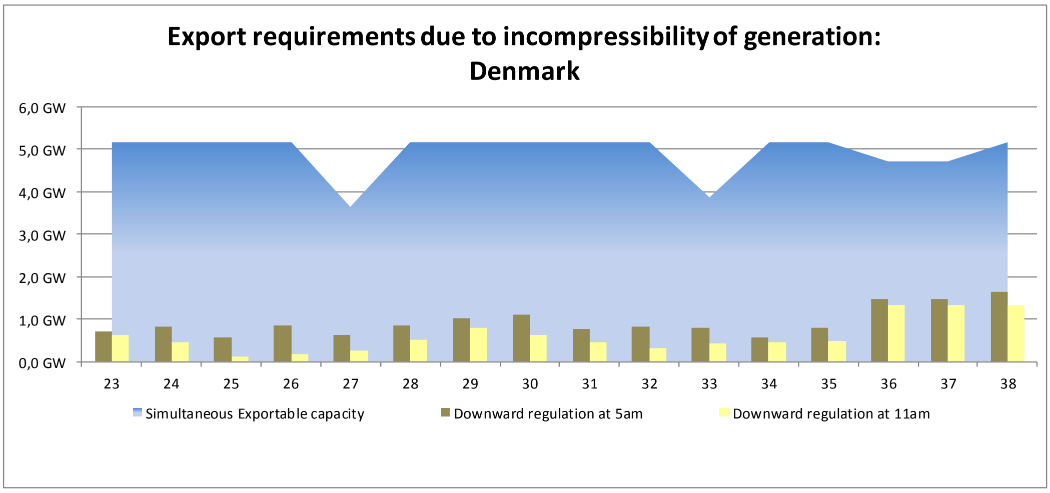

Demand and generation availability: Denmark
14,0 GW
12,0 GW
10,0 GW
8,0 GW
6,0 GW
4,0 GW
2,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Denmark
6,0 GW
4,0 GW
2,0 GW
0,0 GW
-2,0 GW
-4,0 GW
-6,0 GW
-8,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Denmark
150,0%
100,0%
50,0%
0,0%
-50,0%
-100,0%
-150,0%
-200,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Denmark
6,0 GW
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Estonia

Estonian TSO expects to be able to cover the peak load under normal and severe conditions. Preliminar prognose for summer shows that in July (weeks 23 - 30) and in the beginning of September (weeks 36-38) there will be less production capacity than the rest of the summer due to maintenances in oil shale power stations. Still, the system is expected to be in export capability for the whole period of summer.

General situation
The lowest level of available generating capacity in the system is from week 23 to week 30. This is caused by the maintenances of two generators and two generators which are mothballed in oil shale power plants.

Most critical periods
In case of hot weather condition and heavy energy flow to Lithuanian and Latvian power system, there might occur some stressed period for interconnection between Estonia and Latvia. Considering the maintenances of grid elements affecting the interconnections capacity, the most critical period for Estonian TSO is expected to be weeks 28, 33, 34, 36, 37 and 38, when the export capacity to Latvia is the lowest and congestions might occur. Summer maintenances have been limited to avoid congestions which decrease significantly capacities in Estonia/Russia-Latvia interconnection.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export
It is expected that there might occur some congestions in Estonia-Latvia boarder, as it has happened in previous summers, due to large energy flow to Lithuania. There might also occure transit flows from Russia to Lithuania which worsen the situation in Estonia-Latvia interconnection even more. In severe conditions counter trades between Estonian and Latvian TSO are made.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods
The part of inflexible generation in the system is not significant and no problems are expected for managing the inflexible generation inside the power system, even during minimum demand periods.

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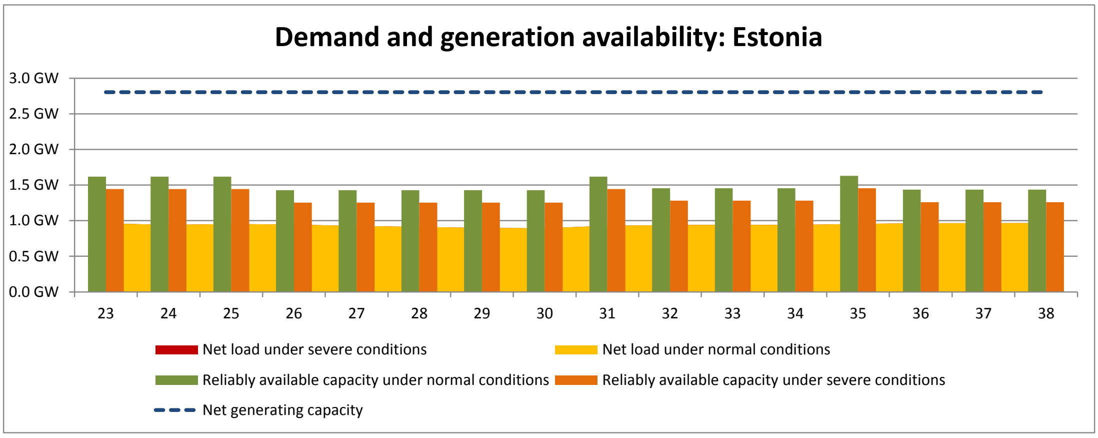
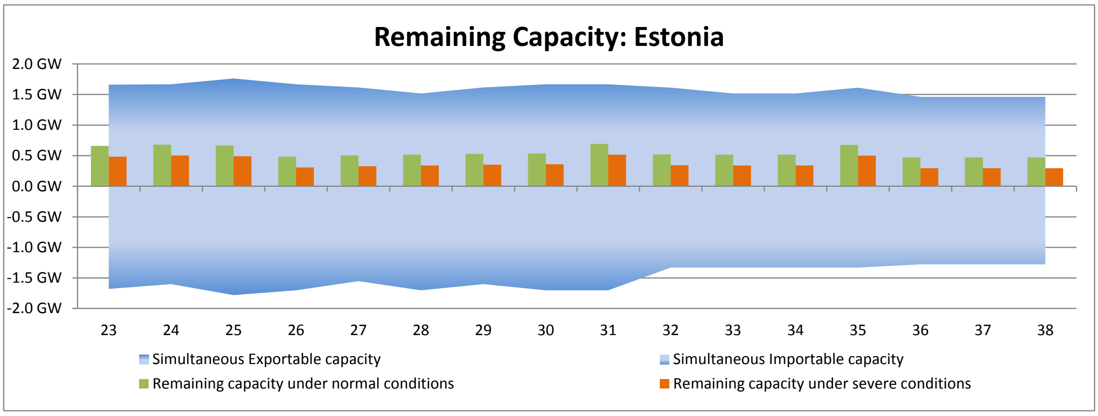
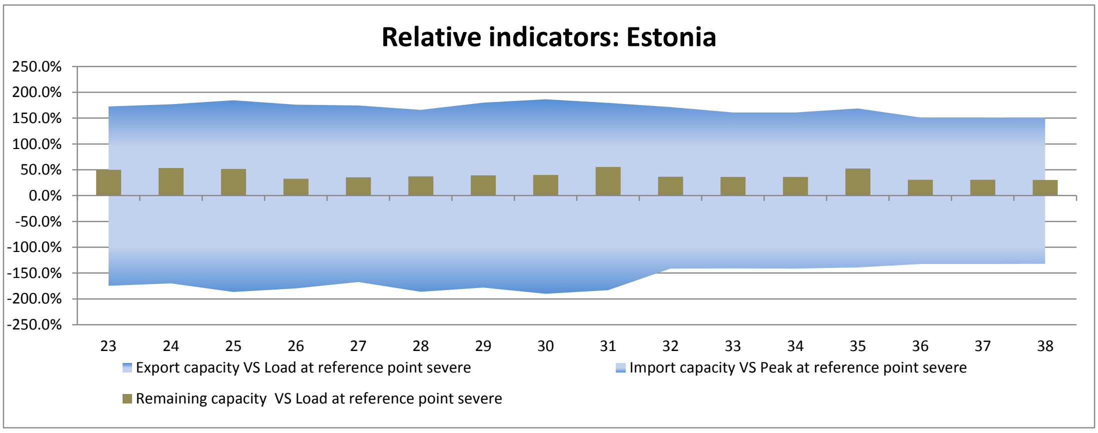
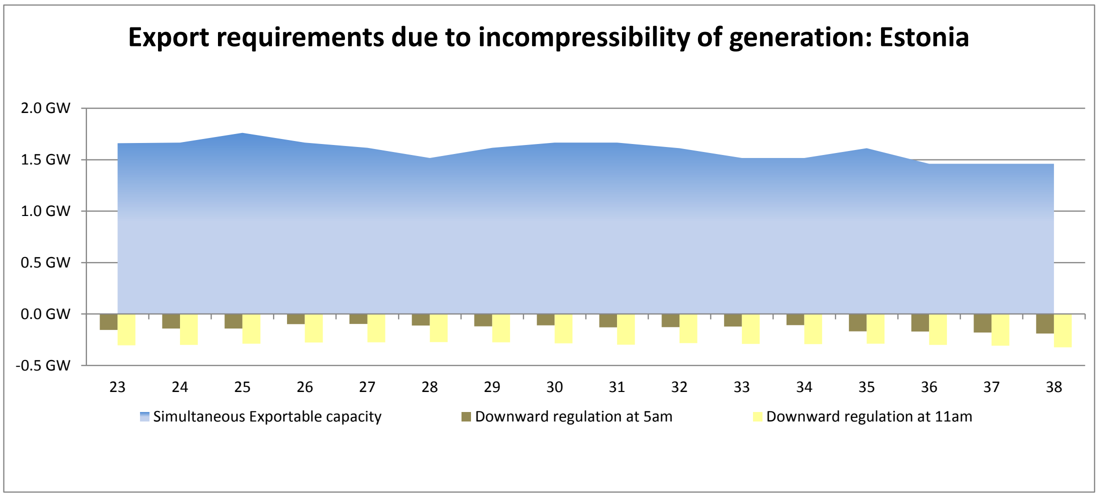

Demand and generation availability: Estonia
3.0 GW
2.5 GW
2.0 GW
1.5 GW
1.0 GW
0.5 GW
0.0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Estonia
2.0 GW
1.5 GW
1.0 GW
0.5 GW
0.0 GW
-0.5 GW
-1.0 GW
-1.5 GW
-2.0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Estonia
250.0%
200.0%
150.0%
100.0%
50.0%
0.0%
-50.0%
-100.0%
-150.0%
-200.0%
-250.0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Estonia
2.0 GW
1.5 GW
1.0 GW
0.5 GW
0.0 GW
-0.5 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Finland

There are not typically adequacy problems in Finland during summer period. The peak load in summer is from 60 to 70 % of the corresponding winter peak value. Still, maintenances limit available capacity in summer period. Especially, combined heat and power plants have overhauls or are closed during the season. However, demand can be met with available generation units. In addition, there is a high level of importable capacity.

There should be no specific export needs during minimum load hours but low down-regulation resources may cause problems.

General situation

There are not typically adequacy problems in Finland in summer period. Load, generation and system adequacy are estimated to remain at the same level as the last summers.

Most critical periods

Most critical weeks are at the last weeks of the summer period. At that time demand is higher and nuclear units have maintenance.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

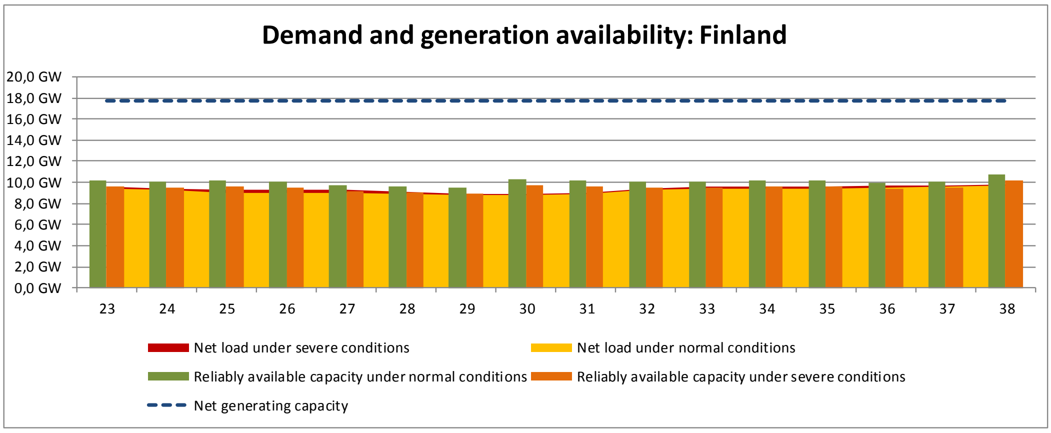
Demand can be met with available generation units. In addition, there is a high level of importable capacity.

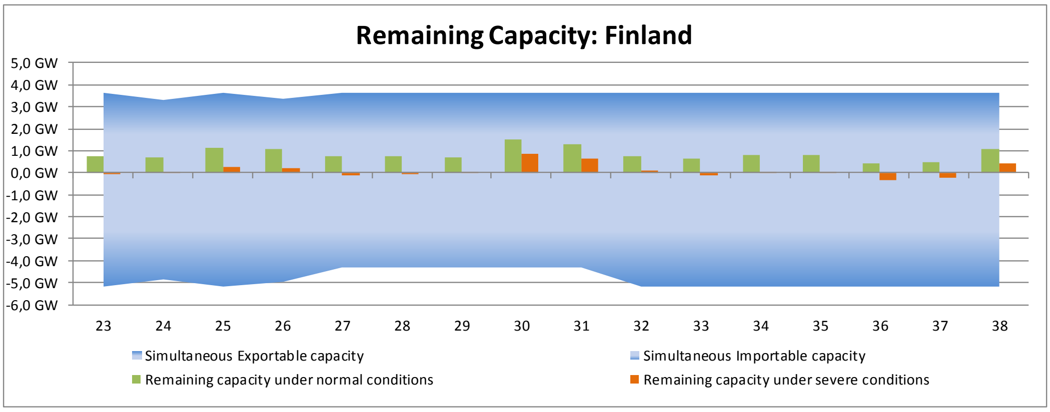
Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

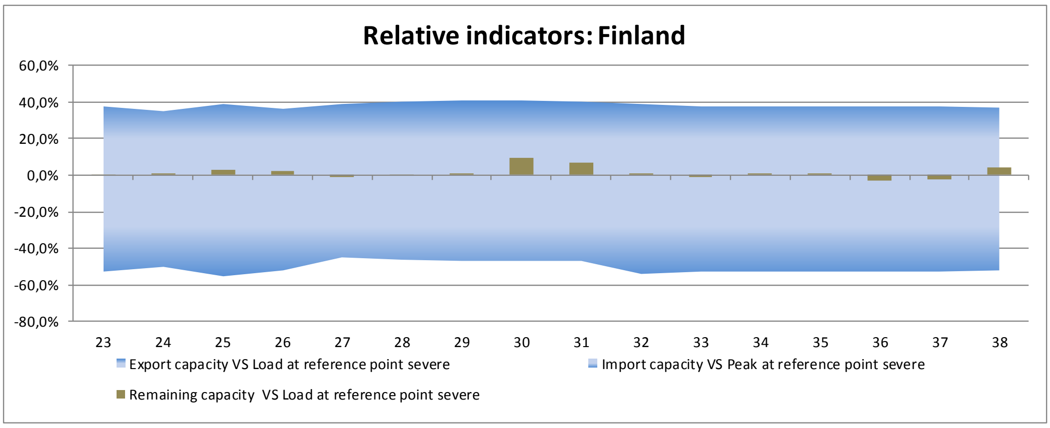
There are no specific export needs due to inflexible generation at minimum demand period. Low down-regulation resources may cause problems during minimum demand periods.

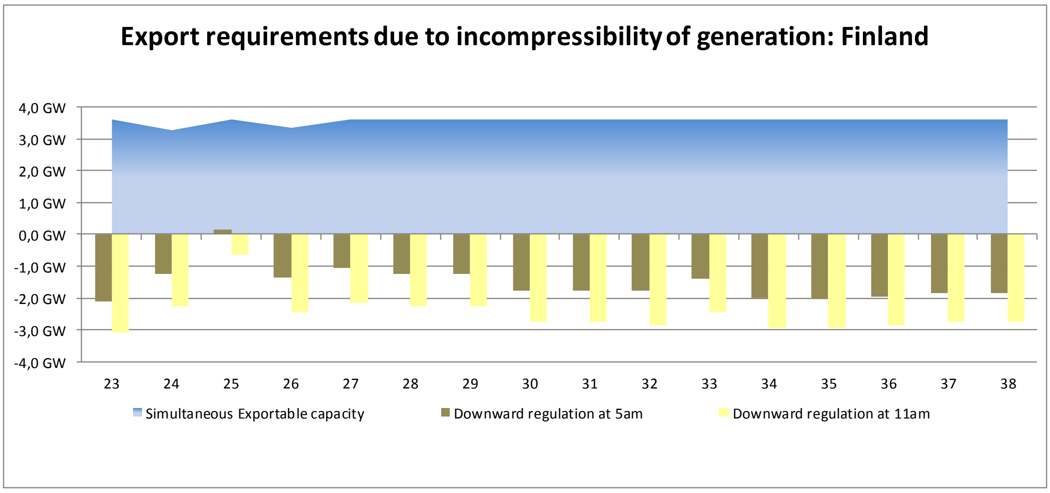
Framework and methodology of the assessments

Maintenance & overhauls are based on available market messages. In addition, maintenances of smaller units are included in non-usable capacity.


Demand and generation availability: Finland
20,0 GW
18,0 GW
16,0 GW
14,0 GW
12,0 GW
10,0 GW
8,0 GW
6,0 GW
4,0 GW
2,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Finland
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
-4,0 GW
-5,0 GW
-6,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Finland
60,0%
40,0%
20,0%
0,0%
-20,0%
-40,0%
-60,0%
-80,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Finland
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
-4,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

France

No large issue is expected concerning the generation - load balance for the coming summer for both upward and downward regulation. The risk related to security of supply is rather low this summer.

For economic reasons many oil and gas generation units will be shut down this whole summer for a volume close to 7 GW. This situation could generate local constraints in the south-eastern bound of France.

General situation

The available generation is lower than last year in normal conditions but at the same level in severe conditions. Also fossil fuel capacity has decreased over the last year. This has been offset by increases of solar and onshore wind generation capacity.
Load forecast is lower than last year with a maximum weekly peak load close to 53 GW.

Most critical periods

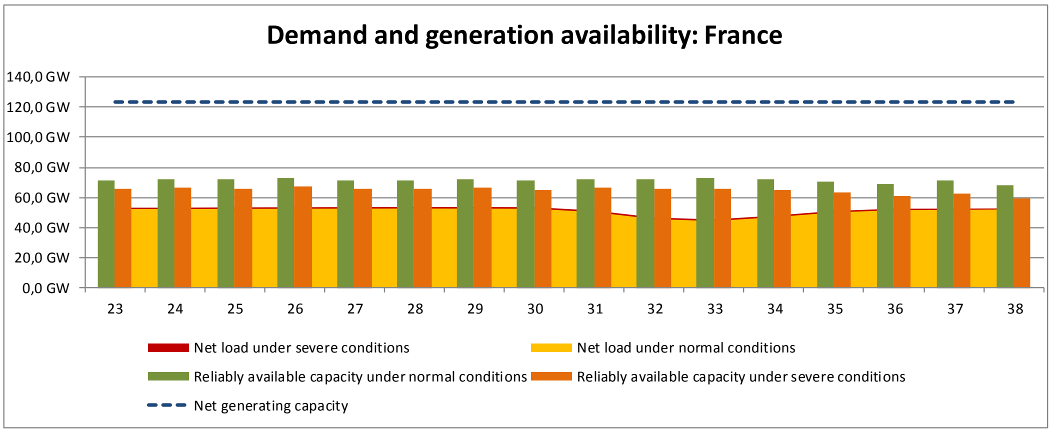
There is no critical weeks, in severe conditions the margins are always above 10 GW expect in September where they are above 6 GW in case of a long drought.

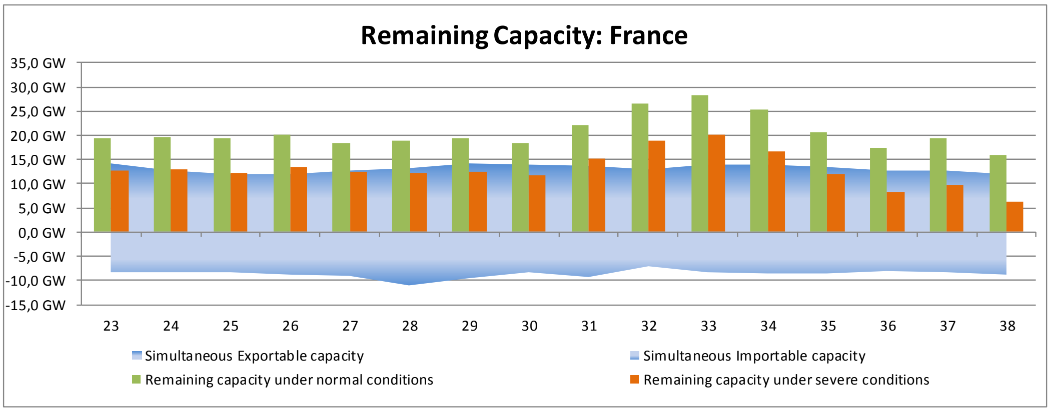
Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

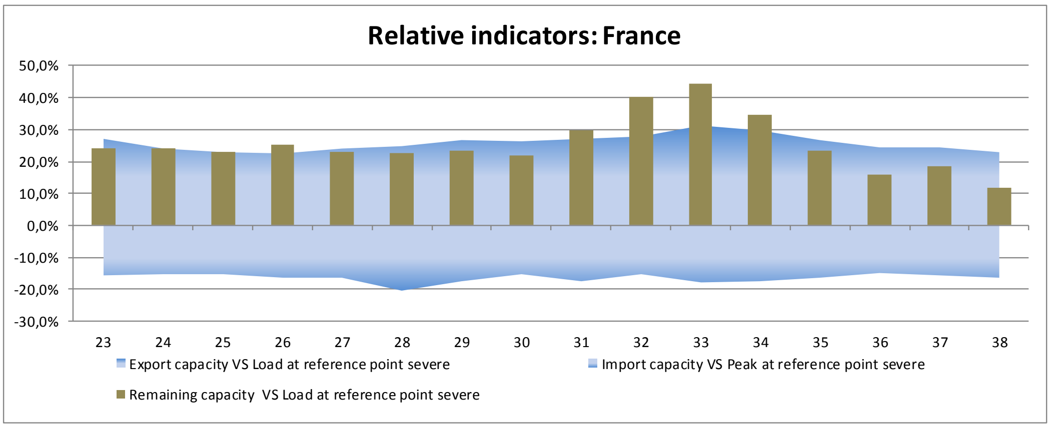
No dependency to interconnectors is identified. As a consequence, the role of interconnectors is let to optimize market efficiency.

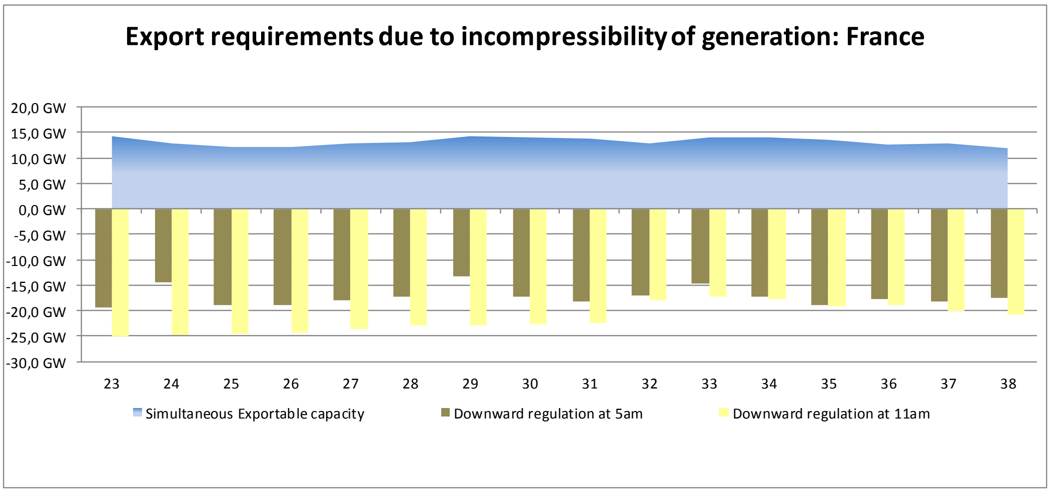
Framework and methodology of the assessments

The framework used for the summer adequacy assessment is as follows: normal and severe demands are forecast (the severe demand forecast is +7°C above normal conditions); generators submit their availability (fossil fuel and nuclear generation, hydro power); breakdown rates are calculated for all units above 100 MW of maximal power based on data provided by generators and correlated with historical data; RES load factors are calculated from data in the last four years; the resultant generation profile is compared with the demand and the system services reserve.
For the downward adequacy assessment load factors are calculated from historic data; must run generation (excluding wind/solar/run of river) is at the moment exclusively inflexible nuclear generation









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FYRO Macedonia

The operation of power system is expecting to be secure and reliable over all summer period.
The generation-load balance in the Macedonian system will not be considered at risk during the summer 2015.
Due to the low demand this period the most overhauls and maintenance work will be conducted during May and September for interconnectors and during June, July and September for thermal blocks.

General situation

Given the lower load in the reference time points in terms of the system, it is estimated that the system will be balanced in normal conditions, and there will be a need of import of around 300 MW in severe conditions.
For the analysed period the adequacy is fulfilled.
Cross-border transmission capabilities of the Republic of Macedonia is such that they can support all import or export electricity transactions from and to the Republic of Macedonia, while allowing unobstructed transit of electricity across the region.

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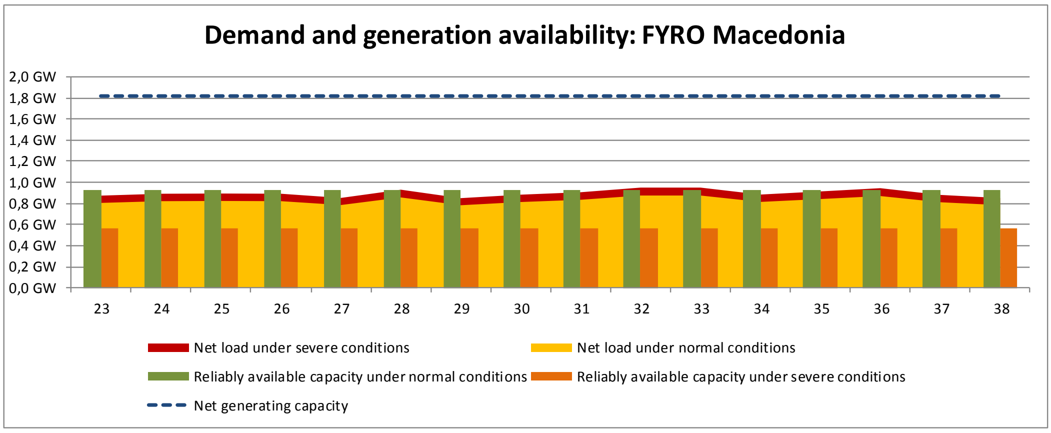
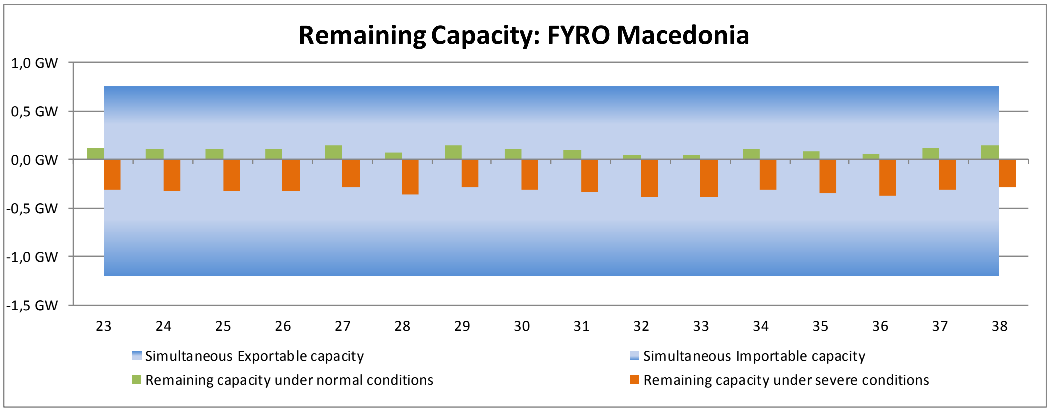
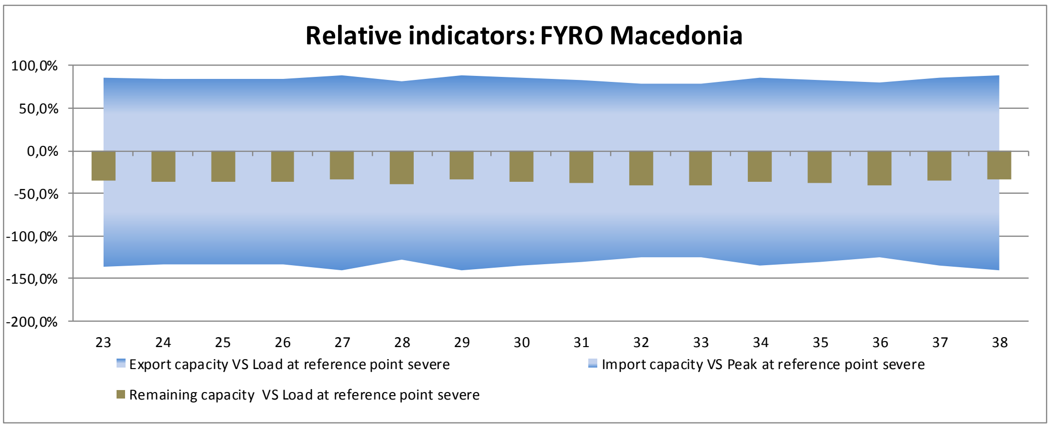
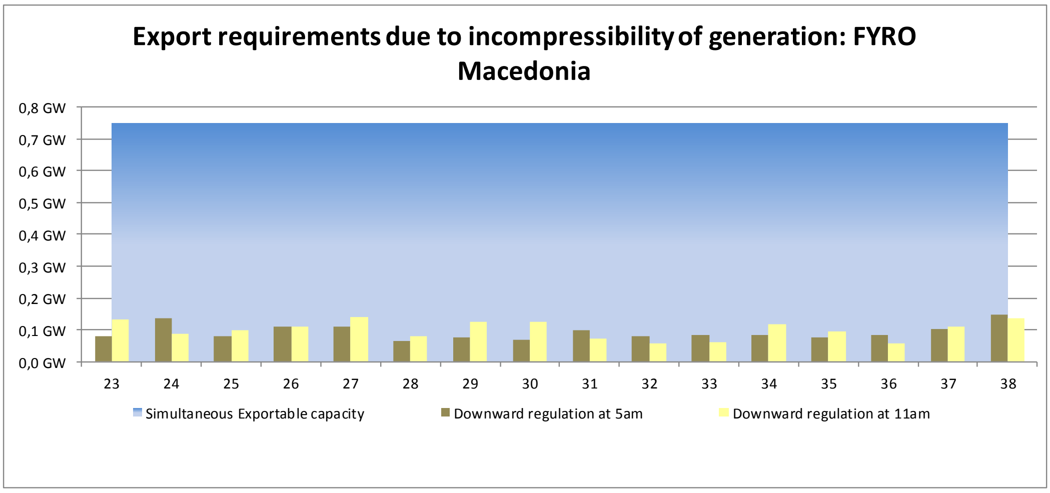

Demand and generation availability: FYRO Macedonia
2,0 GW
1,8 GW
1,6 GW
1,4 GW
1,2 GW
1,0 GW
0,8 GW
0,6 GW
0,4 GW
0,2 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: FYRO Macedonia
1,0 GW
0,5 GW
0,0 GW
-0,5 GW
-1,0 GW
-1,5 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: FYRO Macedonia
100,0%
50,0%
0,0%
-50,0%
-100,0%
-150,0%
-200,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: FYRO Macedonia
0,8 GW
0,7 GW
0,6 GW
0,5 GW
0,4 GW
0,3 GW
0,2 GW
0,1 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Malta

The only source of inflexible generation during minimum loads is the minimum load of the old Delimara plant which cannot go under the 60 MW when both the two units are in service. All other plants are totally flexible even though the old combined cycle must be switched to open cycle mode in order to be 100% flexible. For the coming summer the load forecast was calculated by taking the 2014 as base year, and this was increased by the forecasted increase in demand. The PV contribution is also estimated hence leaving an estimate of the power to be dispatched from Delimara power station and from the interconnector.

General situation

Periods of planned high maintenance activities are generally carried out in periods of low demand which usually correspond to March and October so are out of the time frame described in this report

Most critical periods

The weeks that are considered the most critical are those in the August and September to high load demands and also due to the severe temperatures of the Maltese summer which tends to create problem in the electric circuits of the plants auxiliaries thus increasing the risk of shutdowns.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

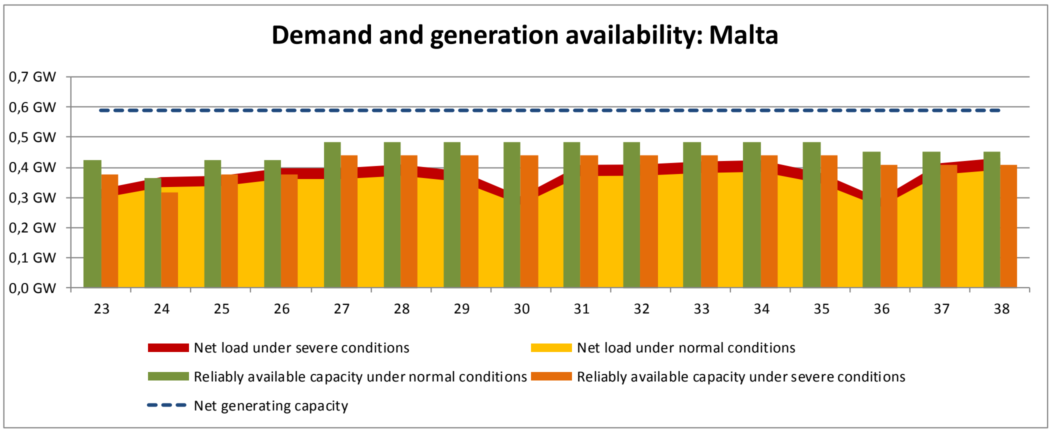
Basically the new Sicily-Malta interconnector's role for the year 2015 is as a substitute to the old power station of Marsa (presently there are two power stations in Malta with the Marsa power station having been shut down and kept in cold stand by-pass until the new gas plant is commissioned (mid 2016)). Since recently Marsa power station was derated to 70MW, the 200MW cable will increase the adequacy.

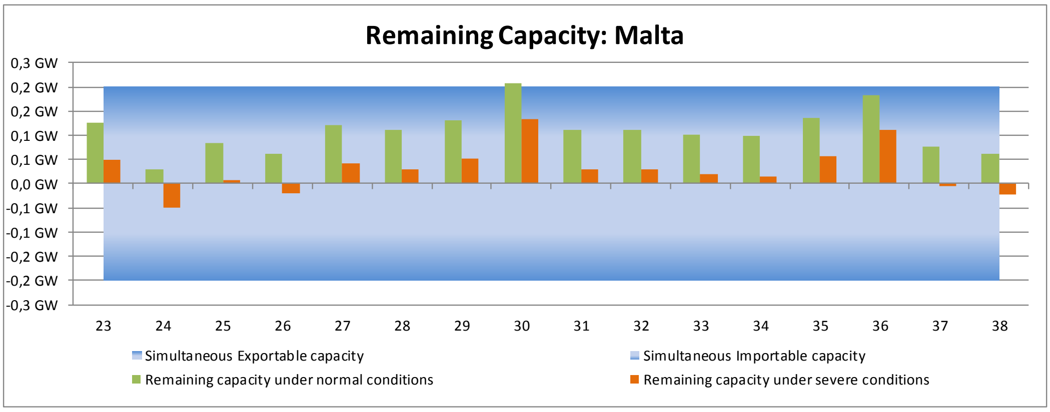
Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

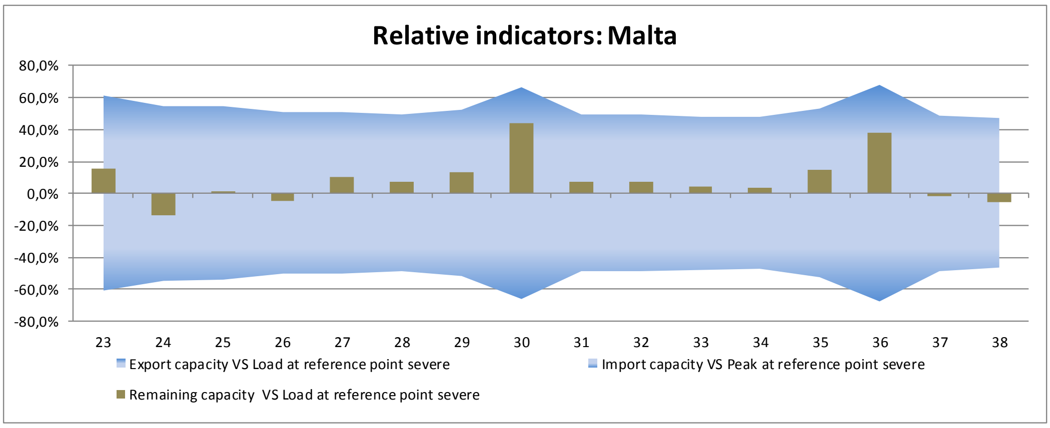
Due to the introduction of the interconnector it is planned to s/d one of old Delimata steam plants thus decreasing the inflexible generation during the minima to 30 MW from the 60 MW.

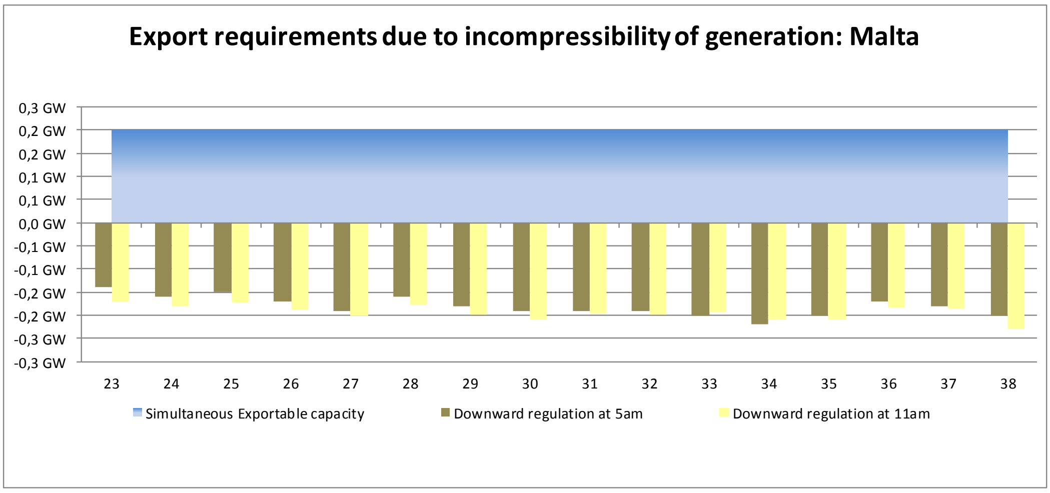
Framework and methodology of the assessments

The increase of load demand with respect to the previous year from the 1st january was analysed and found to be around 5% Hence load demand for the summer period is assumed to be that of the corresponding period of year 2014 plus 5%. The projected installed PV during the summer was determined. From the PV load factors from the corresponding base year days the amount of expected PV contributions were estimated. Hence the difference beween the forecasted demand and the PV forecasted contribution is the forecasted power to be generated from the power station and from the interconnector. The plant availabilty was determined together with the interconnecter NTC. Hence the power capacity was determined.









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Germany

The German TSOs do not expect significant problems with the generation-load balance for the coming summer. The German load can be covered with the available capacity. Possibly the increasing PV feed-in could lead to unexpected load flows in the German transmission system. Especially if the RES feed-in in the north of Germany is high and low in the south.

General situation
No specifics foreseen.

Most critical periods
Specifically, the time around Whitsunday could be critical for voltage problems in case of low demand, no PV feed-in in the south of Germany but a moderate feed-in of wind energy. More generally, a longer dry and hot period could lead to problems with cooling water.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export
Even at severe conditions Germany is not expected to be dependent on interconnectors to maintain adequacy.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods
In periods with high renewable feed-in and low (regional) demand high power flows on interconnectors are expected. Situations might occur in which regional feed-in management is necessary to solve overload problems. Still, no critical situations are expected.

Framework and methodology of the assessments
The data base includes TSO-connected generation and available DSO-connected generation. Percentages of non-usable capacity are based on statistical evaluation of historical data.

The power plant group “Kraftwerksgruppe Obere Ill-Lünersee” (1.7 GW) is located in Austria and is therefore part of the installed Austrian Hydro Power capacity (row 4). As it is directly connected to the German TSO TransnetBW the net generating capacity of this power plant group can be considered as a firm import for Germany.

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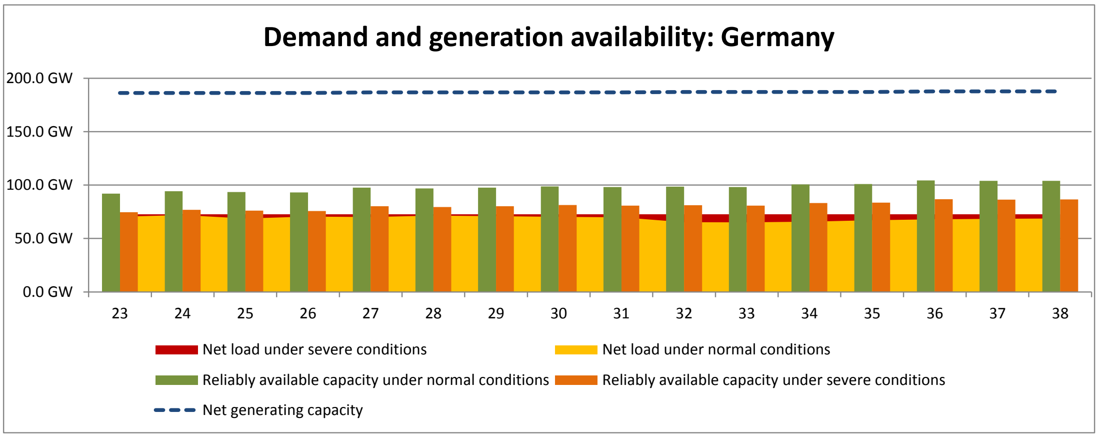
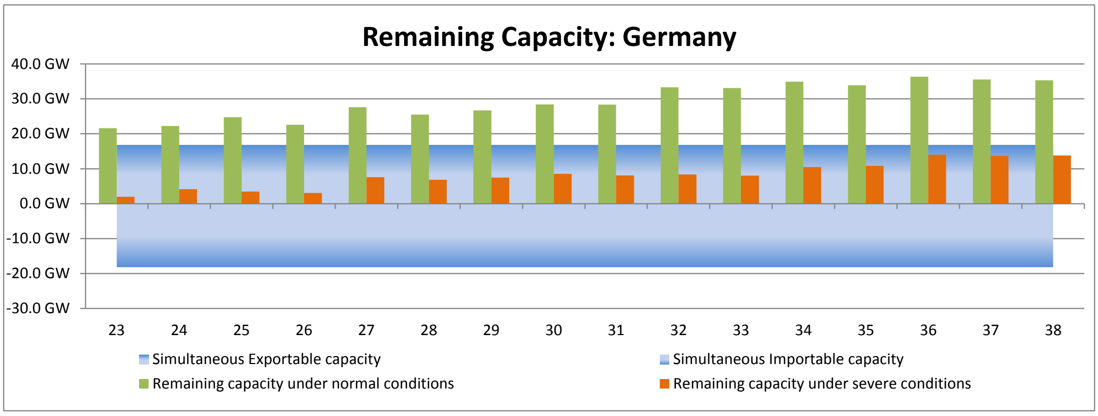
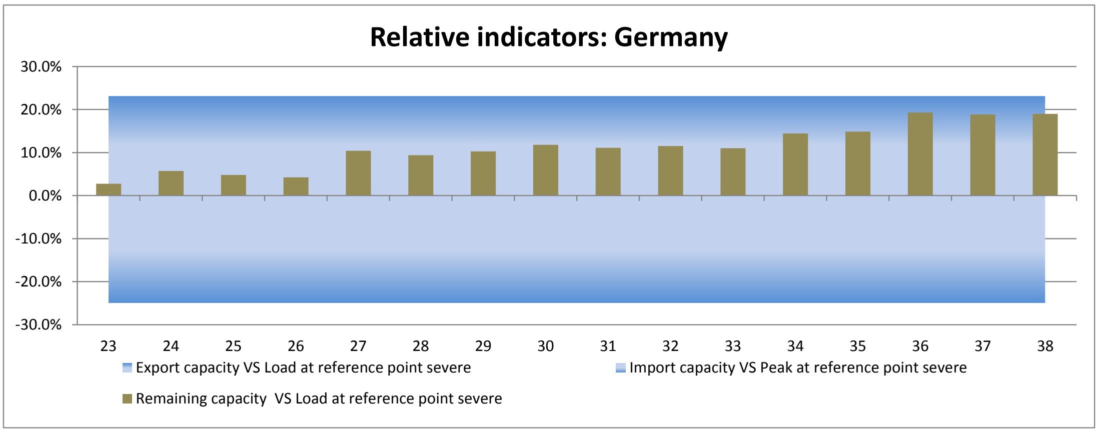
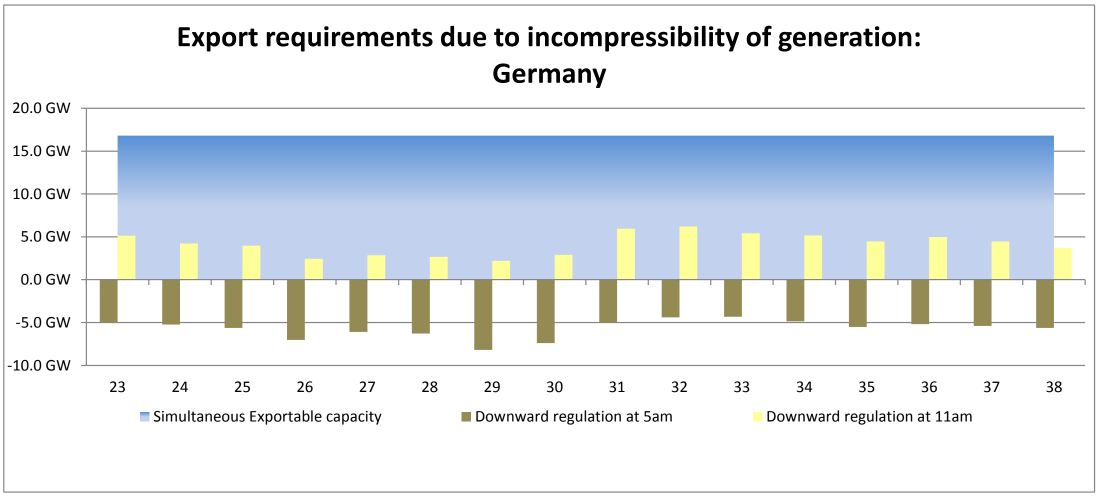

Demand and generation availability: Germany
200.0 GW
150.0 GW
100.0 GW
50.0 GW
0.0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Germany
40.0 GW
30.0 GW
20.0 GW
10.0 GW
0.0 GW
-10.0 GW
-20.0 GW
-30.0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Germany
30.0%
20.0%
10.0%
0.0%
-10.0%
-20.0%
-30.0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Germany
20.0 GW
15.0 GW
10.0 GW
5.0 GW
0.0 GW
-5.0 GW
-10.0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Greece

There is not any risk for the forthcoming summer. The estimation for this summer will be the same as 2014. The expected demand (peak load at 13:00) from the Transmission System will be lower than previous years (2009-2014), given that a big amount of consumption will be covered by photovoltaics which are distributed in the Medium and Low Voltage Grid. The water levels in the reservoirs are estimated to be higher than the last year. Expected load development and availability of generation capacities are in balance during the whole summer period. Remaining capacity is positive. Availability of flexible generation at times of minimum summer demand could slightly affected in case of level water storage.

General situation

The hydro storage level at reservoirs is expected higher than the previous year and this situation will increase the capacity of the total generation.

Most critical periods

For the forthcoming summer there is not any week which will be critical regarding adequacy.. In general the most critical weeks are at the first half of July for the Greek System. Especially week 27, 28, 29 and 30 are in particular critical due to the maximizing of the demand.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

The interconnections can play a significant role especially in periods with large variations in System demand. In these cases IPTO could export or import energy to/from other countries depending of the market prices. For the current year 2015, the HVDC Link Greece-Italy (500MW capacity) remains in operation whereas in the previous year the DC Link was out of order from the beginning of January 2014 till the 17 of July 2014, due to a fault on the Italian side in the underground part.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

From the system point of view, it is not expected that the excess of inflexible generation will cause a need for pumping or additional export.

Framework and methodology of the assessments

For the upward adequacy assessment IPTO used the data from its data base and the yearly plan of maintenances. Generally there are no maintenance scheduled for the plants and the Tie-lines for this summer period. So the NTC values are taken to be some higher than already agreed yearly values. For the downward adequacy assessment load factors are calculated from historic data; must run generation (excluding wind, solar, etc.) is at the moment exclusively inflexible mandatory hydropower.

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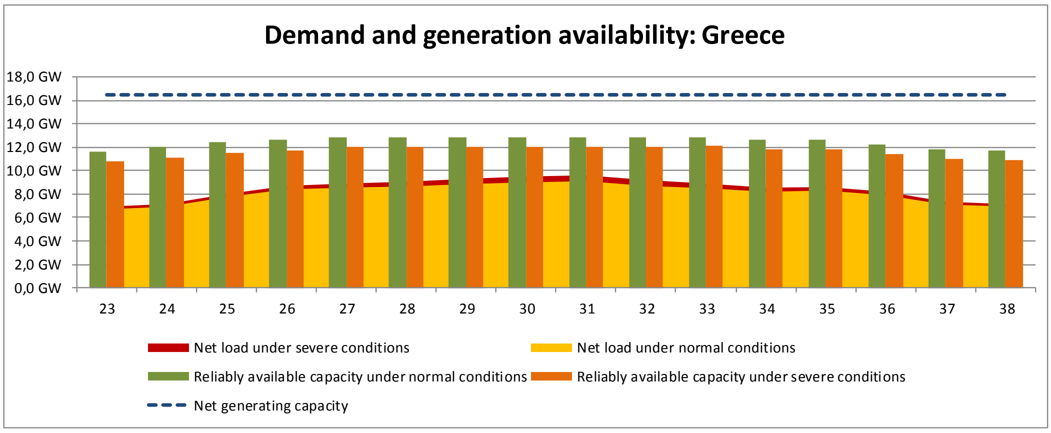
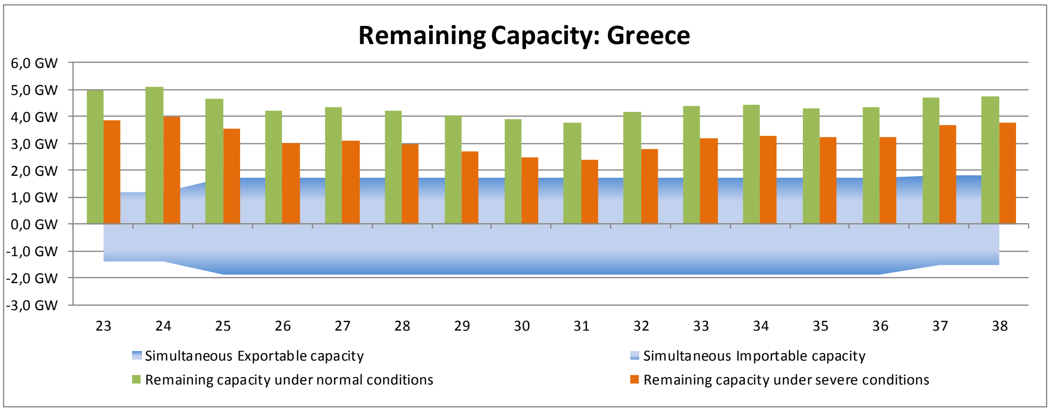
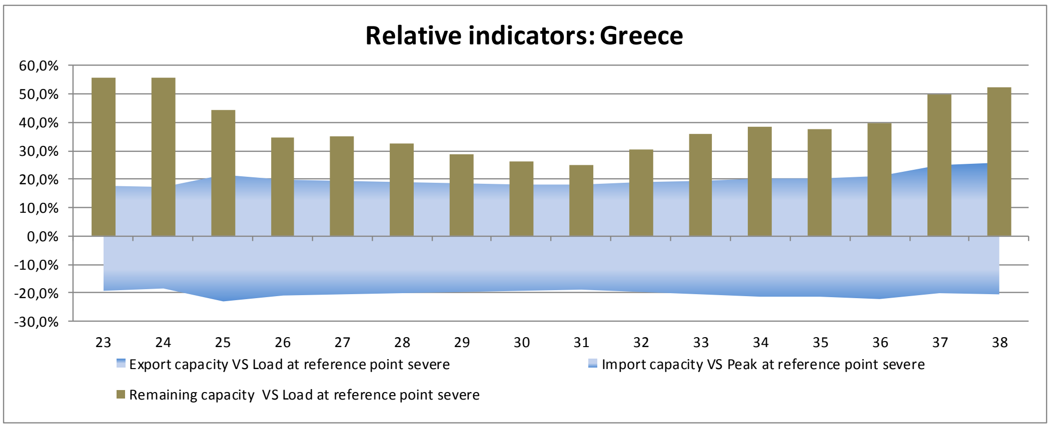
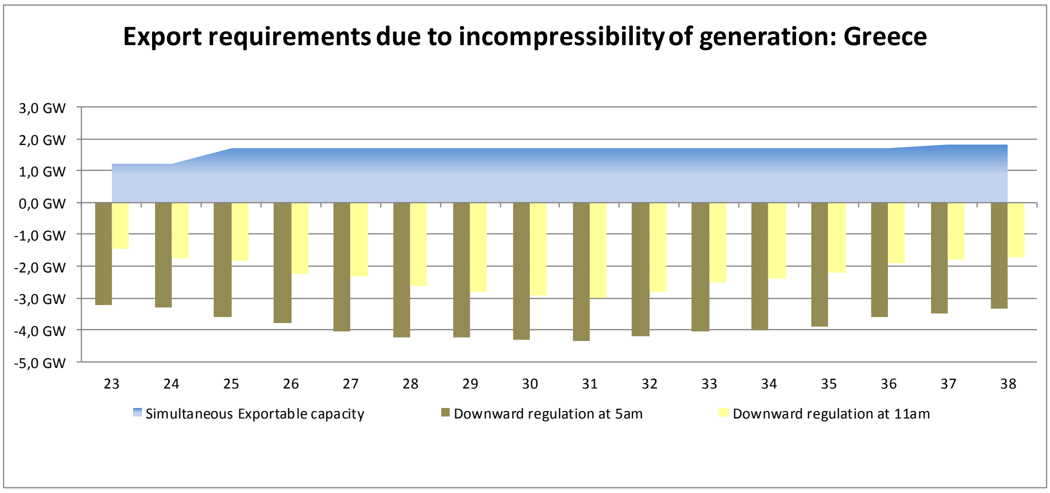

Demand and generation availability: Greece
18,0 GW
16,0 GW
14,0 GW
12,0 GW
10,0 GW
8,0 GW
6,0 GW
4,0 GW
2,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Greece
6,0 GW
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Greece
60,0%
50,0%
40,0%
30,0%
20,0%
10,0%
0,0%
-10,0%
-20,0%
-30,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Greece
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
-4,0 GW
-5,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Great Britain

Margins between generation availability and normal demand are forecast to be adequate for the summer and even with full exports we could still maintain our reserve requirement. Negative margins have been analysed during minimum demand periods and margins are also forecast to be adequate. Interconnector imports would not be required to secure most weeks of the SEVERE conditions.

General situation

The minimum generation availability over the summer is in the week 27. The margin in this week is forecast to be 4.8GW, assuming the interconnectors are at net float. Other tighter period are week 32 and 33.

Most critical periods

The tighest weeks are 27, 32 and 33.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

The current spreads between GB and EU, for summer 2015 are slightly wider than at this time last year (in EU to GB direction), with GB prices at a similar level and EU prices lower. This indicates that full imports are expected on IFA and BritNed. 26% of weekdays saw net import to GB reduce below 1500MW during the morning hours (generally 05:00-07:00); this is expected to remain similar for summer 2015.

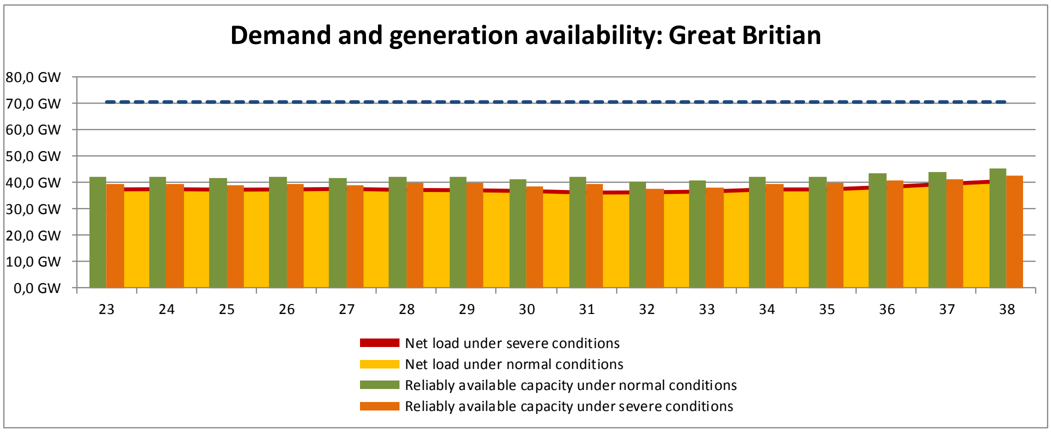
Flows on EWIC and Moyle are expected to continue to flow from GB to Ireland the majority of the time. Only during times of high wind in Ireland (particularly overnight) are flows expected to reduce from full export and could potentially start importing to GB.

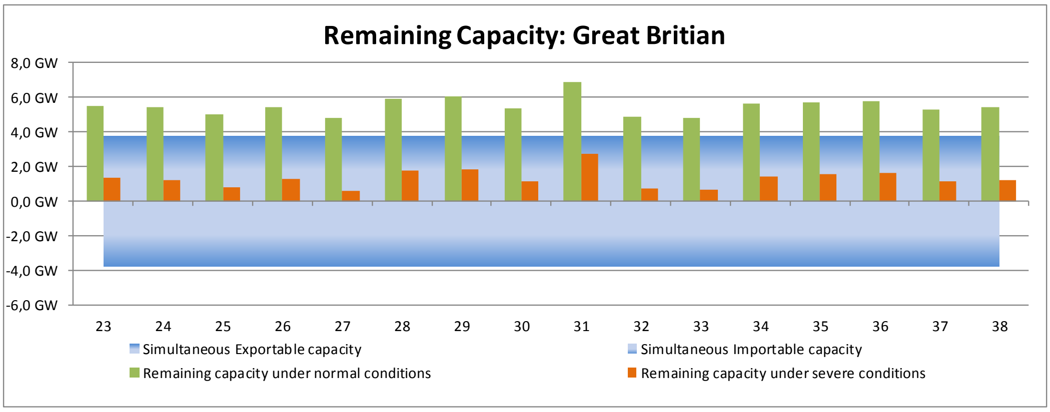
Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

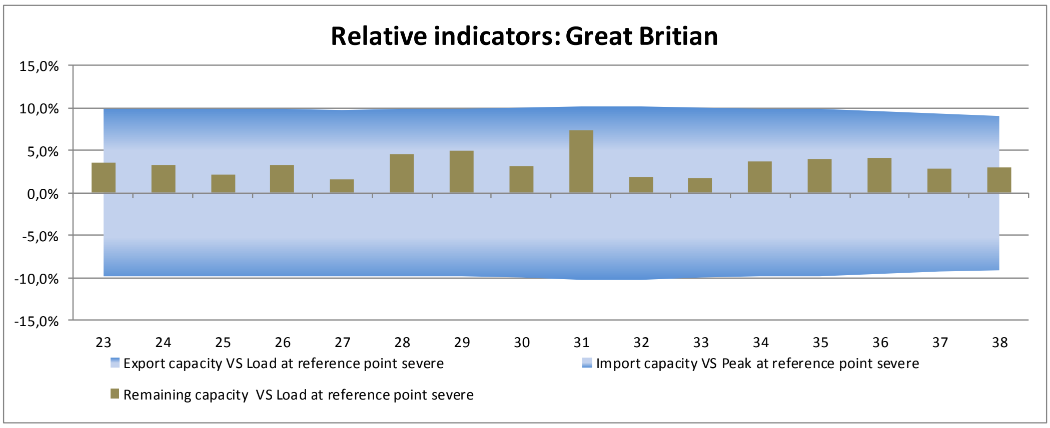
Based on the 65% load factor assumed for wind given in the spreadsheet, our minimum demand analysis shows that interconnectors would not be needed at any time to manage an excess of inflexible generation. In fact full imports could be accomodated with negative margins being maintained. However if the wind generation was closer to 100% then the ability to import would be restricted. Some GB wind farms are flexible and can contribute to balancing supply with demand, which makes the situation better than indicated by the analysis.

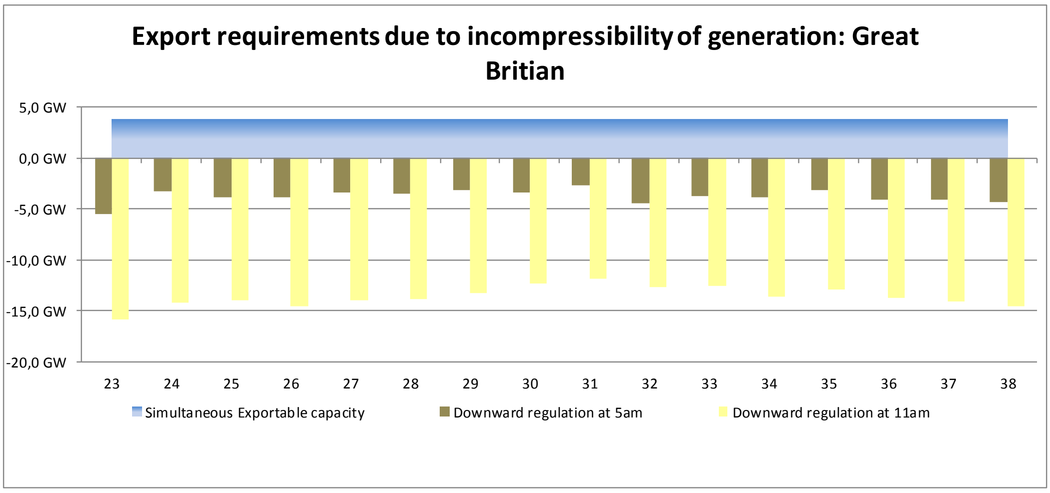
Framework and methodology of the assessments

We de-rate capacity for breakdown by fuel type against submitted availability for each generator. This submitted availability is provided by the generators at a weekly resolution and includes planned outages. We then put this against a forecast of demand with a scenario for max interconnector imports and exports.









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Hungary

In the Hungarian electric power system the required adequacy margin can be guaranteed by a considerable amount of import only. Several years are necessary to overcome this historical feature as a result of being lack of competitive, highly flexible generation units.

General situation

The level of maintenance is relatively high during the summer, it is between 500 and 1000 MW, which is about 5-10% of the Hungarian installed capacity. The most critical periods are the weeks of May, when the level of maintenance is over 1000 MW.
Across minimum demand there is a limit of a reduction of a nuclear units.

Most critical periods

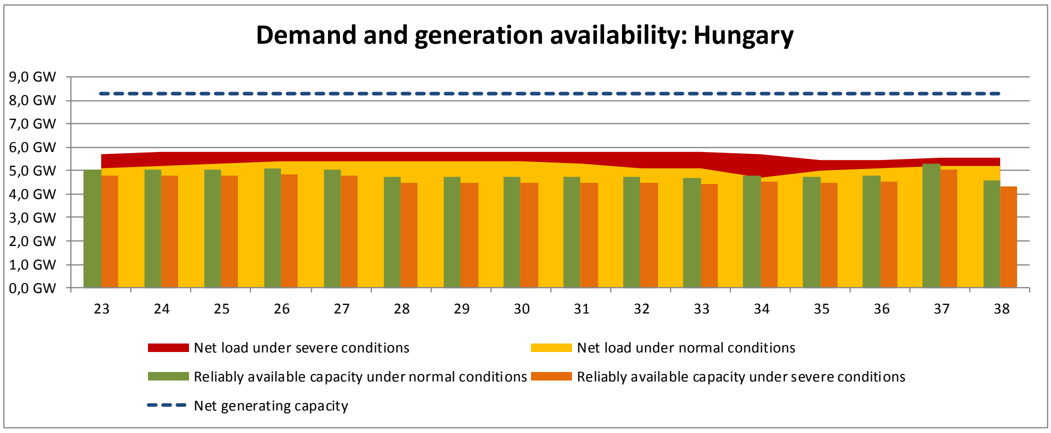
In accordance with the constantly growing demand, there is no period of time when the import could be ignored. The unavailable capacity is increasing, which strengthens the dependence on the import.
The most critical periods can be caused by the severe weather conditions in June and July, since the units are temperature dependent.

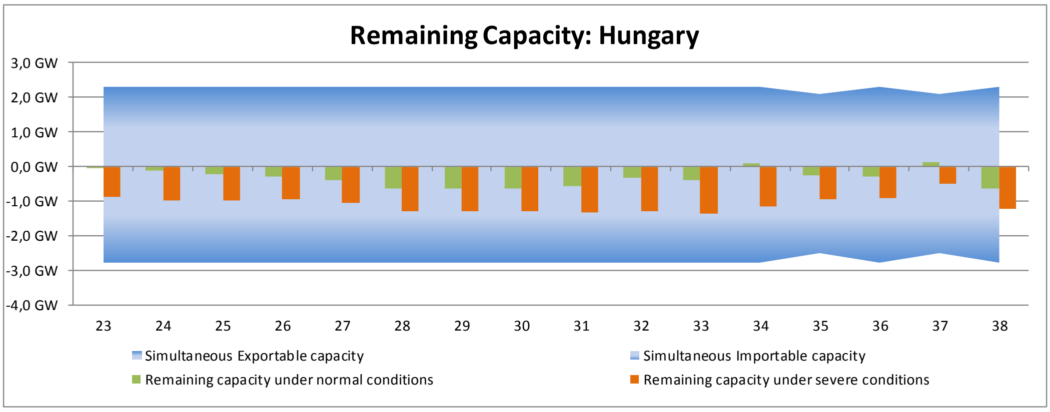
Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

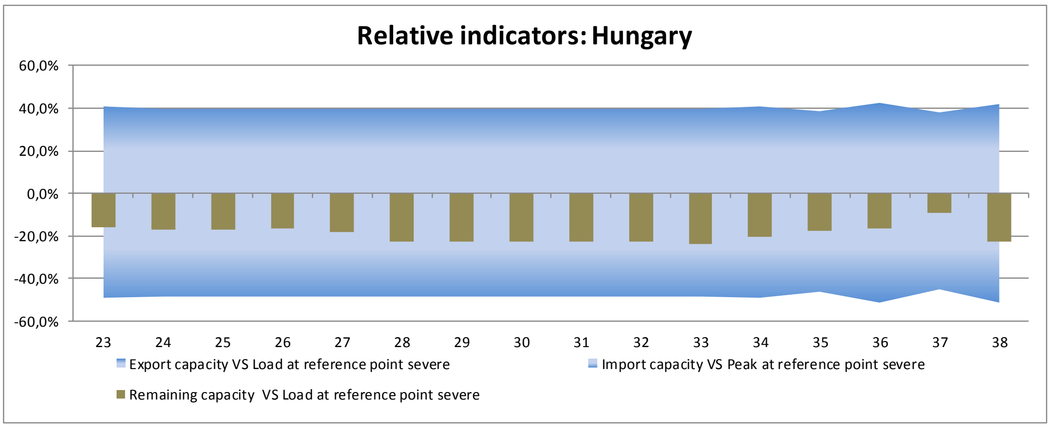
After liberalisation, import is mainly an issue of the traders, available interconnection capacity is satisfactory. Access is possible via yearly, monthly, daily and even intraday capacity tenders, auctions. The only limitation is due to high transit flows through the interconnections.

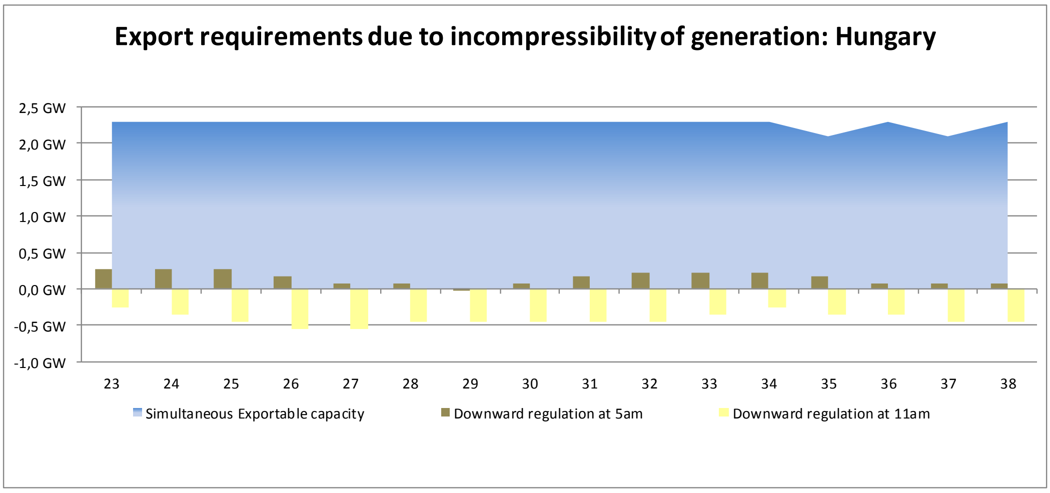
Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

The available export capacity provides opportunity to trade the remaining production on intraday market.


Demand and generation availability: Hungary
9,0 GW
8,0 GW
7,0 GW
6,0 GW
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Hungary
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
-4,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Hungary
60,0%
40,0%
20,0%
0,0%
-20,0%
-40,0%
-60,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Hungary
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
-0,5 GW
-1,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Ireland

EirGrid does not expect any capacity or demand issues on the Ireland system this summer. According to the latest analysis, there will be sufficient capacity to meet the demand over the entire summer period. The level of long term scheduled outages this year is relatively small with the majority of these affecting smaller hydro generation units, one large coal unit, two small sized heavy fuel oil units and two medium sized peat units. There is sufficient spare capacity to deal with unexpected forced outages. The East-West Interconnector will provide an additional element of system security (it will only be unavailable for three days in September).

General situation

A large portion of the hydro units will be on scheduled maintenance for large portions of the summer. However, as these form a small proportion of our overall system generation it should not have a detrimental effect on the system as a whole. Overall, no issues are anticipated in meeting required demand levels and there will be a significant generation margin during the Summer period.

Most critical periods

The most critical period will be during Week 32 when approximately 999MW, or 14% of our installed capacity, will be on scheduled outage.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

The East-West Interconnector (EWIC) should be fully available during the summer period with the exception of the 3 day outage in early September. This should provide Ireland with the capability to import 530MW or export 500MW of power. Due to current electricity prices in both Ireland and Great Britain, it is likely that that the flow on the interconnector will be primarily imports from Great Britain into Ireland.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

EWIC can export to the UK in times of minimum demand and high wind generation.

Framework and methodology of the assessments

The generator capacities, generator margins and provisionally scheduled outages of generator units are stored in a Margins system. This system will export results for capacity margins and outages (both scheduled and forced) which have been included in this report. The forced outage probabilities used are generated each year based upon the generators availability over the past three years. Generator must run status is based on current operation policies and constraints.

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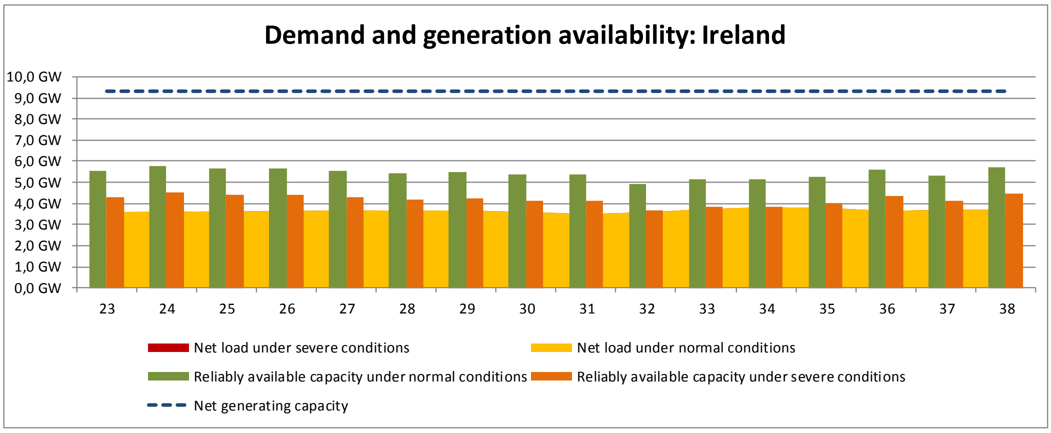
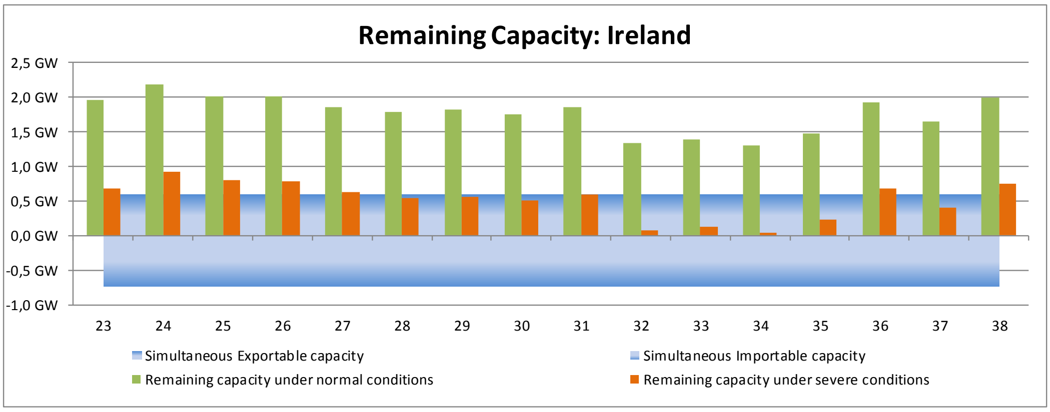
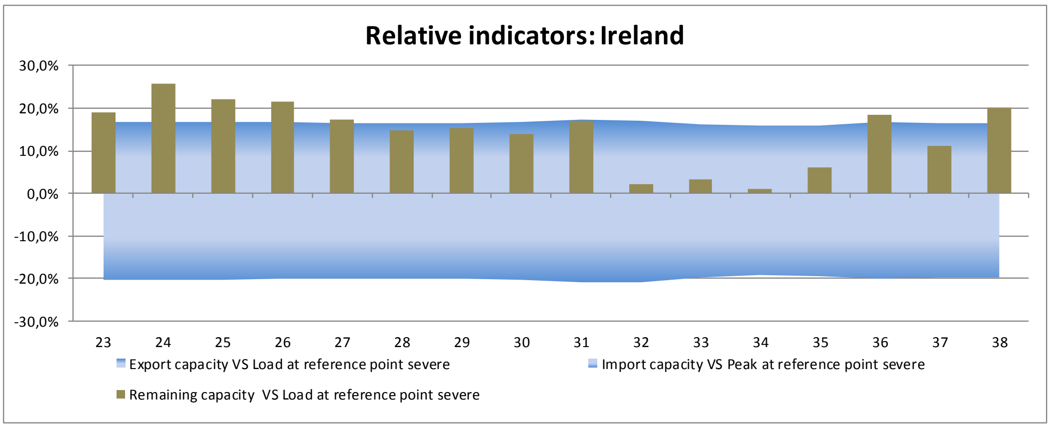
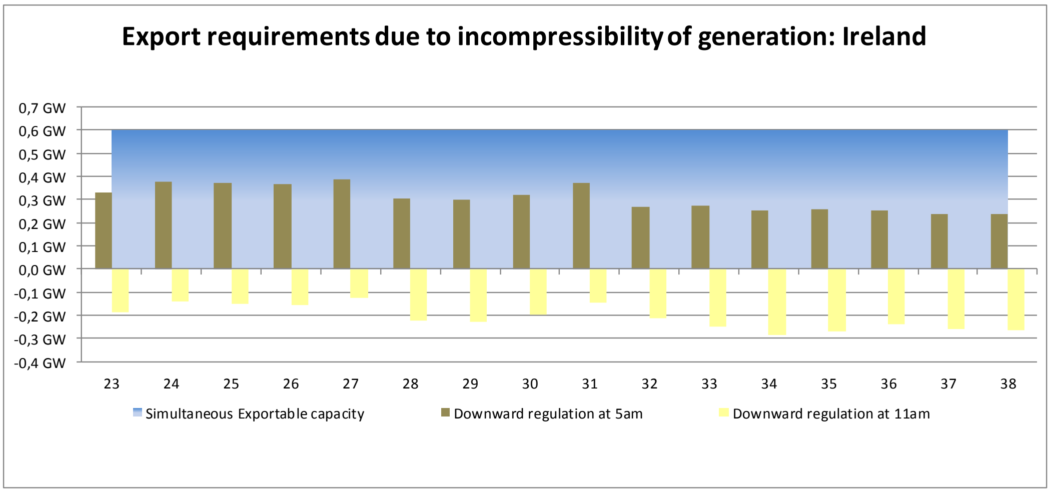

Demand and generation availability: Ireland
10,0 GW
9,0 GW
8,0 GW
7,0 GW
6,0 GW
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Ireland
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
-0,5 GW
-1,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Ireland
30,0%
20,0%
10,0%
0,0%
-10,0%
-20,0%
-30,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Ireland
0,7 GW
0,6 GW
0,5 GW
0,4 GW
0,3 GW
0,2 GW
0,1 GW
0,0 GW
-0,1 GW
-0,2 GW
-0,3 GW
-0,4 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Iceland

The generation capacity in Iceland is expected to be sufficient to meet peak demand this summer under normal as well as severe conditions. Landsnet does not anticipate any particular problems in the isolated Icelandic power system.

The installed generation capacity connected to the Icelandic transmission system is approx. 2.7 GW, of which 77% is hydro based and 23% based on geothermal energy. No new generating units are expected this summer.

Long term Generation Capacity Assessment and Load Forecast for the Icelandic power system are made by Landsnet every year and reported in the Transmission System Development Plan and Energy and Power Balance report. For short term assessment, studies are made by Landsnet on a weekly basis for Generation Capacity, Reserves and Load Forecast.

General situation
Scheduled maintenance usually takes place during the summer period, when the load is the lowest.

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Italy

In normal condition, no problem regarding system adequacy is expected in the Italian system: not withstanding the decommissioning or mothballing of a large number of power plants, the reliable available capacity is expected to be higher than the peak load in the whole period. Also under severe conditions the general situation expected in the summer is not critical, with some problems that may arise only in the Sicily island (the new interconnection with mainland is expected to be put into operation in the second half of the year).
During low load periods high renewable production (wind and solar) could lead to a lack of adequate downward regulating capacity.

General situation

Margins are expected to be comfortable across the whole summer period in normal conditions with high PV infeed during daytime and conventional generation capacity that will cope well with the evening peak load (very high ramp rate in the evening could be an issue). During the last year we registered the decommissioning of several old oil-fired power plants and the mothballing of some most recent combined cycle. This reduction of the available capacity is expected to continue in the coming months but the amount of capacity at risk is unknown.
Also under severe conditions the general situation expected in the summer is not critical, but some problems may arise in the Sicily island until the start of operations of new cable between Sicily and mainland that will tenfold the interconnection capacity of the island.
There are some risk factor such:

- Lack of adequate downward regulating capacity: high renewables production (wind and solar) during low load periods and decreasing of electricity demand on the national power grid recorded during the last periods, taking into account the level of the other inflexible generation, could lead to a lack of adequate downward regulating capacity;
- Voltage regulation problem and congestions: high voltage problems can arise especially in the south due to low load, reduced flows along EHV and high renewable production. Market and physical congestion, especially from South to North, will be common during the summer.

In order to cope with this risks Terna prepares preliminary action and emergency plans and, in case of need, adopt the appropriate countermeasures (e.g. during high renewable/low load periods, in order to guarantee the system security could adopt enhanced coordination with DSO and special remedial actions, such as the curtailment of inflexible generation. Further special actions, such as some NTC reductions, could be planned in cooperation with neighbouring TSOs).

Most critical periods

The worst weeks for downward regulation are expected to be the 32nd, the 33rd and the 34th (also due to the bank holiday on the 15 August).

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

The Italian system is not dependent upon imports of electricity from neighbouring countries to meet the balance between generation and demand.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

During high renewable/low load periods, in order to guarantee the system security Terna could adopt special remedial actions, such as the curtailment of not flexible generation and some NTC reductions, to be planned in cooperation with neighbouring TSOs. In some situation could arise the need of reducing the import of energy or, in extreme case of exporting to the neighbouring countries.

Framework and methodology of the assessments

Updated assesment of load temperature sensitivity based on 2011-14 data.

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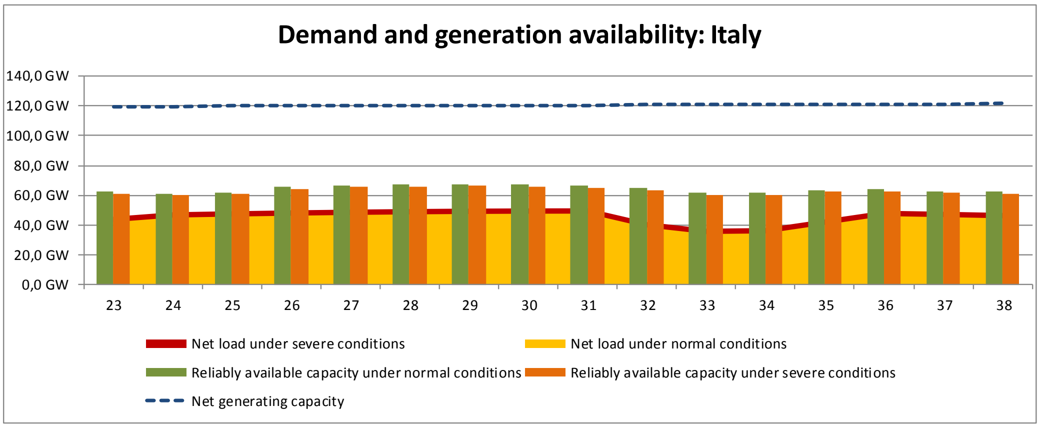
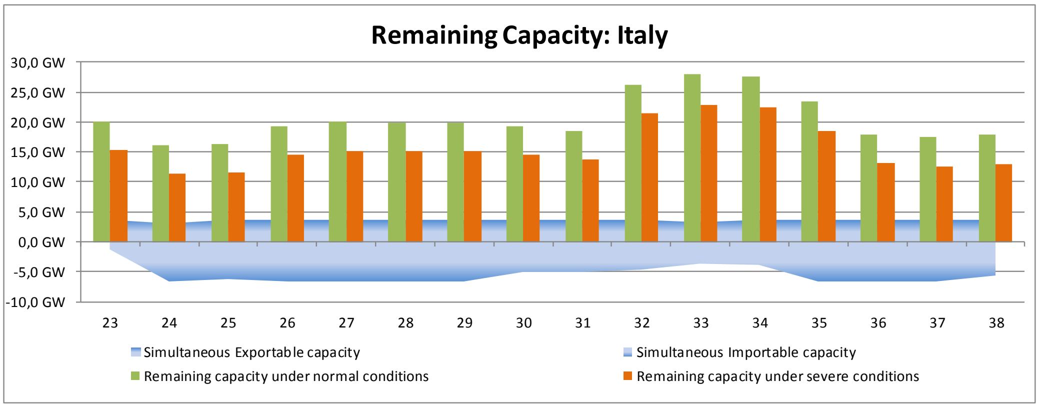
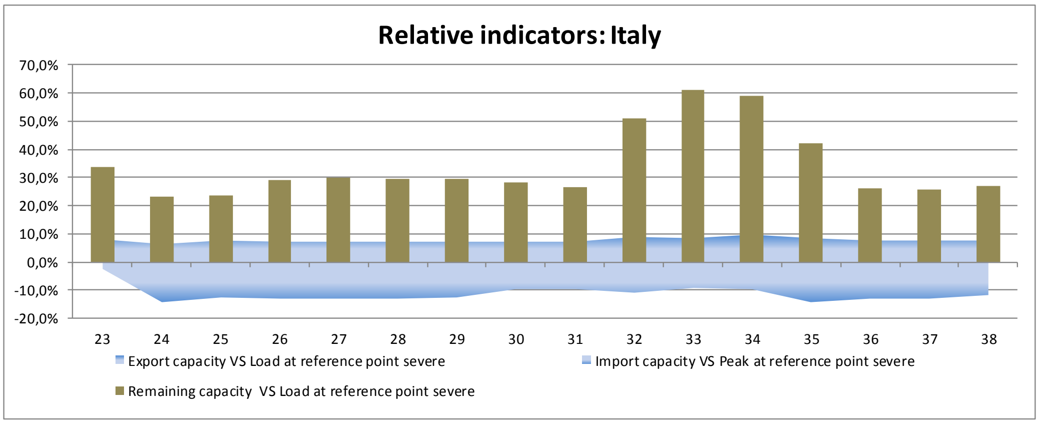
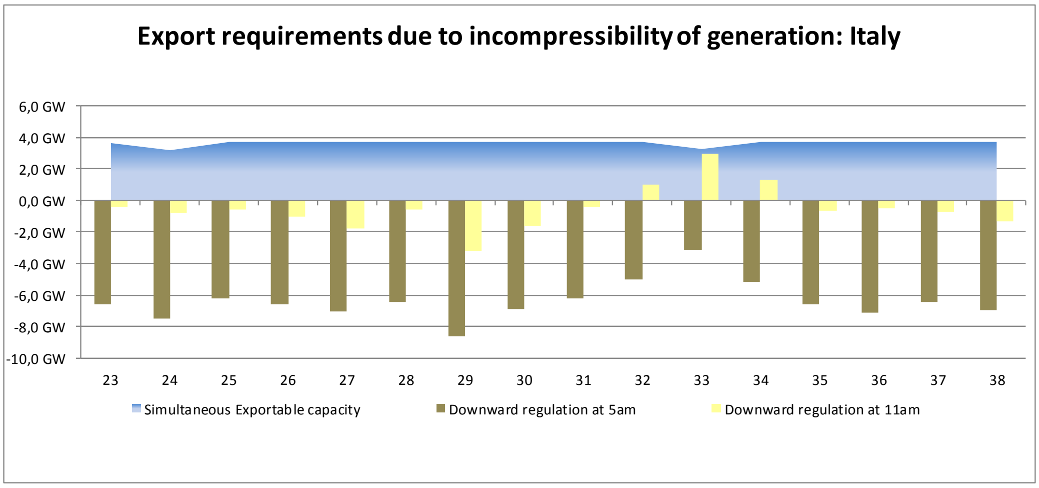

Demand and generation availability: Italy
140,0 GW
120,0 GW
100,0 GW
80,0 GW
60,0 GW
40,0 GW
20,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Italy
30,0 GW
25,0 GW
20,0 GW
15,0 GW
10,0 GW
5,0 GW
0,0 GW
-5,0 GW
-10,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Italy
70,0%
60,0%
50,0%
40,0%
30,0%
20,0%
10,0%
0,0%
-10,0%
-20,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Italy
6,0 GW
4,0 GW
2,0 GW
0,0 GW
-2,0 GW
-4,0 GW
-6,0 GW
-8,0 GW
-10,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Latvia

Despite sufficient installed capacity on the hydro power plants, shortage of inflow water is the main limiting factor for generation availability. The main periods of stress for Latvia power system are possible if water inflow in Daugava river will be very low as showed in severe conditions and all consumption must be covered mainly by CHPPs. The main Latvian CHPPs are fuelled by gas. The fossil fuel for CHPPs Latvian power companies are importing from Russia and gas prices are one of the most significant indicator which could affect availability of CHPPs generation in the area of Latvia. In this summer it is expected, that gas import will be according to CHPPs generation plans and will be sufficient for the CHPPs requirements. CHPPs are the main power plants for Riga district-heating and partly they are in operation.

Latvian TSO is responsible for the security and reliability of power supply in area of Latvia and according to the availability of excess generation capacity in neighbouring power systems and adequate transmission capacity manages the balance of Latvia power system. In the summer 2015 for normal conditions, Latvia power system is self-sufficient whole summer period except week 35. The lack of capacity for this week and whole month is recognized due to maintenance works in the Rigas CHP2 units (lack of around 440 MW) alternating and also limited water resources in the hydro power plants on Daugava river (available around 200 MW). The critical period for Latvian TSO is week 35 when remaining capacity is below zero and then Latvia is planning to be dependent from energy import from neighbouring countries. In severe conditions remaining capacity is also below zero in weeks 35, 37 and 38 due to the reasons described above and more possible limitations on Biomass/Biogas power plants, wind generation isn't expected at all in the generation pattern. Generally Latvian power system is the electricity importer in the summer periods. Latvia can import the remaining part of the basic state electricity supply from Estonia, Lithuania and Russia, and there is also an opportunity of electricity supply from the Nordic States. Security and reliability of power supply in the summer period will be dependent on whole Baltic States generation availability, import and export amounts from 3rd countries and cross-border transfer capacities between Baltic States, Russia and Nordic States. TSO is expecting that these different energy sources guarantee uninterrupted and reliable electricity supply in Latvia during whole winter period.

The basic schedules for planned maintenance of power plants which are connected directly to the transmission system are already known for the coming year and is already used in the forecast. Some reconstructions on hydro generators have been planned during whole summer period but it's not limiting the production of hydro power because the main limiting factor is water inflow on Duagava river. No additional news from producers about plans for new power plants constructed in this year and coming five years, therefore the installed net power capacity will remain approximately 2.92 GW. In normal conditions about 10 % of installed capacity of wind can cover the peak load, but in severe conditions no wind at all. Power systems service reserve is approx. 100 MW whole year, which is being estimated as approx. 6 % of peak load plus 10 % of installed capacity of wind.

General situation

Starting from the week 35 the available capacity of Rigas CHP2 is decreased due to repair works on the both of units alternating. From the system security of supply point of view and adequacy, the TSO can use all net capacity of gas power plants independent on gas prices in market to cover a load in power system of Latvia. In normal conditions full amount of capacity of gas power plants is available but it is assumed that in severe conditions the available capacity of gas is reduced by 100 MW. The reason for that limitation could be a high gas price in Russia or limited gas import from 3rd countries. Historically the CHPs in Latvia are constructed to cover a base load but the hydro power plants on Daugava river are constructed for peak hours and system balance. According to annual water inflow in Daugava river it is foreseen that in normal conditions in summer the available capacity of HPPs could be around 300 MW but in severe conditions 200 MW. It shows that Latvia has huge amount of installed capacity of hydro (around 1584 MW), but actually the available capacity is much smaller. During the summer almost always approximately 200-500 MW of installed capacity of hydro is in maintenance. Latvian TSO is not expecting a dramatic increase of RES generation (wind and solar) during summer period therefore production of RES cannot caused high unbalances in power system or make unpredictable stress situations on certain hour. In normal conditions the available capacity of wind can be around 10 MW but in severe conditions it is assumed that there are no wind generation at all.

Most critical periods

In normal conditions Latvian TSO is expecting to cover a peak load whole summer period except week 35, but in severe conditions Latvian TSO is expecting to cover a peak load till the end of August. In the end of August the both units of Rigas CHP is going on repair alternating and around 450 MW of generation will be reduced. The end of summer could be a critical period for Latvian power system. To avoid any risks and ensure security of supply Latvian TSO will rely on interconnectors for energy imports from neighbouring countries and Nordic countries.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

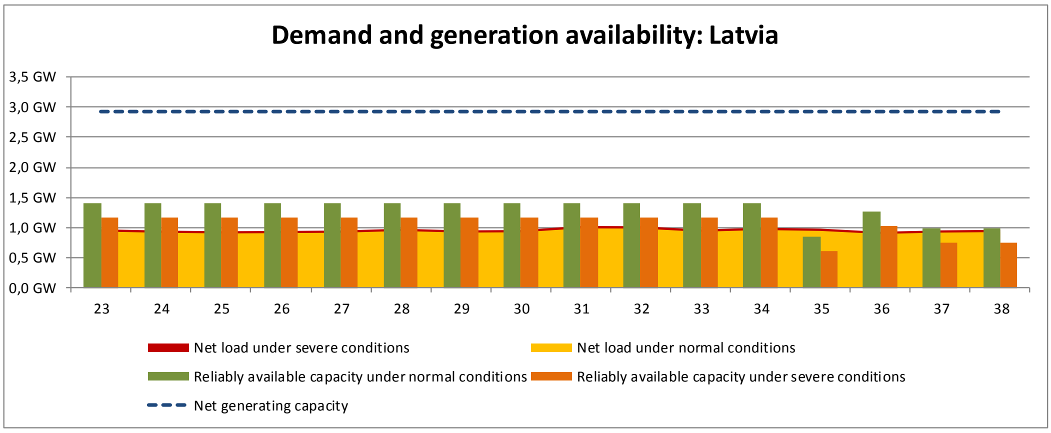
The risks with transmission capacities on cross-border Latvia-Lithuania have not been experienced usually and all cross-border trades are going according to plan. Considering the Lithuanian electricity deficit which is ongoing throughout the year and electricity import from 3rd countries, the Latvian TSO is expecting congestion possibilities only on the border Estonia-Latvia. The overloads are happening due to unpredictable loop flows in Baltic States and Western part of Russia. Since January 2014 cross-border EE/RU/LV has splitted in two parts EE-LV and LV-RU, but full capacity is allocated on the cross-border EE-LV. Russian traders play in electricity market of Baltic States via cross-border Lithuania-Belarus. During the summer period the transmission capacity on the cross-border Estonia-Latvia will be limited and counter-trade between the Latvian and Estonian TSOs might be in place. To ensure the security of supply in Latvian power system and to solve the congestion possibilities on the Estonia-Latvia border, Latvian TSO has rights on the fast hydro reserves on Daugava river.

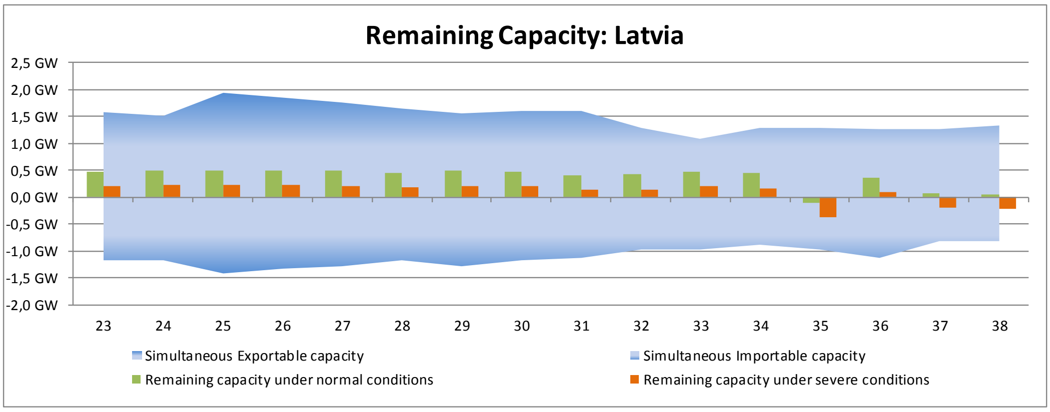
Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

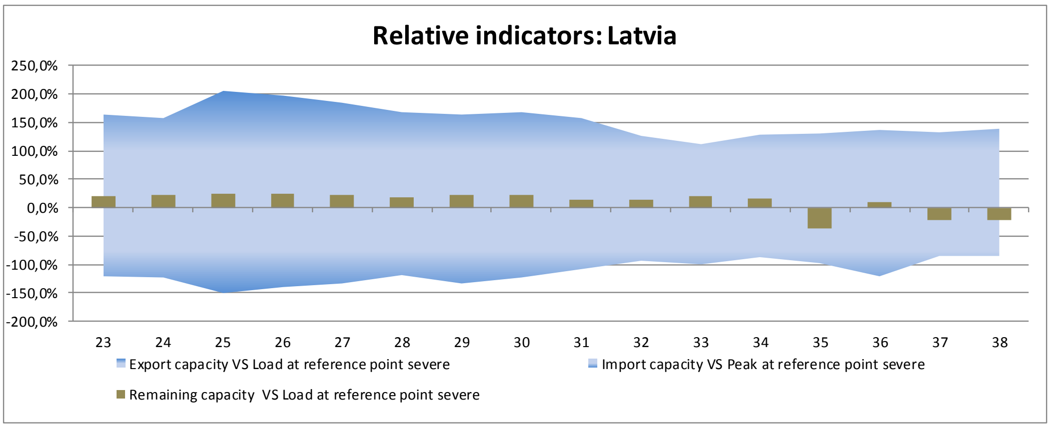
The inflexible generation doesn't cause a significant influence during demand minimum periods, because the amount of inflexible generation is very small.

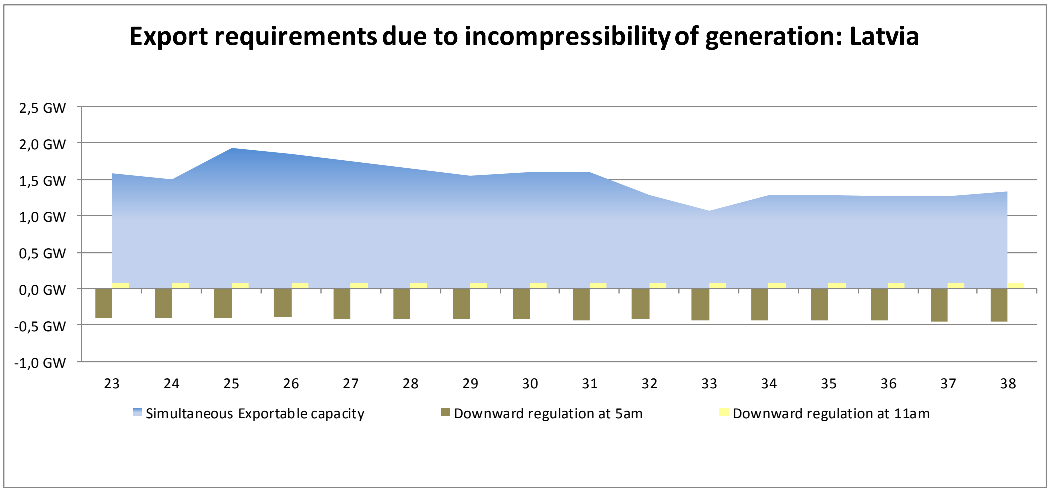
Framework and methodology of the assessments

TSO uses annual data statistics and the information of previous years**.**


Demand and generation availability: Latvia
3,5 GW
3,0 GW
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Latvia
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
-0,5 GW
-1,0 GW
-1,5 GW
-2,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Latvia
250,0%
200,0%
150,0%
100,0%
50,0%
0,0%
-50,0%
-100,0%
-150,0%
-200,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Latvia
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
-0,5 GW
-1,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Lithuania

During upcoming summer, local generation units will guarantee required adequacy margin in Lithuanian power system. Total net installed capacity will decrease in comparisonto previous summer due to closure of two fossil fuel units in Lithuania power plant in the beginning of year 2015, on the other hand new wind farms of capacity of 142MW are planned to be installed during summer period. The average installed capacity is expected to be 4078 MW.
Majority of Lithuanian power plants are mixed fuel (installed capacity of 1902 MW), however main fuel is gas, and only part of power plants are gas fired (installed generation capacity of 622 MW).
Summer peak load is expected at the beginning of August for normal conditions 1456 MW. The minimum peak load is expected in the second half of June for normal conditions 773 MW. The total consumption for upcoming summer is expected to be 1,5% higher than previous summer.
The system balance is expected to be deficit due to prices differences with neighbouring countries. The import of electricity from neighbouring countries will be relied upon cross-borders with Belorussia, Latvia and Kaliningrad area. The electricity generation from local thermal, hydro and wind power plants is expected to cover approximately 43% of demand, while 57% will be covered by imports.

General situation

During summer 2015 two units of Lithuanian power plant are kept mothballed (in total 570 MW of net generating capacity). There is a technical possibility to have these two units available in two months.
For the coming summer season the maintenance schedule in general is not intensive. According to the maintenance schedule the largest generation inaccessibility due to maintenance will be on weeks 25-26 when two units of Vilnius CHP3 will be on maintenance. This maintenance does not have any influence for system adequacy for normal and severe conditions.

Most critical periods

According to the last summer notices, the most critical period is when the interconnection lines are on maintenance and there is limited available transfer capacities. Highest restrictions are foreseen during weeks 23-30 and 33-35.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

From system adequacy point of view capacity of interconnectors does not play an important role for Lithuania PS because available generation capacity is sufficient to cover system demand. However, available generation is usually not competitive in the wholesale market, therefore large amount of Lithuania PS demand is covered by imported electricity. All import volume from 3rd countries (Russia, Belarus) defined based on power flow calculation and allocated at Lithuania-Belarus interconnection. Import volume from 3rd countries highly depends on Estonia-Latvia interconnection capacity which is reduced during summer period due to higher ambient temperature and maintenance activities on the interconnection lines. This cause import restrictions from 3rd countries to Lithuania PS for whole summer period. Highest restrictions are foreseen during weeks 23-30 and 33-35. In addition to this, import ability of Lithuania PS also depends on available generation in Kaliningrad region. Import restrictions are foreseen during weeks 23-24 and 26-27 when generation of Kaliningrad TPP is planned to be reduced due to maintenance activities.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

Whereas Lithuania is the importing country with fairly low amount of installed renewables, role of interconnectors to managing an excess of inflexible generation is very low.

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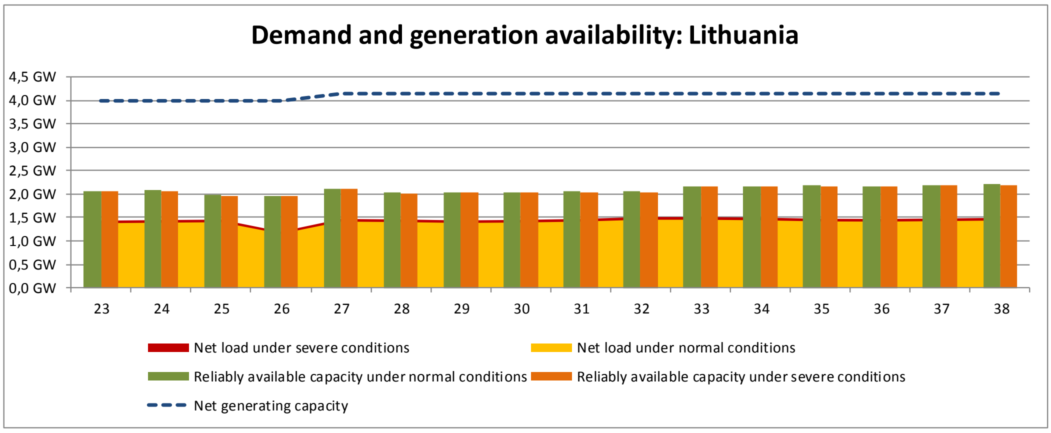
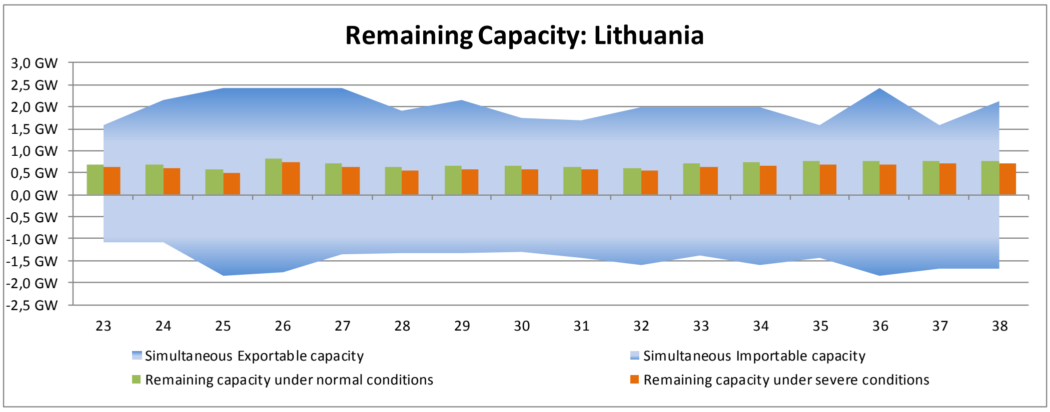
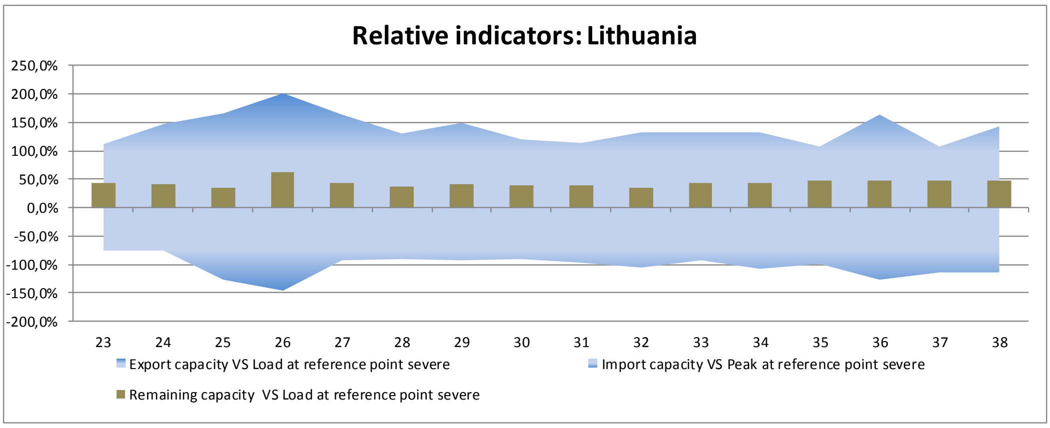
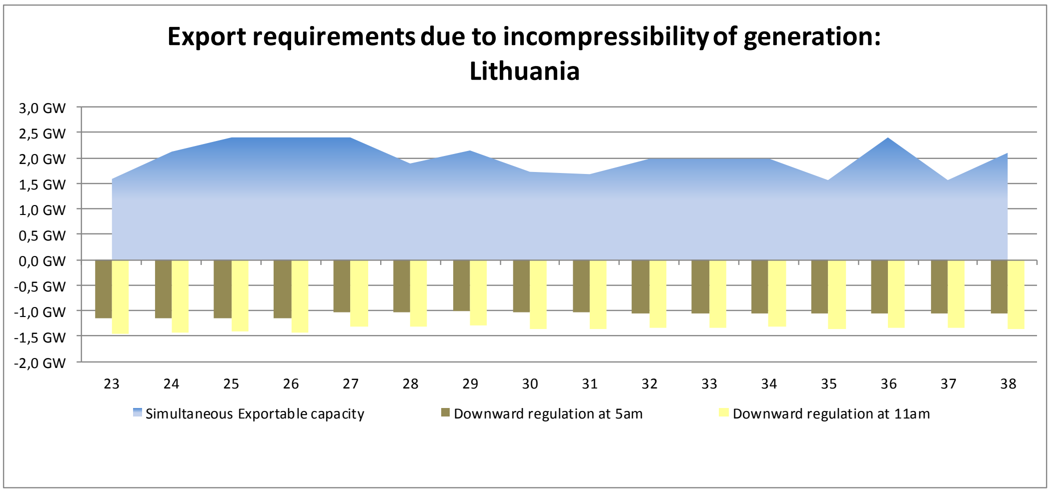
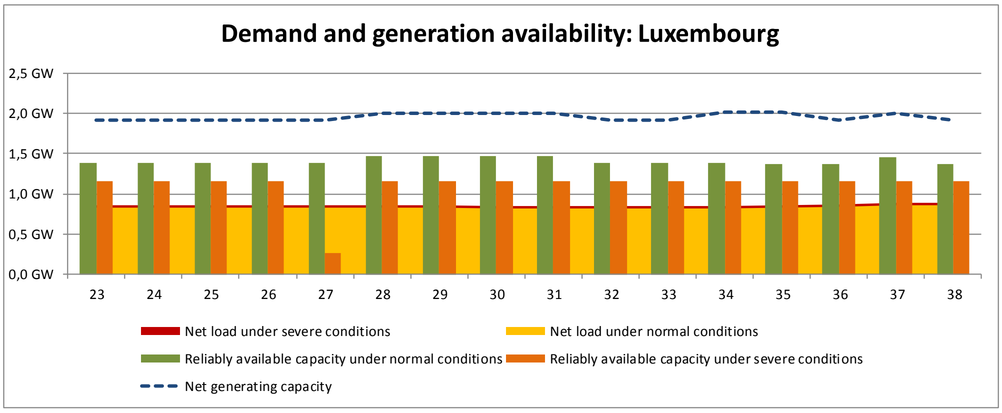

Demand and generation availability: Lithuania
4,5 GW
4,0 GW
3,5 GW
3,0 GW
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity

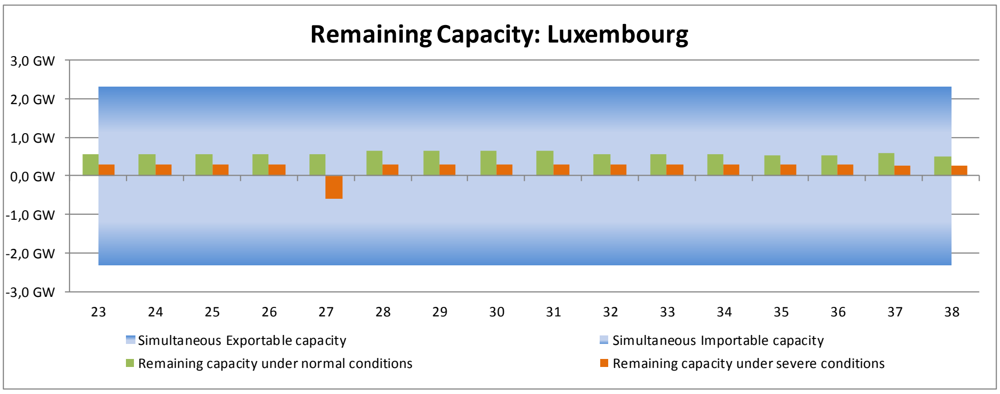

Remaining Capacity: Lithuania
3,0 GW
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
-0,5 GW
-1,0 GW
-1,5 GW
-2,0 GW
-2,5 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions

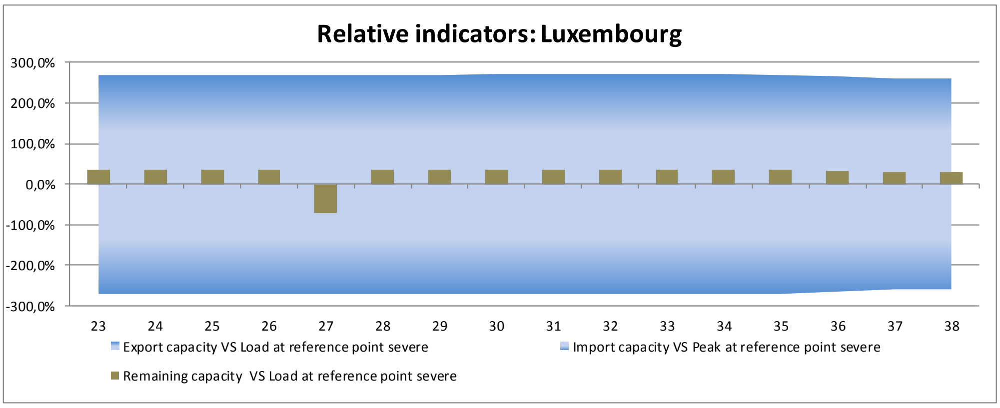

Relative indicators: Lithuania
250,0%
200,0%
150,0%
100,0%
50,0%
0,0%
-50,0%
-100,0%
-150,0%
-200,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe

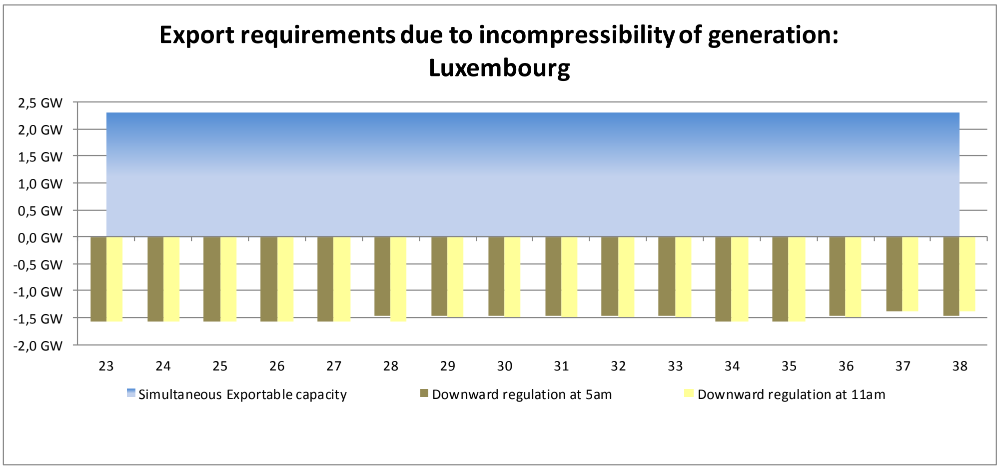

Export requirements due to incompressibility of generation: Lithuania
3,0 GW
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
-0,5 GW
-1,0 GW
-1,5 GW
-2,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Luxembourg









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Montenegro

Due to high influence of aluminium and steel industry on Montenegrin power demand, some mistakes in demand prediction can be expected. Our best expectations are that generation – load balance problems, under normal conditions, will not be expected in the summer 2015. Difference between consumption and production in the critical periods will be covered with imports of energy.

General situation

Most of maintenance and overhauls works are planned to be finished during the spring and the beginning of the summer period.

Most critical periods

The main period of stress can be weeks in August. The main factor can be high demand and bad hydrological conditions.

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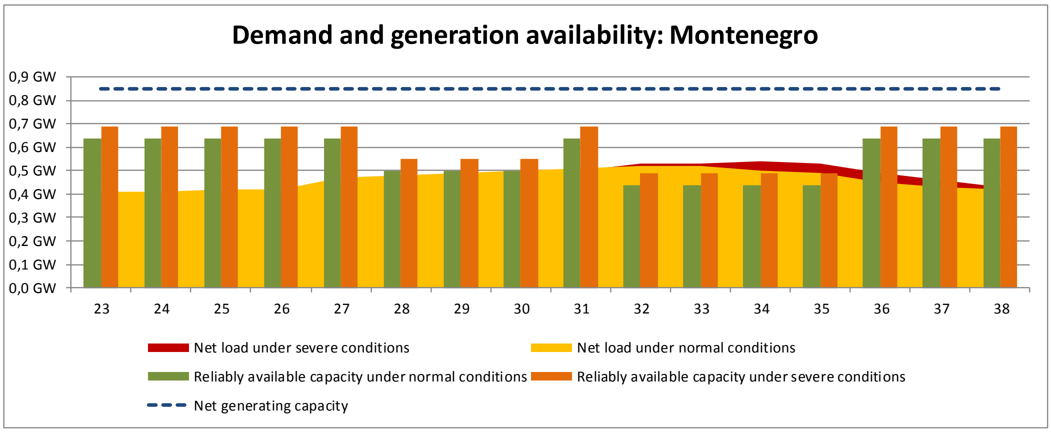
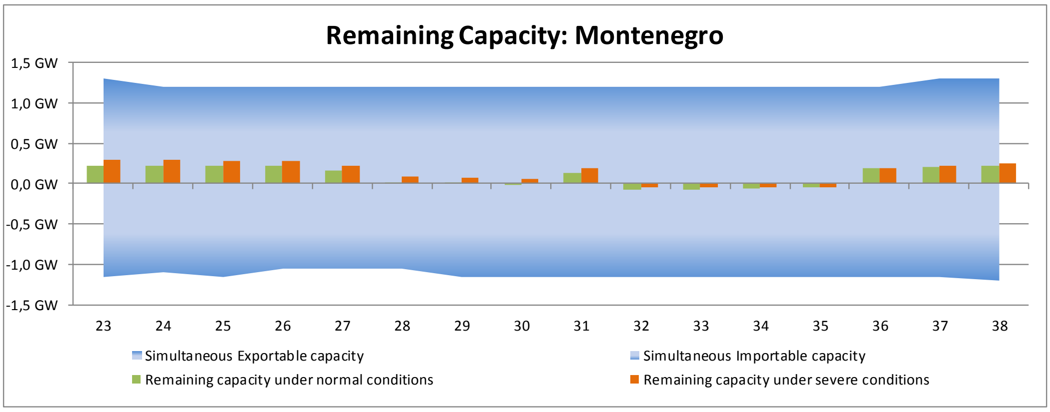
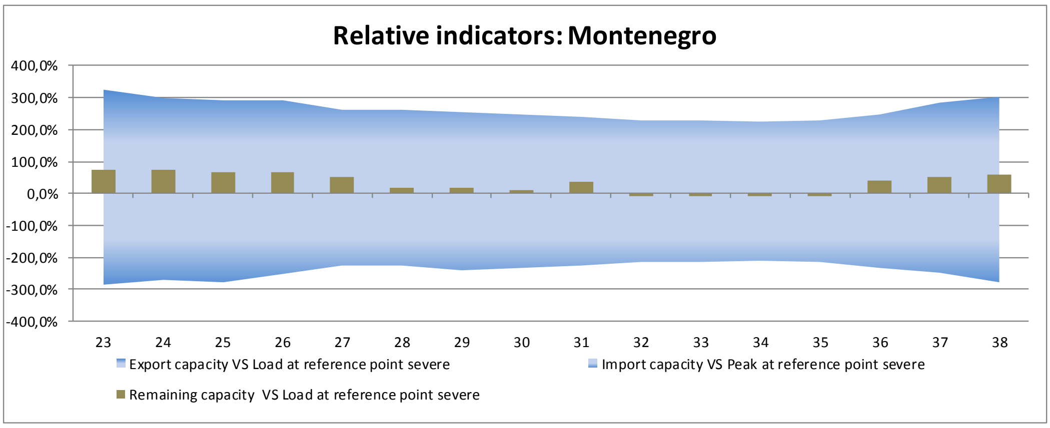
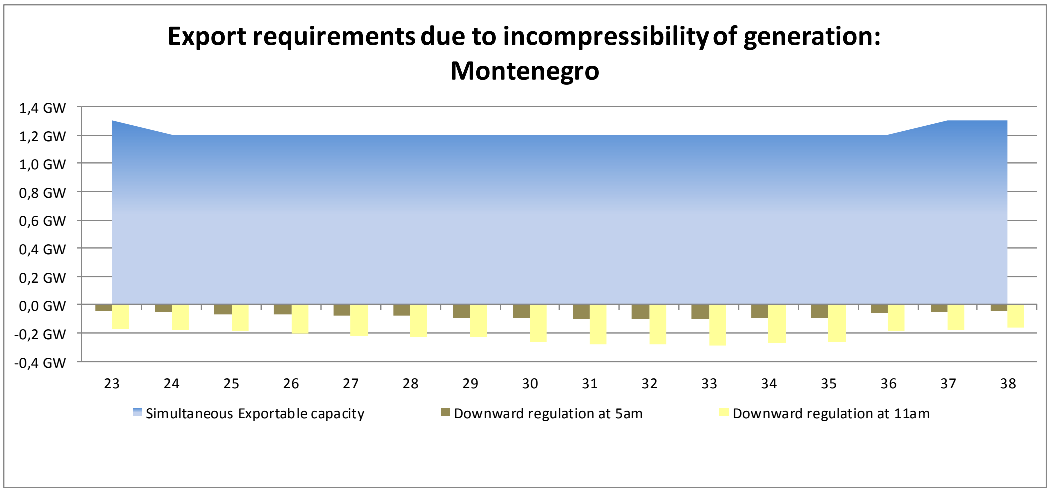

Demand and generation availability: Montenegro
0,9 GW
0,8 GW
0,7 GW
0,6 GW
0,5 GW
0,4 GW
0,3 GW
0,2 GW
0,1 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Montenegro
1,5 GW
1,0 GW
0,5 GW
0,0 GW
-0,5 GW
-1,0 GW
-1,5 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Montenegro
400,0%
300,0%
200,0%
100,0%
0,0%
-100,0%
-200,0%
-300,0%
-400,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Montenegro
1,4 GW
1,2 GW
1,0 GW
0,8 GW
0,6 GW
0,4 GW
0,2 GW
0,0 GW
-0,2 GW
-0,4 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

The Netherlands

No specific summer forecasts with regards to security of supply or adequacy assessments on a weekly basis will be executed by TenneT TSO B.V.
The development on interconnection capacity (expansion) and the building of new power plants, have decreased the necessity of short range adequacy assessments in the Netherlands.
Nevertheless, there is no indication of lack of power based on weather conditions in the summer period and therefore it is not foreseen that any significant generation shortages during the summer of 2015 will occur. Sufficient generation capacity will be available and no large amount of outages during this period are reported.
Apart from this, sufficient export and or import capacity is available.
To our opinion the supply-demand balance will be realized on the basis of the price-driven demand principle and it's not a task of the TSO to intervene in a good functioning market.
The specific TSO's task is balancing the system and supply emergency power when necessary.
TenneT TSO B.V. by law provides on behalf the Ministry of Economic Affairs the report on national adequacy, so called Monitoring of Security of Supply, 15 years ahead (in dutch: Rapport Monitoring Leveringszekerheid). Visit the TenneT website for the latest report www.tennet.eu.

General situation
For the Netherlands no specific situations for the summer period are expected.

Most critical periods
No periods are considered critical

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export
National generation capacity is sufficient for peak demands and we do not rely on the import or export capacity for that. During the coming summer period no changes to import or export capacity are expected.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods
The amount of inflexible generation is managed by the Program Responsible Parties and can still be handled within the minimum demand periods. Any excess of generation capacity will lower the market prices and this will lead to export generation or shutdown of installations.

Framework and methodology of the assessments
TenneT assesses the summer adequacy based on the forecast margin.

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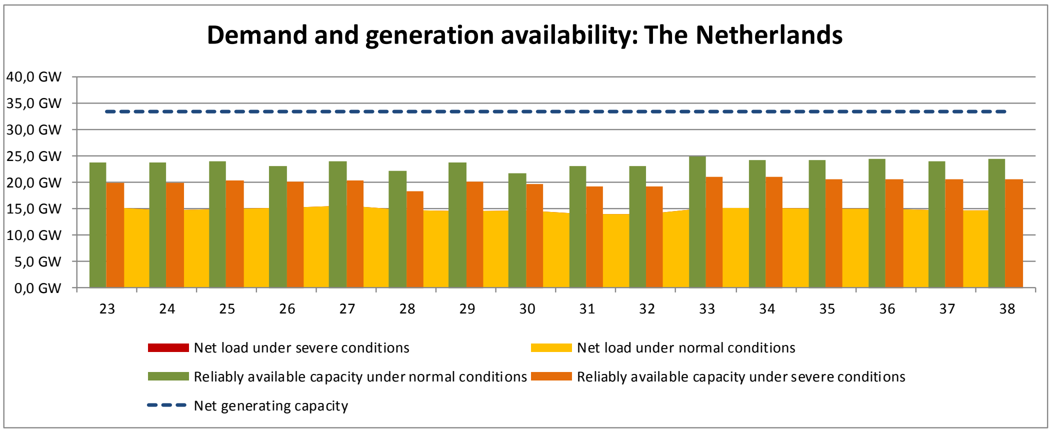
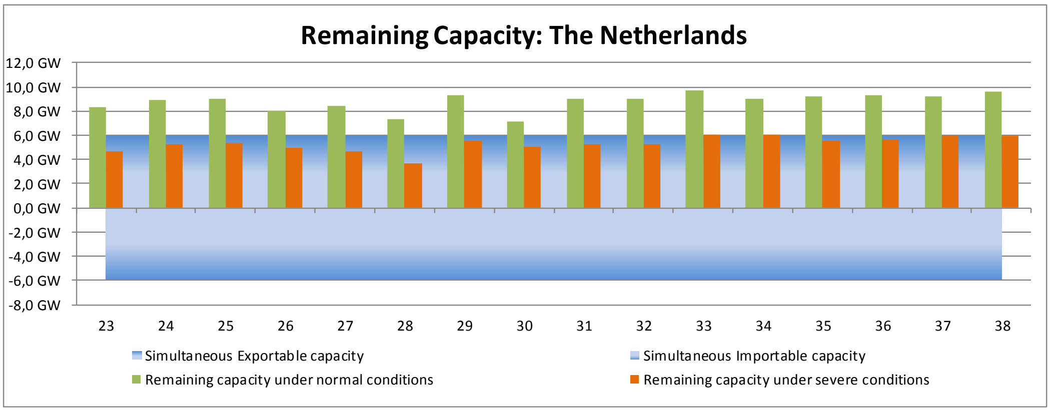
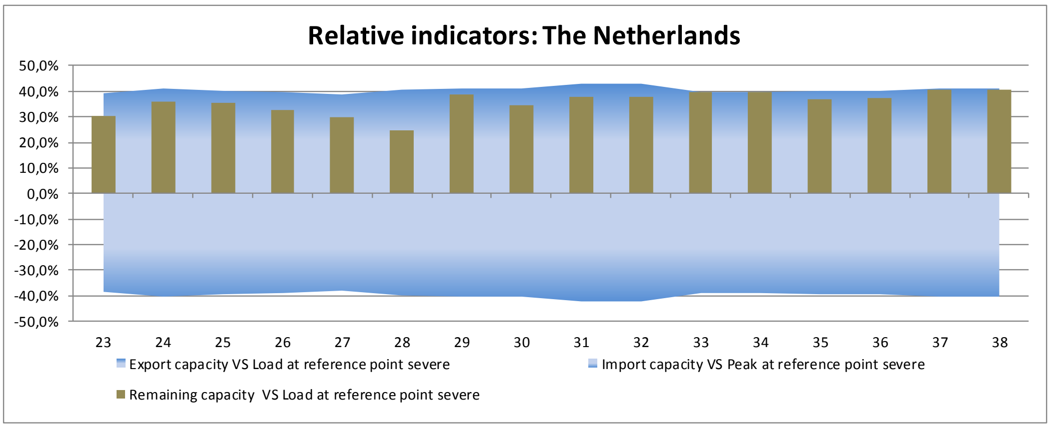
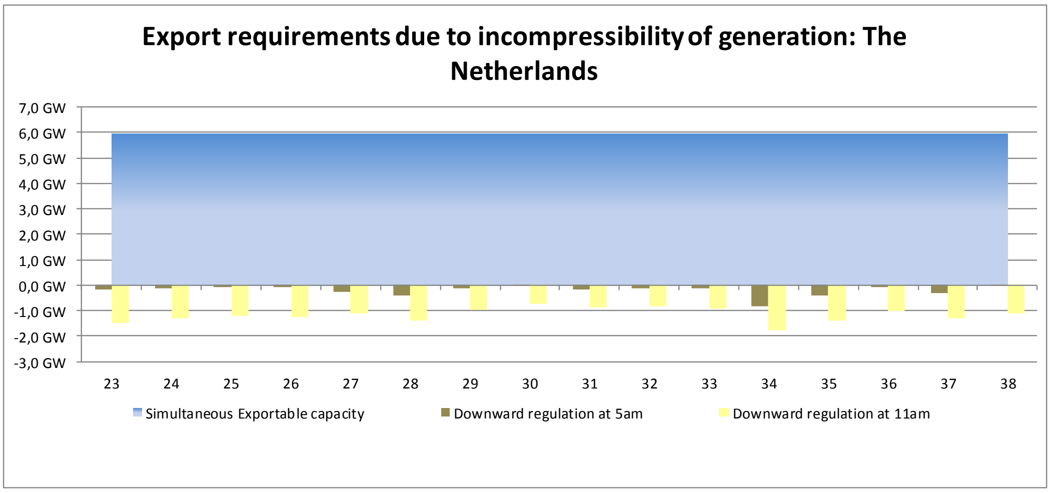

Demand and generation availability: The Netherlands
40,0 GW
35,0 GW
30,0 GW
25,0 GW
20,0 GW
15,0 GW
10,0 GW
5,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: The Netherlands
12,0 GW
10,0 GW
8,0 GW
6,0 GW
4,0 GW
2,0 GW
0,0 GW
-2,0 GW
-4,0 GW
-6,0 GW
-8,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: The Netherlands
50,0%
40,0%
30,0%
20,0%
10,0%
0,0%
-10,0%
-20,0%
-30,0%
-40,0%
-50,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: The Netherlands
7,0 GW
6,0 GW
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Northern Ireland

There are a number of planned generator outages scheduled for the summer months in 2015. These outages are required to facilitate modifications to existing plant on the Northern Ireland system to meet capacity needs going forward. At no time is there a negative generation margin in Northern Ireland.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

Interconnectors between GB and IE will continue to play a role in satisfying system demand and system stability in Northern Ireland.

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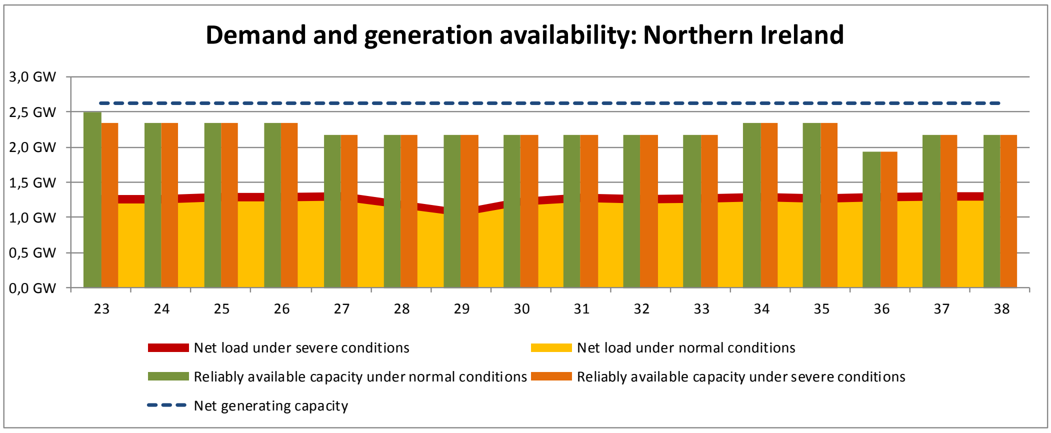
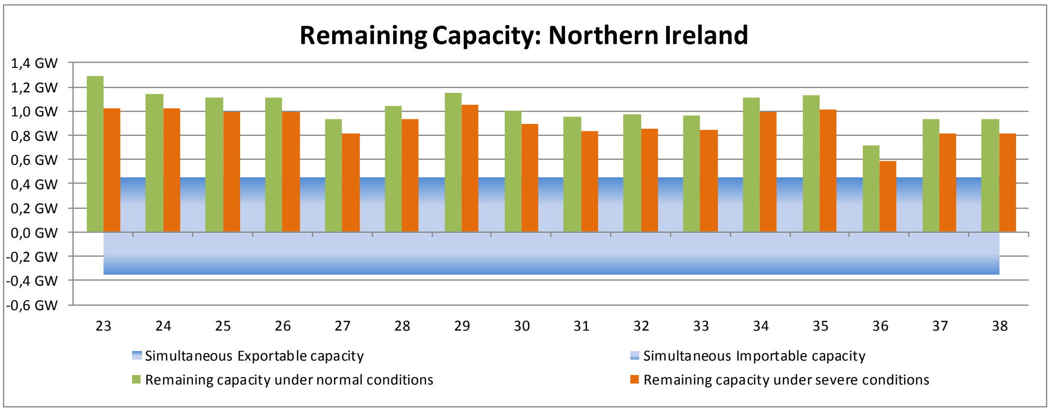
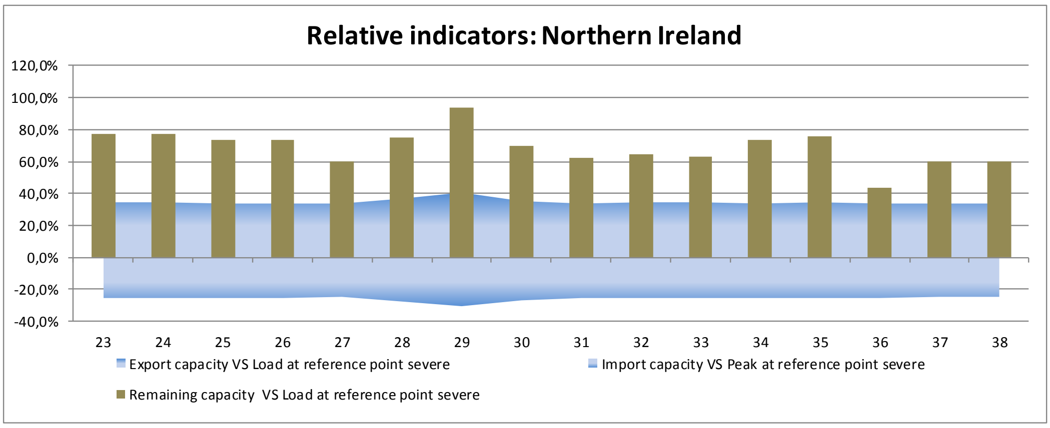
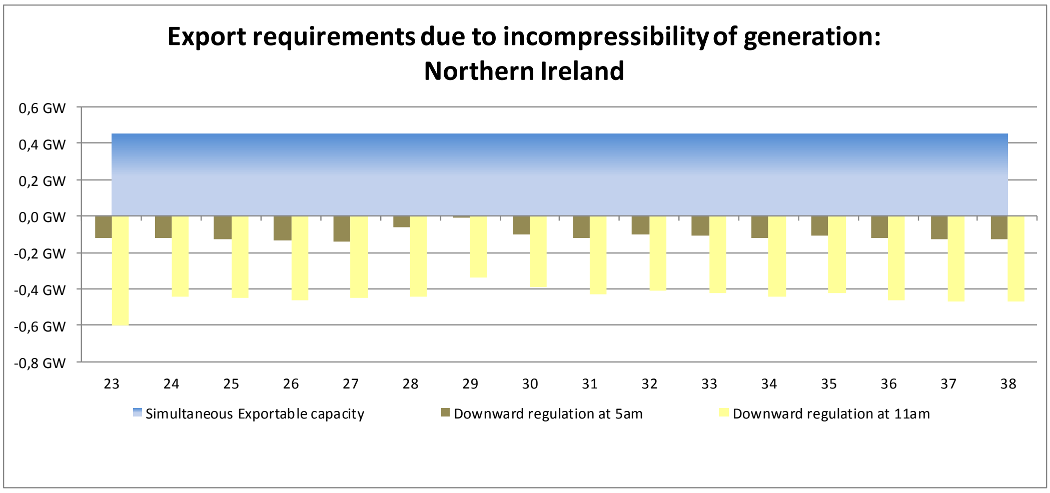

Demand and generation availability: Northern Ireland
3,0 GW
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Northern Ireland
1,4 GW
1,2 GW
1,0 GW
0,8 GW
0,6 GW
0,4 GW
0,2 GW
0,0 GW
-0,2 GW
-0,4 GW
-0,6 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Northern Ireland
120,0%
100,0%
80,0%
60,0%
40,0%
20,0%
0,0%
-20,0%
-40,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Northern Ireland
0,6 GW
0,4 GW
0,2 GW
0,0 GW
-0,2 GW
-0,4 GW
-0,6 GW
-0,8 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Norway

Norway is normally self-supplied during the summer with a capacity surplus, also in severe conditions. We expect that the demand will be higher than the inflexible generation, but in some areas you may get a surplus in some periods.

General situation

Towards the summer period 2015 we expect that the hydrological balance will be normal.

Most critical periods

Statnett does not expect any critical situation during the summer 2015. The available generation capacity exceeds the expected peak load.

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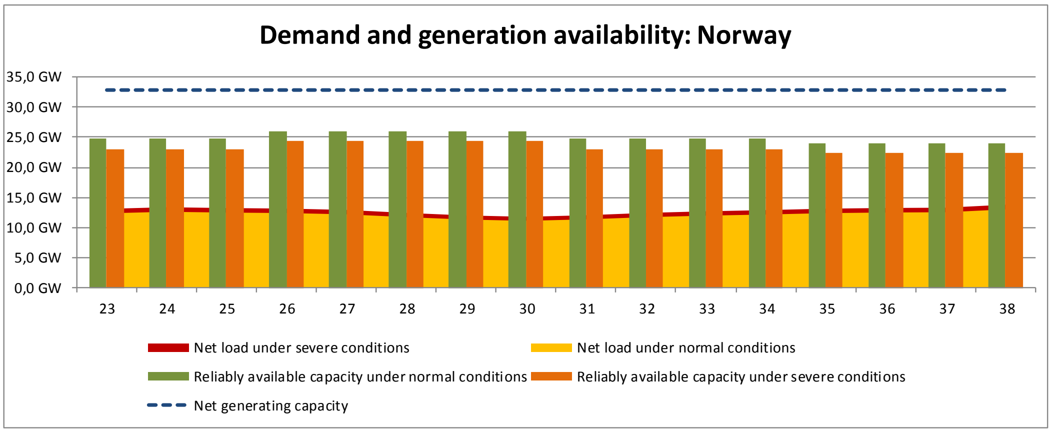
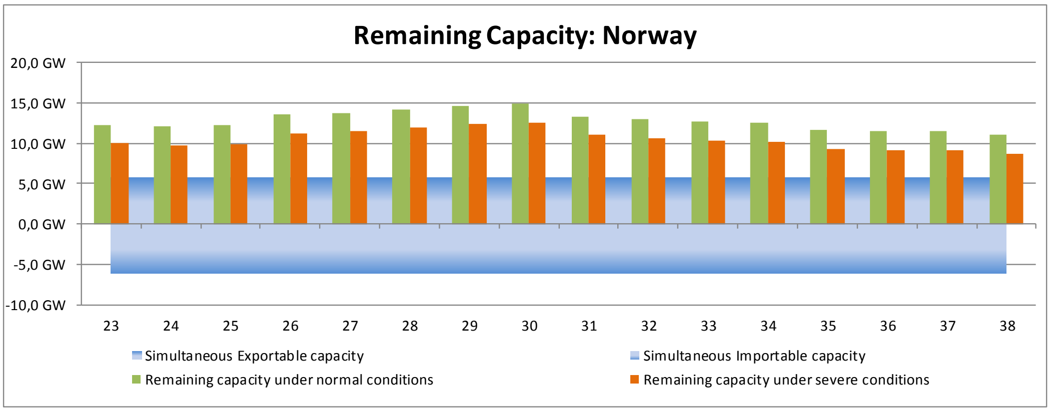
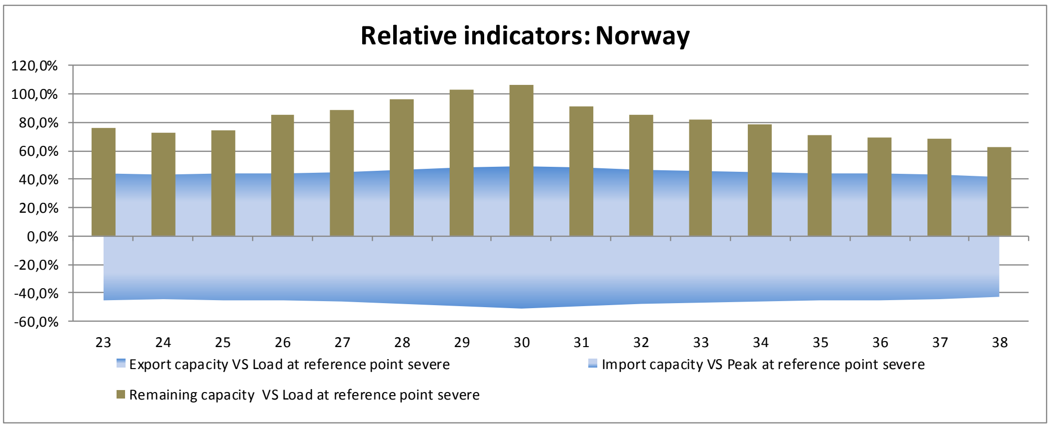
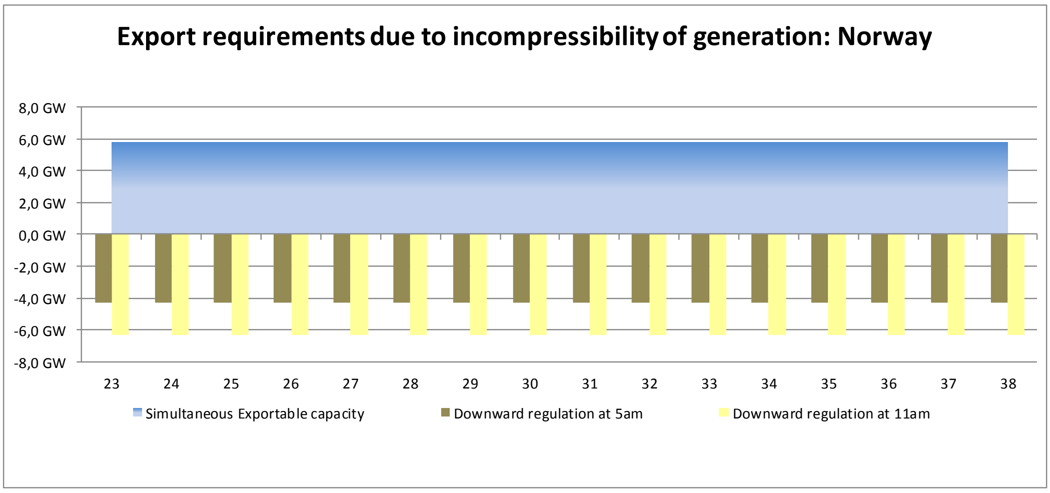

Demand and generation availability: Norway
35,0 GW
30,0 GW
25,0 GW
20,0 GW
15,0 GW
10,0 GW
5,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Norway
20,0 GW
15,0 GW
10,0 GW
5,0 GW
0,0 GW
-5,0 GW
-10,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Norway
120,0%
100,0%
80,0%
60,0%
40,0%
20,0%
0,0%
-20,0%
-40,0%
-60,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Norway
8,0 GW
6,0 GW
4,0 GW
2,0 GW
0,0 GW
-2,0 GW
-4,0 GW
-6,0 GW
-8,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Poland

Power balance at 12:00 CET
In normal conditions PSE does not expect any problems with balance of the system this summer.
Under severe conditions, for most of analysed reference points PSE observes a negative balance, however all of them (except for single one) do not exceed the level of importable NTC forecasted for this summer (from SE and UA; importable NTC on synchronous profile amounts zero – see below).
Extremely severe balancing conditions in the summer period may take place in case of long lasting heat spells leading to significant deterioration of Polish power balance (increase of load with simultaneous decrease of generating capacities due to higher forced outage rate of generators, worse cooling conditions and increase in network constraints). The risk of high unscheduled transit flows through the Polish system (from the west to the south) during such weather conditions can be higher, than in previous years, as a result of development of solar generation in Germany. In such a situation, if necessary from power balance point of view (to recover minimum generating capacity reserve margin required), additional import on synchronous profile towards the Polish system can be realized under the condition of simultaneous multilateral redispatch action (with source and sink respectively south and west of Poland) taken at the same time to limit the unscheduled transit flows through the Polish system. It is estimated that ca 300 MW of such a redispatch (assuming source in Austria and sink in Germany) is necessary to allow 100 MW of import to Poland from Germany. A relevant framework for such a remedial action has been developed recently within TSC project. It is worth saying that capacity resulted from multilateral redispatch could not be confirmed as sure, what shown 10th June 2014 case - PSE requested 1000 MW of multilateral redispatch and finally found out only 500 MW in the least relevant control area from the point of view of its efficiency (precise description can be found in Summer Review 2014 part of Winter Outlook 2014/2015 report).
Nevertheless it is important to note that the negative balance means that necessary operational generating reserves are below required level but load is still fully covered.
Visible increase of Remaining Capacity for September's weeks 36-38 refers to reference hour (12:00 CET) – RC at peak time (20:00 CET) is lower.

Power balance at minimum demand conditions:
PSE does not expect problems with renewable infeed at 5:00 and 11:00 a.m. in Sundays.

Operational conditions
Referring to network conditions, for years PSE S.A. has been affected by high unscheduled transit flows through the system from the west to the south. The flows limit capacity on the whole synchronous DE/CZ/SK profile, which is offered to the market (lack of import capacity and significant reduction of export capacity) and on top of that, more and more frequently causes congestions on the western border (violation of n-1 rule).
To keep system safe in such situations PSE will take the following actions:
– Activate DC loop flow (HVDC rescheduling) PL→DE→DK→SE→PL.
– Activate cross-border redispatching.
– Activate multilateral redispatching.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export.
PSE provides aggregated NTC data for the whole 220/400 kV synchronous PL - DE/CZ/SK profile on the base of the Polish Grid Code that accounts for physical power flows in the interconnected systems of Continental Europe, i.e. unscheduled transit flows through Polish system from the west to the south. Additional Polish connections in use are: DC cable to Sweden, 220kV line to Ukraine, on which import only is possible (Ukrainian units are connected synchronously to the Polish system). This summer PSE cannot confirm availability of power from Ukraine because since months there have been no exchanges although the offered capacity is allocated.

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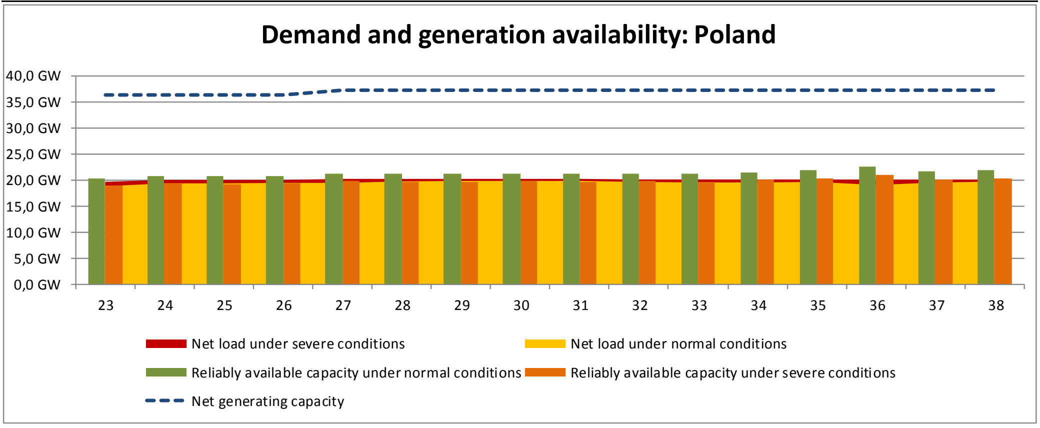
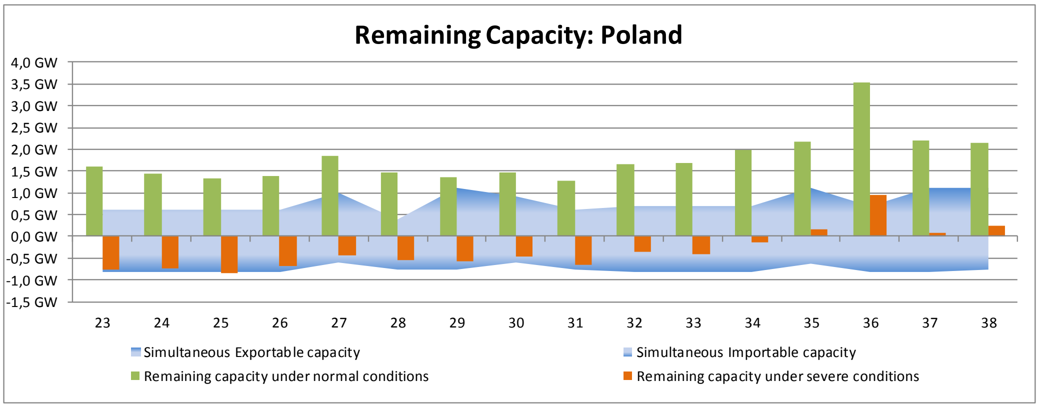
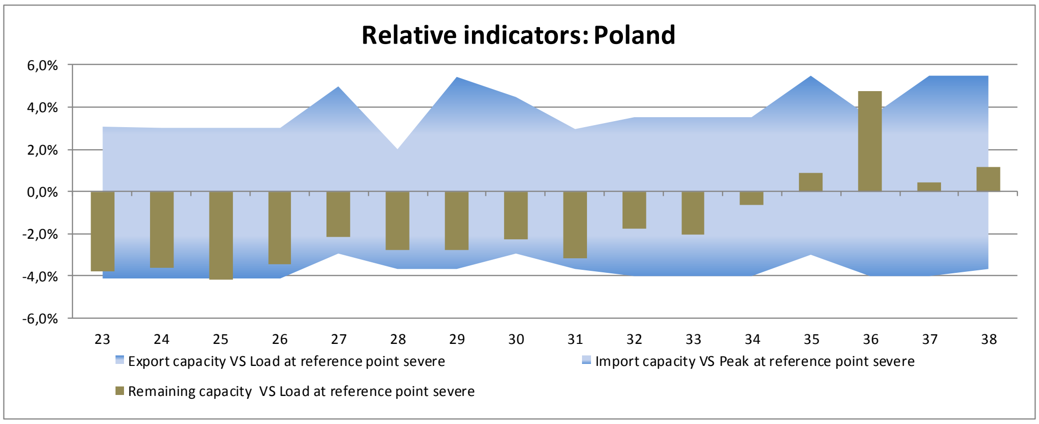
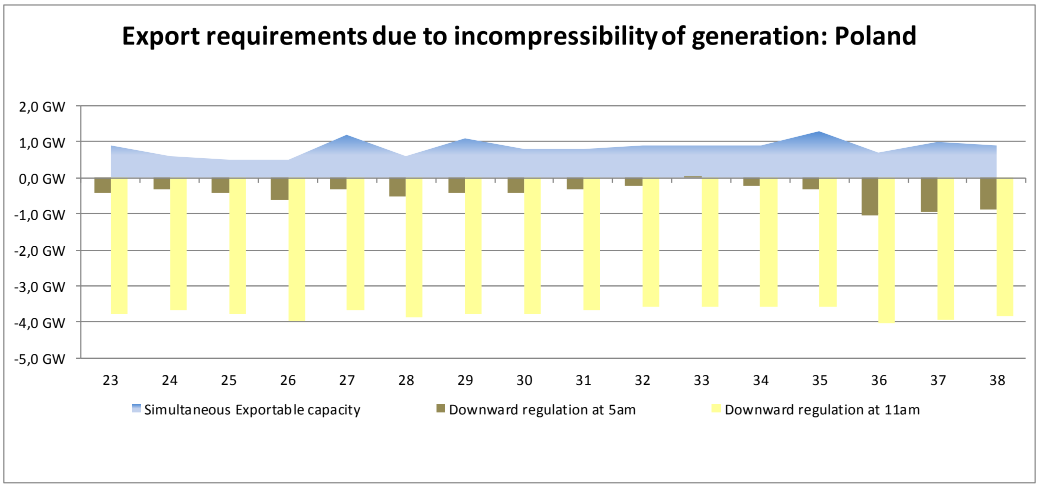
As the “best estimate of NTC” for Summer Outlook, PSE provides seasonal forecast of NTC, which takes into consideration unscheduled transit flows through PSE control area. The forecast include also the constraints caused by planned outages of the cross-border and / or internal lines (or other elements). Both factors limit the transmission capacity in Polish system in the yearly planning horizon.
For the whole analysed summer period (in fact during the whole year) yearly forecast of NTC in import direction on PL – DE/CZ/CK profile amounts to zero. In summer 2015 TTC, which is calculated on the basis of N-1 criterion, amounts zero as well as the result of progressing increase of unscheduled transit flows through Poland. In other words, all capacity possibly to be offered to the market players is already consumed by these unscheduled transit flows.

Framework and methodology of the assessments
In Poland forecast plans (yearly coordination plans) are done for the whole year on a monthly basis, till 30th November every year. Prepared data concerns average values from working days at peak time (during main summer months, means June, July and first half of August peak time in Poland is taking place between 12:00 and 13:00 CET (13:00 – 14:00 CEST)). At the end of August and in September peak load is taking place in the evening. On 26th every month PSE publishes monthly coordination plans, which include the precise information on power balance in peak time for all days of the next month. Further specification is done within the operational planning (weekly and daily).
Because of Outlook reports require weekly data, PSE has prepared special assessment for Summer Outlook, where weekly data of NGC, maintenances, load and “best estimate of NTC” are available. It is important to underline that, this is still an update of year-ahead plan. This assessment as well as coordination plans are coherent and based on information from producers (NGC, overhauls, part of non-usable capacity), and Polish TSO own analysis (load, outages, reserves, non-usable capacity, NTC). In normal conditions PSE classifies 90% of wind NGC as non-usable capacity, for severe conditions it is 100%. Load under severe conditions can be reduced according to agreements concluded between PSE and major customers.
PSE does not prepare forecast for downward regulation capabilities in yearly and monthly horizon (only during daily planning), so provided data is a kind of estimation only and this estimation based on quite pessimistic factor of usage onshore wind farms, amounted 85% of their NGC (no offshore wind farms at the moment, amount of solar is negligible). In general PSE can confirm that there can be some stress days during the year (especially during Christmas, Easter and holidays in May), when low demand and simultaneously high wind condition could cause the balance problem in Polish power system.


Demand and generation availability: Poland
40,0 GW
35,0 GW
30,0 GW
25,0 GW
20,0 GW
15,0 GW
10,0 GW
5,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Poland
4,0 GW
3,5 GW
3,0 GW
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
-0,5 GW
-1,0 GW
-1,5 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Poland
6,0%
4,0%
2,0%
0,0%
-2,0%
-4,0%
-6,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Poland
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
-4,0 GW
-5,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Portugal

In the upcoming 2015 summer season, the Portuguese system is expected to be in balance.
Remaining capacity is sufficient to cover peak loads during the whole period, both in normal and severe condition and, with the expected commissioning of new reversible units in Baixo Sabor and Ribeiradio (217MW), hydro capacity could be more reliable than in previous years.
Regarding system's downward regulation capability, our assessment has identified appropriate margins to deal internally with the excess of inflexible generation.

Most critical periods
No critical periods in particular were identified in our assessment.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export
From the adequacy point, the Portuguese system does not relies on import capacity, however, in certain market conditions, some significant power flow in the interconnections can be expected.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods
Eventual issues with inflexible generation are expected to be managed without resorting to export capacity.

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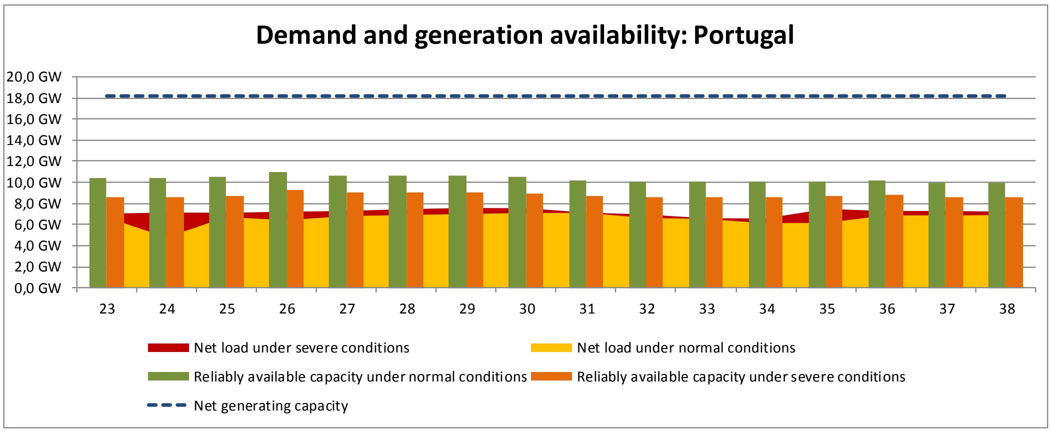
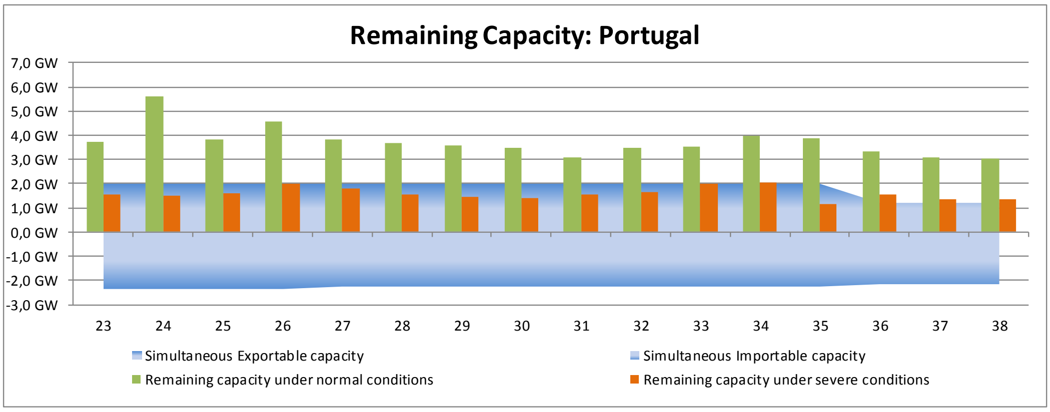
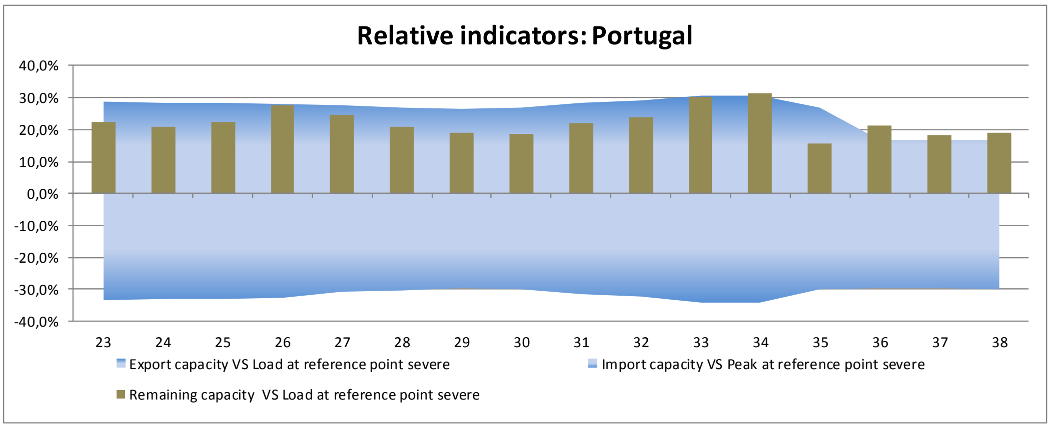
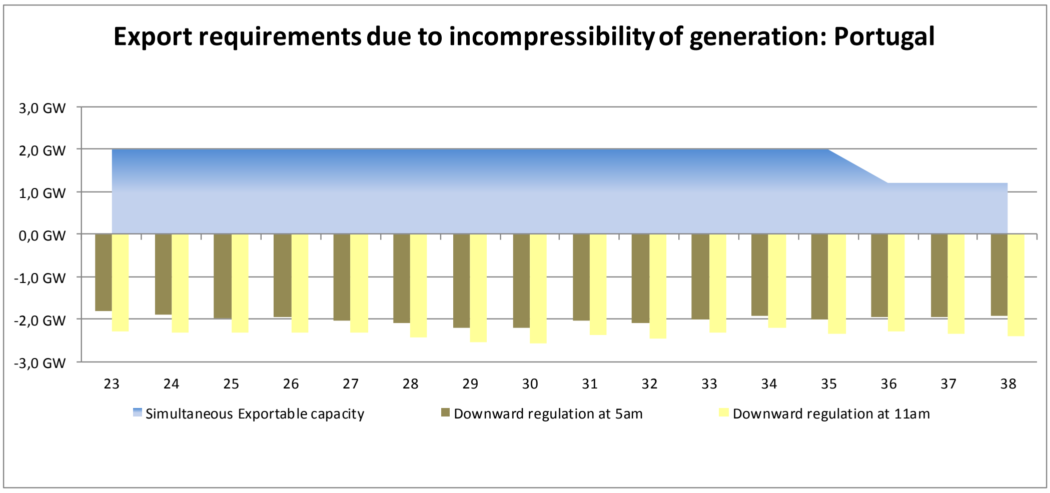

Demand and generation availability: Portugal
20,0 GW
18,0 GW
16,0 GW
14,0 GW
12,0 GW
10,0 GW
8,0 GW
6,0 GW
4,0 GW
2,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Portugal
7,0 GW
6,0 GW
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Portugal
40,0%
30,0%
20,0%
10,0%
0,0%
-10,0%
-20,0%
-30,0%
-40,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Portugal
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Romania

The forecast for the coming summer 2015 does not indicate any problem which could affect the Romanian Power System adequacy.

General situation
The generation units maintenance plan takes into account the requirements to cover the internal demand and to fulfil the system reserves amount in any time interval.

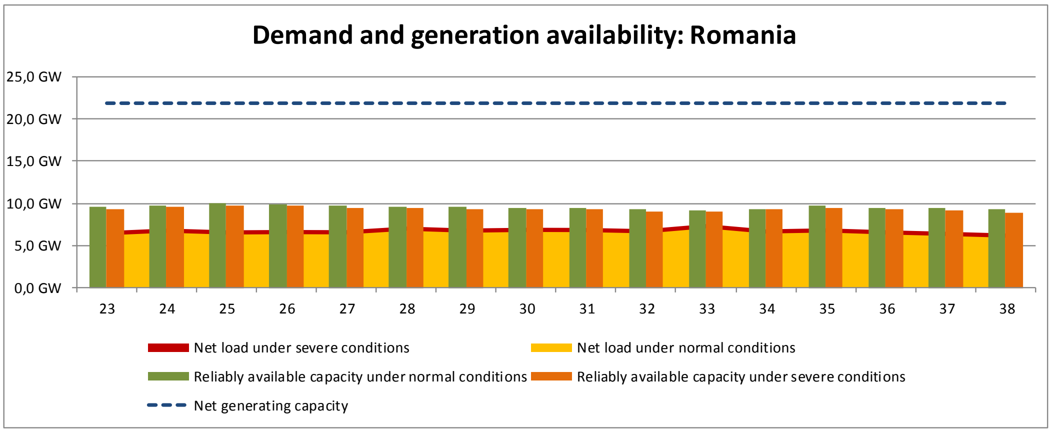
Most critical periods
During the summer 2015, we do not expect critical time intervals, even for heat wave circumstances.

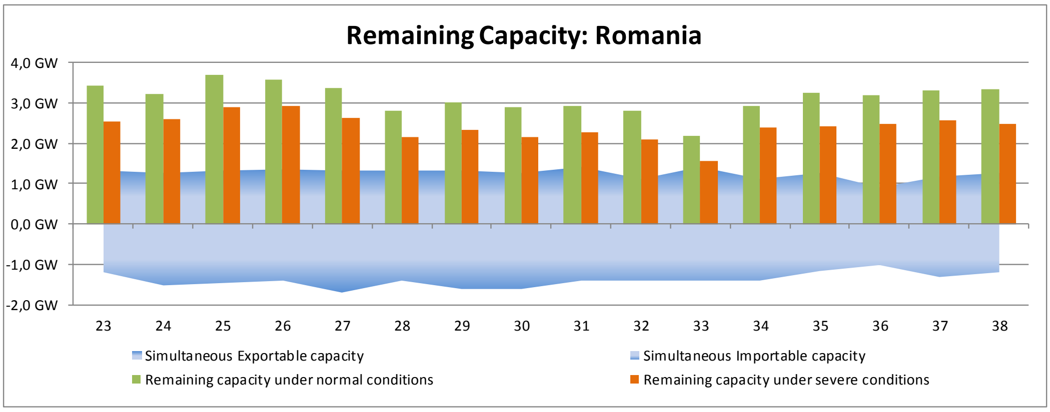
Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export
The interconnection capacities will be used in the range of the NTC values offered to the market. There are regional coordinated plans of the interconnectors maintenance, in order to avoid the jeopardising of interconnection safety and to optimise the NTC values.

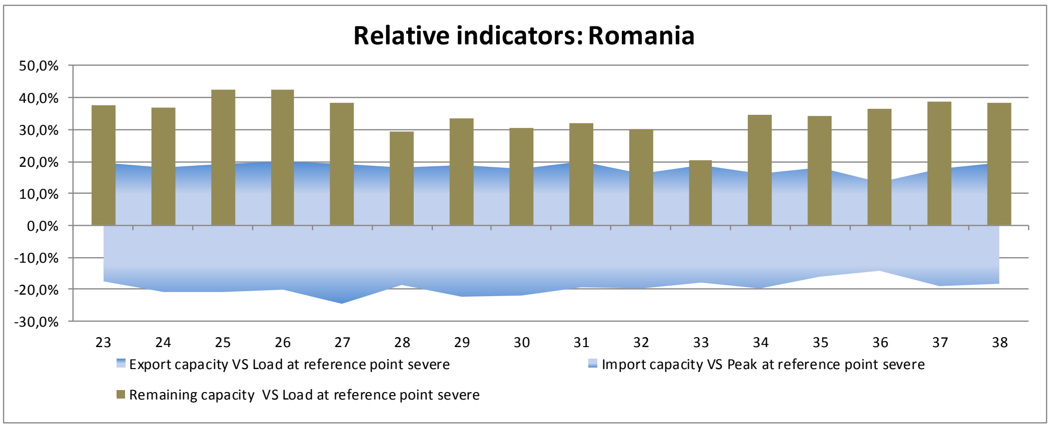
Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods
Sometimes, during the minimum load periods with high renewable generation, it was observed an increased level of export schedules within the agreed NTC ranges.
However there are market rules and procedures in order to avoid unplanned exports when it could be an excess of inflexible generation at minimum load hours.

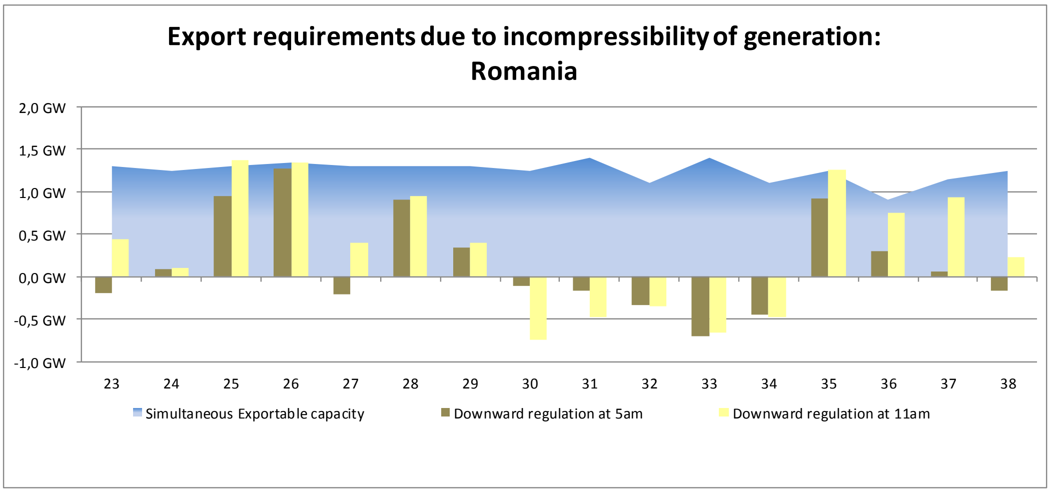
Framework and methodology of the assessments
Based on a Methodology issued by the National Energy Regulatory Authority, Transelectrica receives from the producers the planned maintenance / overhauls schedules and units technical and economic data for the next year, in order to perform the market analysis that will provide the input to the Regulator for establishing the regulated contracts. Also, according to the same Methodology, the suppliers and distribution companies send their hourly load forecasts. These data, correlated with statistics, are used as input to assess the load and national generating capacity evolution for next summer adequacy outlook.
The best estimated NTC values was obtained based on the NTC profile for 2014, calculated on monthly basis for time periods defined by maintenance schedules for both transmission network in the National Power System and in the neighbouring region. The following algorithm was applied:

- the network elements limits for 2015 was checked in comparison with the 2014 ones;
- average NTC values for periods without significantly limiting disconnections from June till September 2015 were determined and set for the summer 2015 dates without significant disconnections;
- the disconnections of the lines in the National Power System and interconnected regions, which determined significant modification of Romanian export/import NTC values in the summer 2015, were identified;
- the disconnection periods of these lines were identified in the 2015 national maintenance plan and in the regional maintenance schedules and correspondingly modified NTC values were declared for 2015 summer days with such significant disconnections.


Demand and generation availability: Romania
25,0 GW
20,0 GW
15,0 GW
10,0 GW
5,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Romania
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Romania
50,0%
40,0%
30,0%
20,0%
10,0%
0,0%
-10,0%
-20,0%
-30,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Romania
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
-0,5 GW
-1,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Serbia

For the upcoming summer, we don't expect problems in covering demand. Moreover, export of energy is expected under normal weather conditions and normal hydro levels.
There are no installed wind units in our power system, hence exceed power of our "must run" thermal and hydro generation at low demands should be compensated by our pump storages. Only in case of high hydro levels or technical problem in generation units or pumps, generation exceeding at low overnight demands might occur, but rarely and for short periods.

General situation
Taking into account planned level of maintenance and expected hydro levels, the Serbian power system is expected to be in balance in the forthcoming summer.

Most critical periods
Under severe weather conditions, i.e. extremely high temperatures and very low hydro levels, lack of energy from generation units within Serbian control area might happen in certain weeks (mainly during the first half of June and August), but this can be easily overcome by energy import, as Serbian market is operational and there is enough cross-border capacity to meet domestic and regional demand.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export
According to harmonized maintenance plan in South-East Europe, some of interconnectors will be unavailable due to maintenance. During the unavailability of interconnectors, exchange of energy on these borders will be set to zero, which will decrease total capacity for exchanging the energy. But taking into account that almost all interconnectors are planned to be available in the first half of June and August, which is expected to be the most risky month under severe condition, we don't expect any issues in exchanging the energy.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods
Maintenance works are performed mainly with daily disconnection, therefore almost all interconnectors will be available overnight when generation exceeding at low demand might occur in Serbian Power System. In generally, the surplus of energy at low demands period is compensated by domestic pumping storage.

Framework and methodology of the assessments
Load scenario is based on statistical hourly data from previous years taking into account forecasted consumption growth for 2015.
Maintenance and overhauls values are calculated from the official maintenance plan of Serbian Generation Company.
The best estimated NTC values are obtained on basis of historical monthly NTC values.

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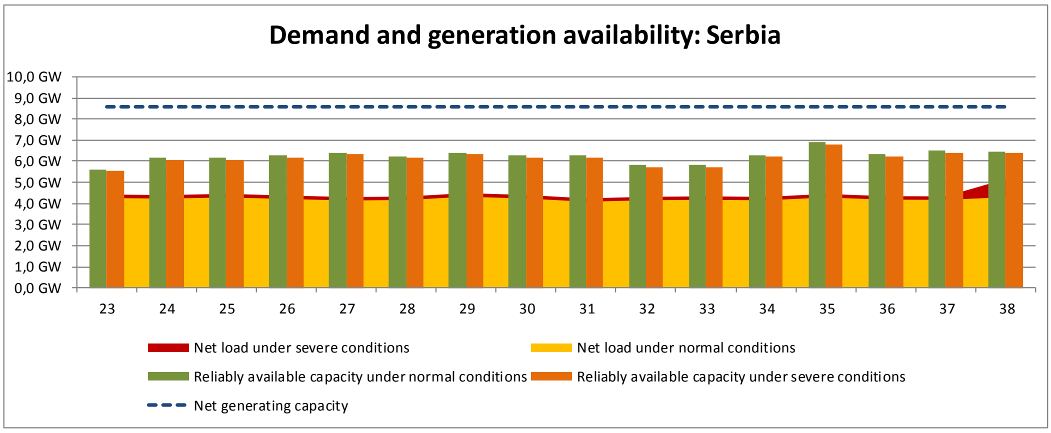
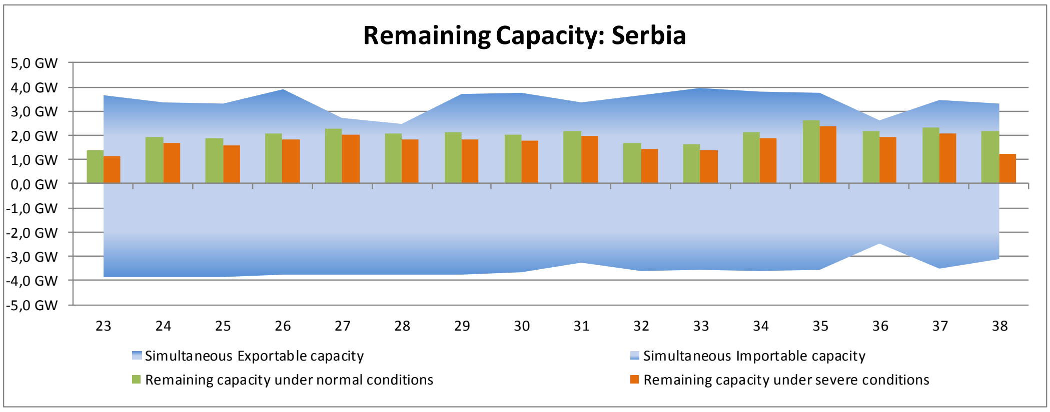
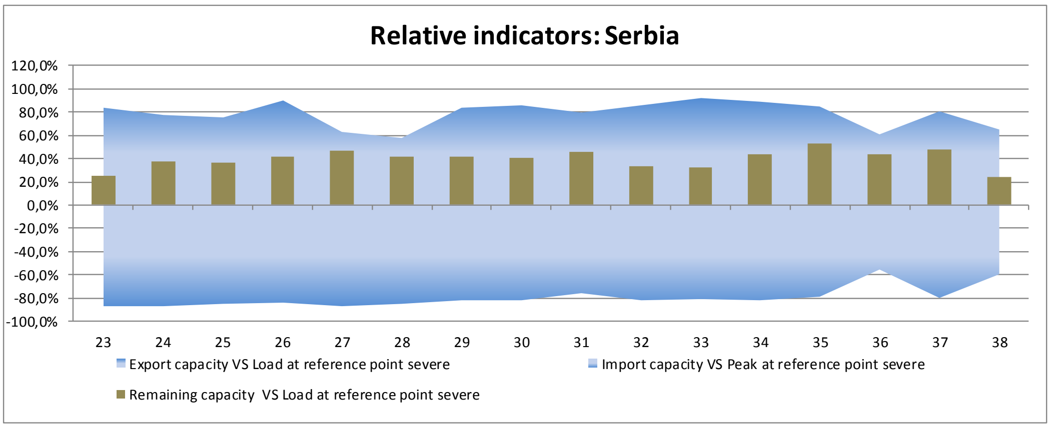
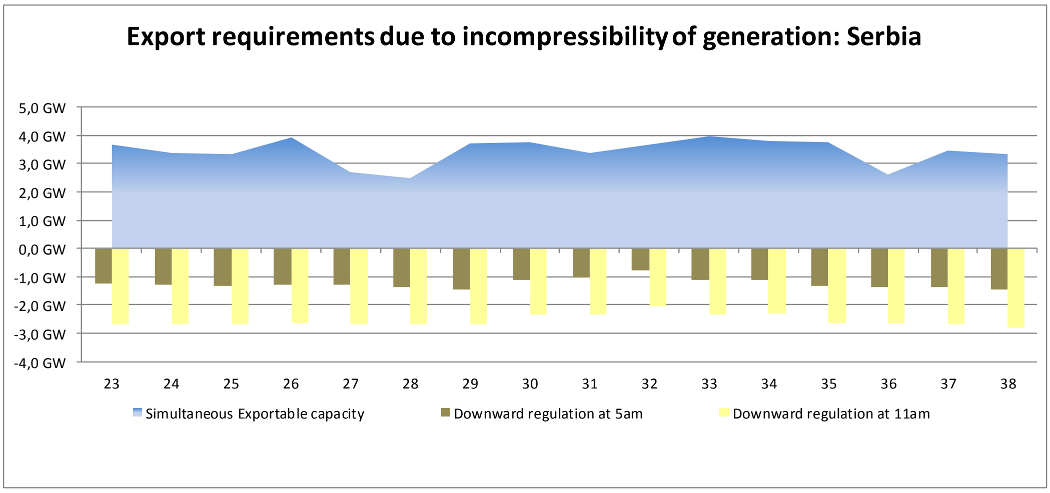

Demand and generation availability: Serbia
10,0 GW
9,0 GW
8,0 GW
7,0 GW
6,0 GW
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Serbia
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
-4,0 GW
-5,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Serbia
120,0%
100,0%
80,0%
60,0%
40,0%
20,0%
0,0%
-20,0%
-40,0%
-60,0%
-80,0%
-100,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Serbia
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
-4,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Slovakia

Slovakia expects that the generation capacity will be sufficient to meet the expected peak demands this summer and to ensure the appropriate level of security of supply under normal conditions. The peak load in summer 2014 was 3 643 MW. When all influences are considered, it is anticipated that the peak demand for summer 2015 will be approximately 3 610 MW. The maximum weekly peak load in severe conditions is expected 3 780 MW (same level as in the last summer period). The remaining capacity seems to be insufficient in June and the first week of July under severe conditions. In this case cross-border capacities for electricity import are sufficient. The summer peak demand is expected in 37th and 38th week.

General situation

Summer is a regular period for maintenance of generation units. In June and the first week of July there is a schedule of the maintenance of a nuclear unit (500 MW) and two units of conventional power plants (2 x 110 MW). In the rest of summer period two or only one conventional power plant unit maintenance is scheduled.

Framework and methodology of the assessments

Data of non-usable generation capacities are based on numbers of previous years, after that the average was taken into account. The maximum weekly loads were estimated at the same level as the last year 2014 (we assume the same weather and behaviour of consumers). Operation of nuclear, thermal, hydro and renewable sources is foreseen according to experience from previous years. Cross-border capacities were calculated, taking into account planned outages of transmission elements.

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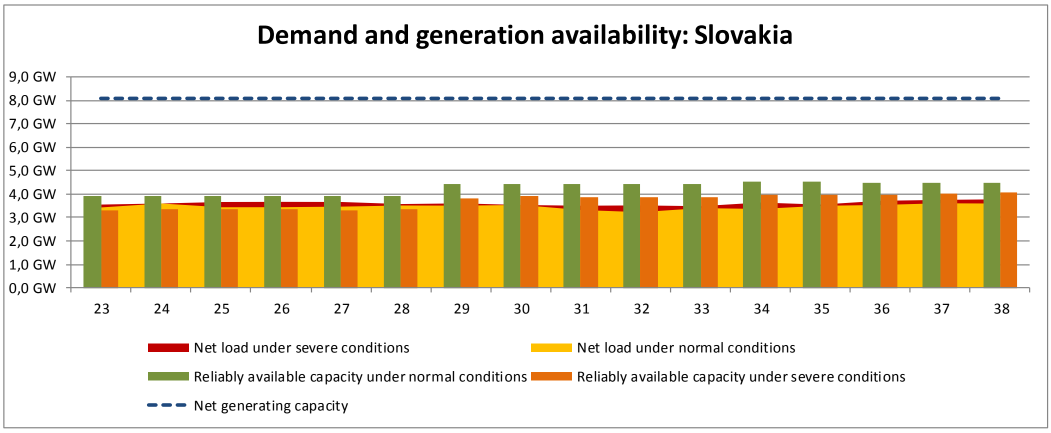
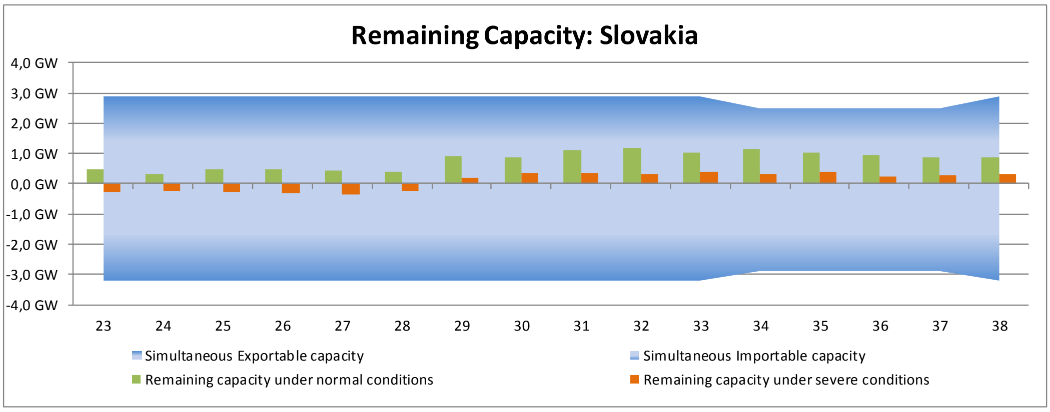
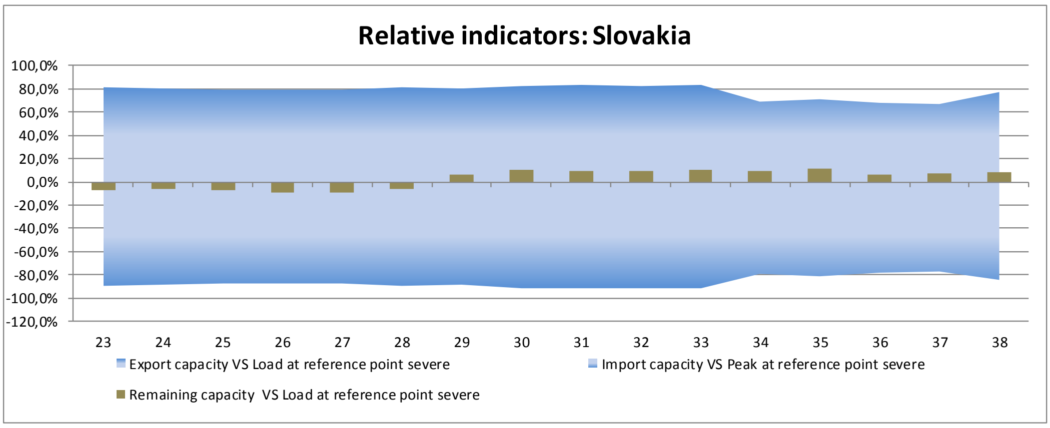
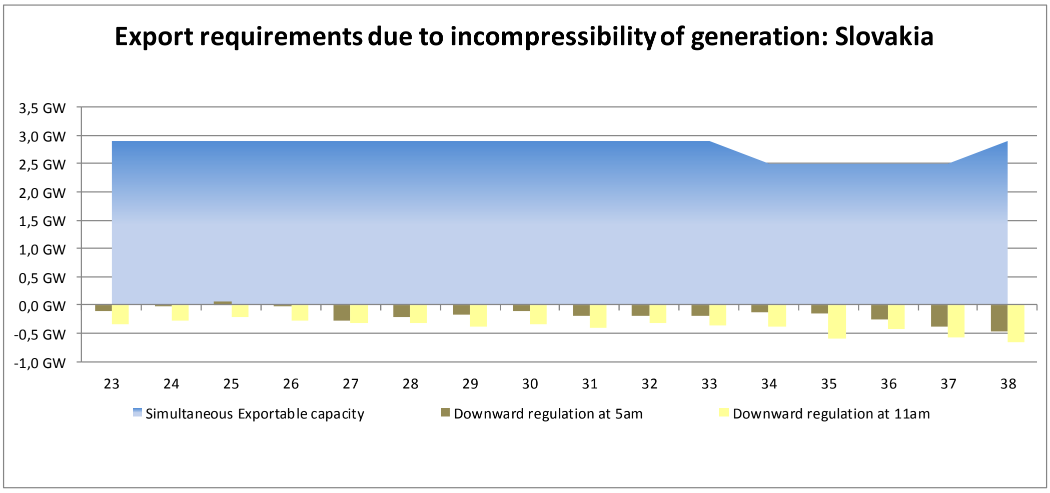

Demand and generation availability: Slovakia
9,0 GW
8,0 GW
7,0 GW
6,0 GW
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Slovakia
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
-4,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Slovakia
100,0%
80,0%
60,0%
40,0%
20,0%
0,0%
-20,0%
-40,0%
-60,0%
-80,0%
-100,0%
-120,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Slovakia
3,5 GW
3,0 GW
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
-0,5 GW
-1,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Slovenia

The forecast for the upcoming summer does not indicate any problem which could affect the Slovenian power system adequacy. With firm export contracts taken into account, Slovenia is mostly net balanced. Higher imports are expected in case of extreme low hydrology when lower hydro production and possible reduction of generation from some thermal units may occur. No issues identified at times of minimum demand.

General situation

In July and August lower hydro levels are expected. No problems with gas supply are expected and Slovenia has low electricity production from gas. No planned commission or decommission of units in the coming summer.

Most critical periods

No critical situations are expected. With firm exports taken into account imports will probably occur.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

Slovenian power system is well connected to neighbouring systems. Interconnectors enable cross border trading as well as help from neighbouring systems in case of emergency.

Slovenian power system is connecting three different price areas (central-east Europe, Italy, south–east Europe), therefore electricity prices in these three areas dictate export/import situation in Slovenia. High import and high export at the same time are characteristic for typical transit country, such as Slovenia is, however due to well interconnected network ELES does not expect transmission constraint and/or reductions of import/export in coming summer period.

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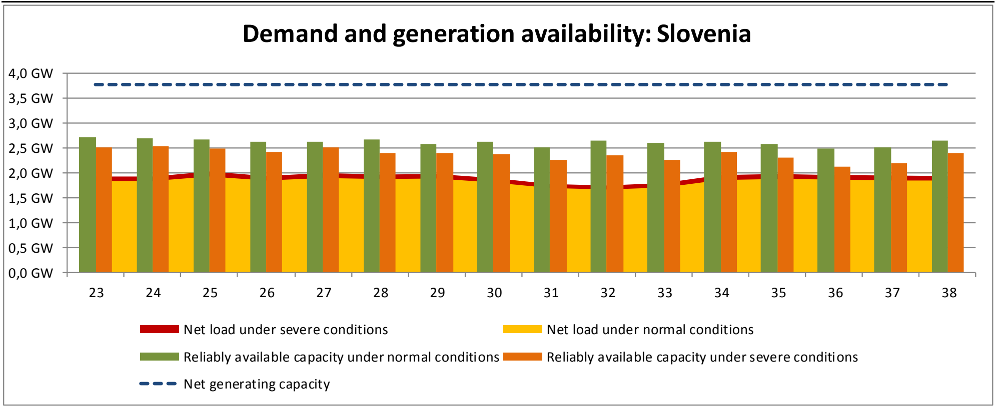
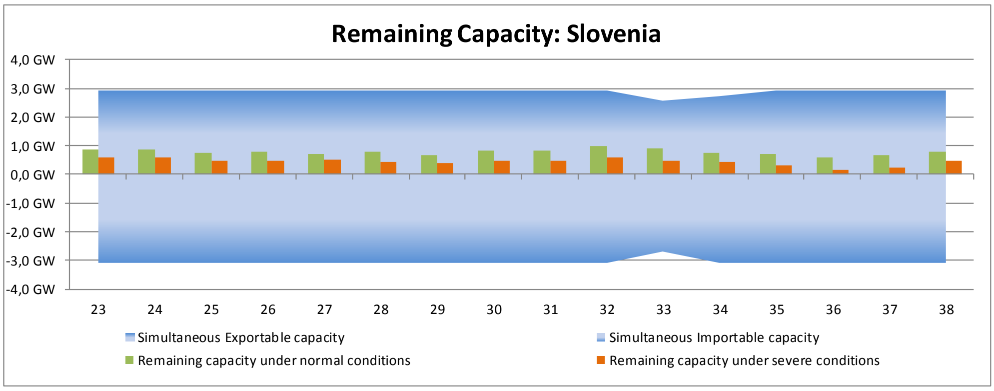
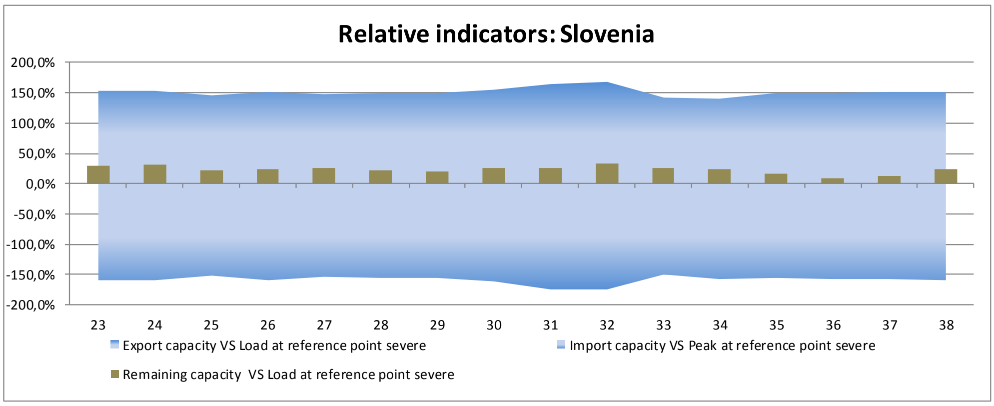
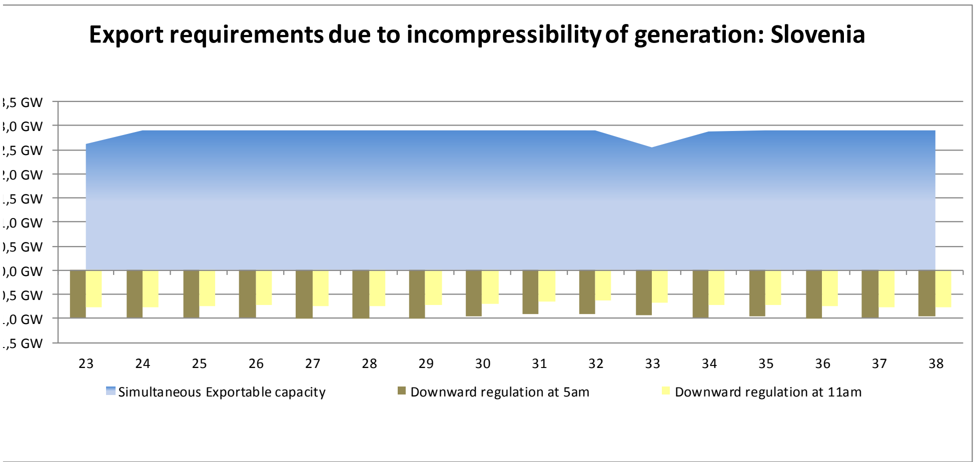

Demand and generation availability: Slovenia
4,0 GW
3,5 GW
3,0 GW
2,5 GW
2,0 GW
1,5 GW
1,0 GW
0,5 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Slovenia
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
-4,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Slovenia
200,0%
150,0%
100,0%
50,0%
0,0%
-50,0%
-100,0%
-150,0%
-200,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Slovenia
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Spain

From the point of view of generation adequacy, the situation in the Spanish peninsular system is not critical for the upcoming summer, even considering very low wind generation (95% probability) and a high thermal forced outage rate. Even in extreme conditions problems concerning load meeting are very unlikely to happen at any week of the period. Good generation adequacy during peak demand hours can be expected regardless imports from neighbouring countries.

At minimum demand periods, with high amounts of renewable production, power surplus with spilling of RES can take place. The Spanish TSO has a specific control center for renewable sources (CECRE), which is permanently monitoring and supervising the renewable production in order to maintain a balanced situation.

The export capacity of interconnectors is a key factor in order to avoid spilling of renewable energy, mainly wind power. The new HVDC interconnection with France will increase capacity and will be very useful for that matter. Another point of worthy mention is the importance of energy storage -mainly pump storage plants- in order to properly manage the excess of inflexible power.

General situation

From the point of view of generation adequacy, there’s no dectected risk situation in the Spanish peninsular system for the upcoming summer. If average conditions are considered, remaining capacity will be over 16500 MW. In the case of simultaneous extreme peak demand, very low wind generation (less than 5% of wind installed capacity), drought conditions and a high thermal forced outage rate, assesed remaining capacity is still over 10500 MW
The demand values have been stabilising in 2014 and the beginning of 2015, after the significant drop that took place due to the economical and financial crisis. It is expected that the demand in 2015 will slightly recover. Nevertheless, the demand peak values expected for summer, with high temperature values and a probability to be reached of 1 %, are the same as the expected for 2014.
The most important risk factors for the next summer in the Spanish system are wind conditions, sensitivity of load to temperature in extreme weather conditions and gas availability to combined cycle and gas thermal plants.

Most critical periods

The lowest remaining capacity at peak demand hours is expected to be met during the first weeks of the summer period, specially if high temperatures are reached. Nevertheless, there's not a risk situation or a low capacity detected.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

Good generation/demand adequacy can be expected for peak demand hours regardless imports from neighbouring countries.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

The export capacity of interconnectors is a key factor in order to avoid curtailment of renewable energy , mainly wind power. The expected increase of NTC to North Europe due to the new HVDC interconnection with France will be very useful in that sense. It’s also necessary to point out the importance of demand management and energy storage –mainly hydro pump storage plants- in order to properly manage the excess of inflexible power at minimum demand periods. Nowadays the installed capacity of hydro pump storage plants in Spain is around 5000 MW.

Framework and methodology of the assessments

Among other reports, every month, a medium term system adequacy forecast report for the next 12 months is produced by the Spanish TSO.
Medium term system adequacy forecast is carried out using a hydrothermal coordination model with stochastic dynamic programming that minimizes variable operation costs. The analysis is based on a probabilistic tool where hydro stochastic behaviour and non planned thermal outages are considered. In addition, regional studies are performed looking for congestions.
The medium term forecast considers several hydro conditions, available thermal capacity and wind production scenarios.

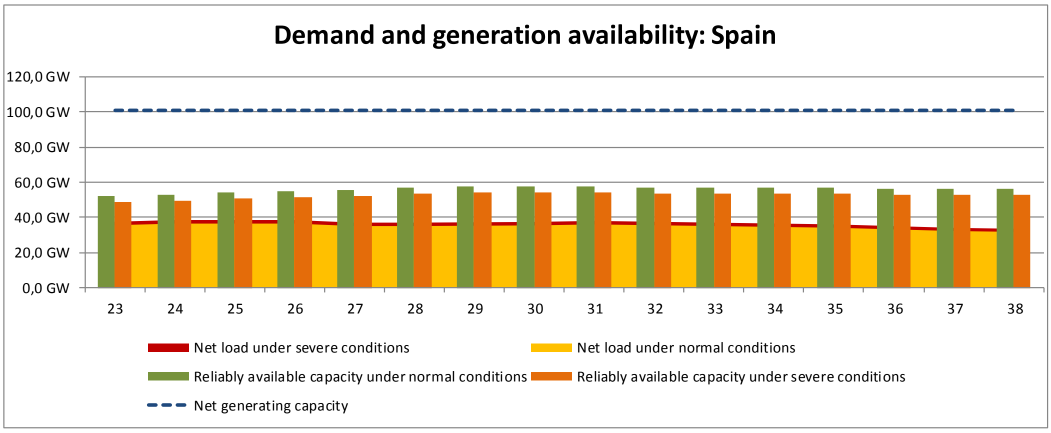
All scenarios are built under the following assumptions:

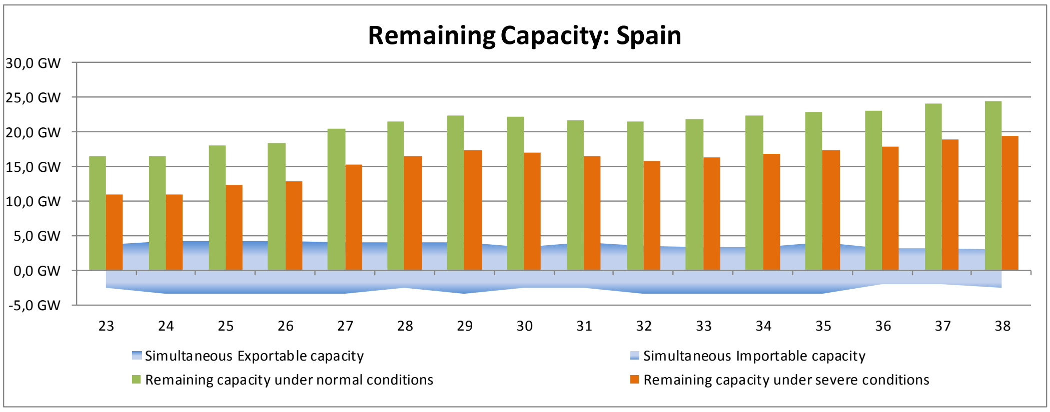
• Overhaul planning notified by generators.

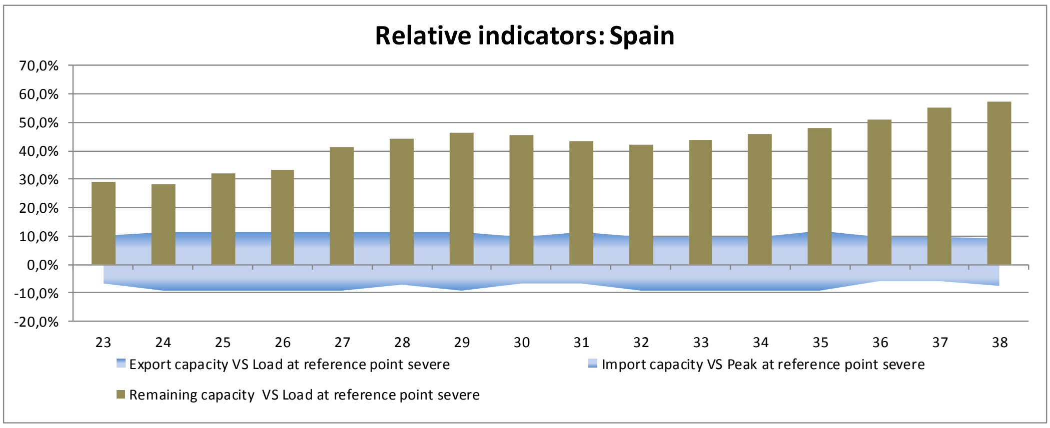
• Guaranteed fuel (gas) supply to combined cycle and gas thermal plants.
• Low wind conditions: wind generation considered is around 5-6% of available capacity. Wind generation has been above this rate with a probability of 95%.

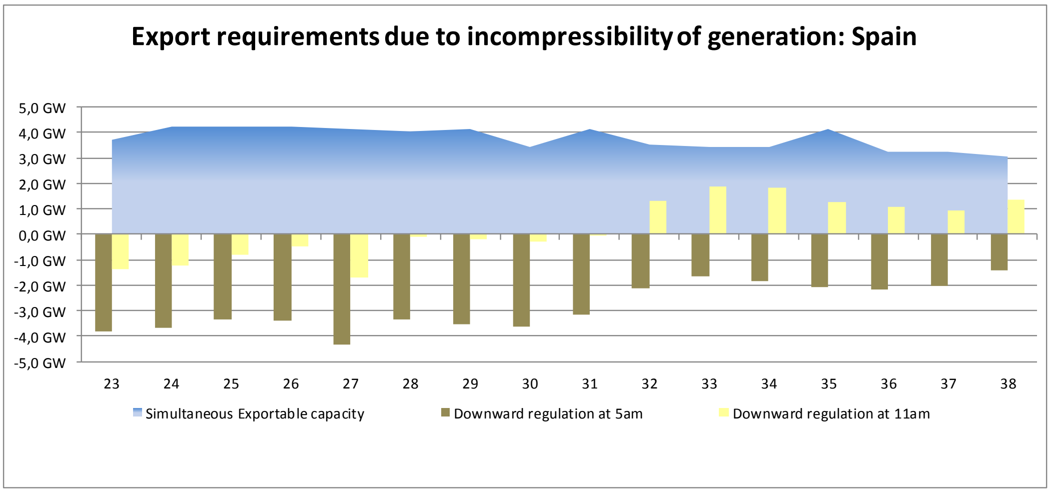
Extremely severe conditions for the system are simulated as:

• Extreme demand due to severe weather conditions, typically very high temperatures
• No import capacity is considered in the study in severe conditions. So, it is not taken into account in the load – generation balance.


Demand and generation availability: Spain
120,0 GW
100,0 GW
80,0 GW
60,0 GW
40,0 GW
20,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Spain
30,0 GW
25,0 GW
20,0 GW
15,0 GW
10,0 GW
5,0 GW
0,0 GW
-5,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Spain
70,0%
60,0%
50,0%
40,0%
30,0%
20,0%
10,0%
0,0%
-10,0%
-20,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Spain
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
-4,0 GW
-5,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Sweden

The electricity demand in Sweden is strongly dependent on outside temperatures. Due to the climate conditions, the electricity consumption is much lower during the summer. Therefore, there are no expected issues with the generation vs load balance for the coming summer. Export is to be expected on the interconnectors, but this is rather a question of price than of inflexible generation. Since there is such a large proportion of flexible hydropower in both Sweden and Norway there is usually no problem with inflexibility. Although, this should not be taken for granted any longer since more and more wind power are being installed in the synchronous area. Due to this, the flexibility of the system is decreasing.

General situation

When it comes to grid elements taken out of service it is both due to maintenance of existing facilities and due to new investments. The number of maintenance work is at a normal level this year. They are relatively evenly distributed over the period, with an exception for the first weeks of June, when the production from nuclear units is reduced to half of the installed capacity. During this time there can be an increased need for import to the south of Sweden. No particular problems are foreseen but the maintenance work requires careful planning.

Most critical periods

No particular problems are foreseen although a lot of maintenance requires special attention due to local problems and with regard to the N-1 criterion. Generally, situations with high voltages are to be expected (especially during nights) due to low load on long transmission lines. This could however be handled by disconnecting parallel lines, which is a standard procedure for voltage control in Sweden. This should not cause any problems for neighbouring countries. Furthermore, during spring flood some overloads in the northern 220 kV grid may occur which requires reallocation of production and/or disconnection of lines. Beside this, the summer is also a period with increased probability of lightning strikes. As this is the most common cause of the faults in the Swedish national grid a Lightning Localization System is used.

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

Although Svenska kraftnät predicts Sweden to be independent of import during normal conditions, the interconnectors plays an important role. The interconnectors help to keep electricity prices down at low levels and are also very important for balancing purposes (to enable exchanging balancing power between the Nordic countries). As Sweden is expected to export power during the whole summer period no adequacy issues related to the interconnectors are expected.

Framework and methodology of the assessments

Values of demand and must run generation are based on historical data. NTC-values, mothball plants and outages comes from the homepage of Nord Pool Spot.

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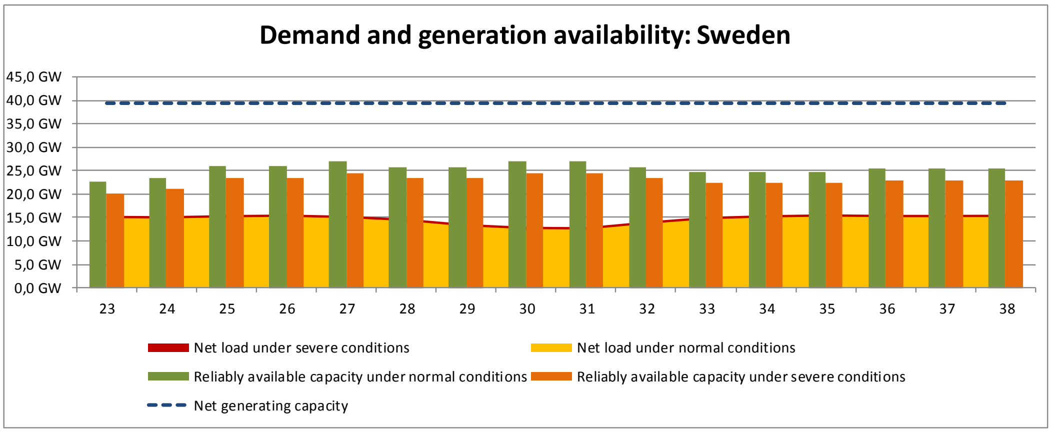
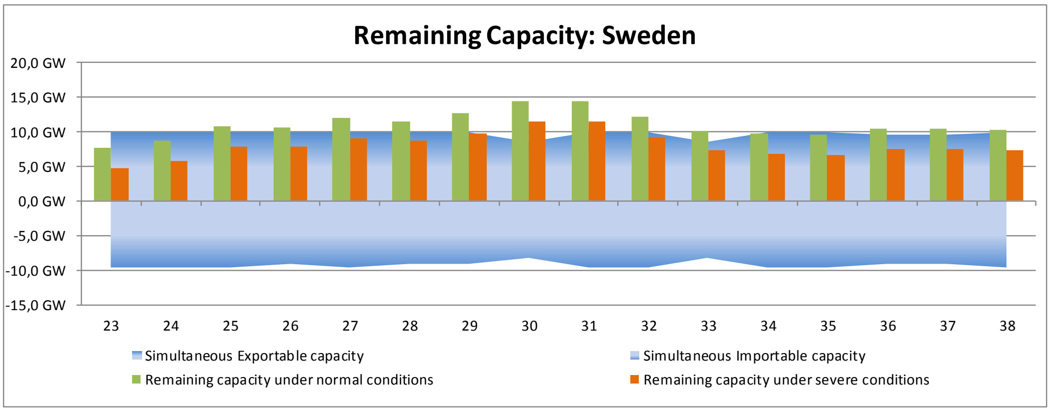
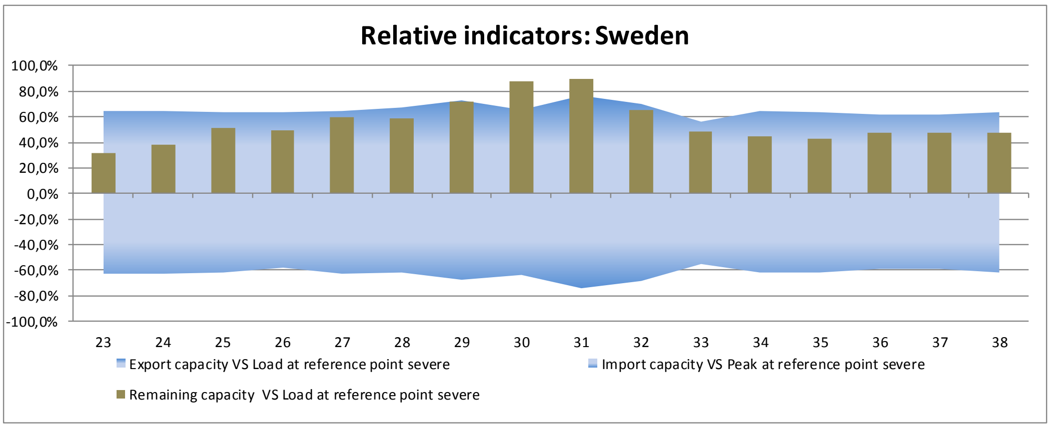
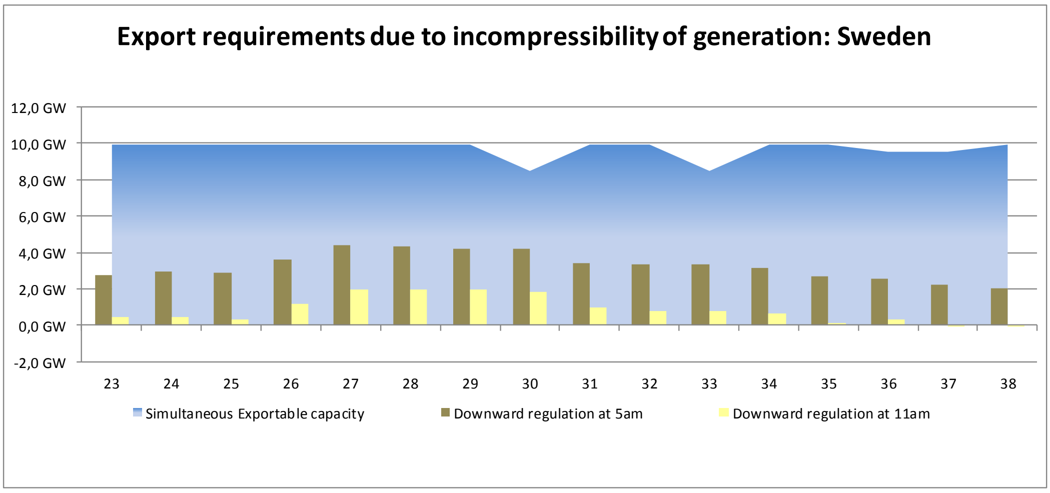

Demand and generation availability: Sweden
45,0 GW
40,0 GW
35,0 GW
30,0 GW
25,0 GW
20,0 GW
15,0 GW
10,0 GW
5,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity


Remaining Capacity: Sweden
20,0 GW
15,0 GW
10,0 GW
5,0 GW
0,0 GW
-5,0 GW
-10,0 GW
-15,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions


Relative indicators: Sweden
100,0%
80,0%
60,0%
40,0%
20,0%
0,0%
-20,0%
-40,0%
-60,0%
-80,0%
-100,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe


Export requirements due to incompressibility of generation: Sweden
12,0 GW
10,0 GW
8,0 GW
6,0 GW
4,0 GW
2,0 GW
0,0 GW
-2,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Switzerland

Using this adequacy methodology, no special problems concerning the generation - load balance or concerning inflexible generation at times of minimum demand are detected.

However, because the current methodology from ENTSO-E is focused on capacity [MW] only, it cannot reveal potential problems faced by hydro-dominant countries like Switzerland. In particular for Switzerland it is very important to also take into account energy constraints [MWh]. Furthermore, this methodology does not provide any insight on overloads and voltage problems..

General situation

In the summer, maintenance of generation units especially concerns the nuclear power plants (cf. Line 7). Lines tend to be maintained in the summer, but this only marginally affects the NTCs.

Most critical periods

Using this adequacy methodology, no critical periods can be detected.

However, because the current methodology from ENTSO-E is focused on capacity [MW] only it cannot reveal potential problems faced by hydro-dominant countries like Switzerland. In particular for Switzerland it is very important to also take into account energy constraints [MWh]. Furthermore, this methodology does not provide any insight on overloads and voltage problems..

Expected role of interconnectors in relation to maintaining adequacy and the ability to import or export

Switzerland is characterized by a balance that varies strongly between import and export, therefore the interconnections are very important.

Expected role of interconnectors to managing an excess of inflexible generation at demand minimum periods

As mentioned above, Switzerland is not concerned by problem of inflexible generation, therefore the interconnectors are not needed for that particular reason.

Framework and methodology of the assessments

The given NTC values are:

- bilateral NTC values: typical NTC values; physically two borders are relevant: the CH-IT border, resulting from a split of the Italian Northern Border, and the 'Swiss Roof' (CH-FR & CH-DE & CH-AT). The NTC of the Swiss Roof is then split onto the individual borders;
- simultaneous exporting / importing capacity: these values are not the sum of the corresponding bilateral NTC values, but are given by the physical limits of the Swiss transmission grid, i.e. +/- 5 GW.

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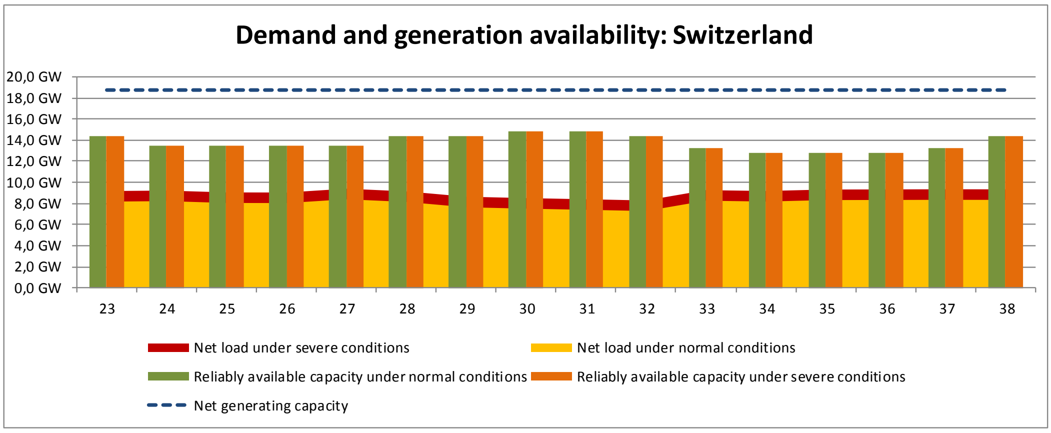
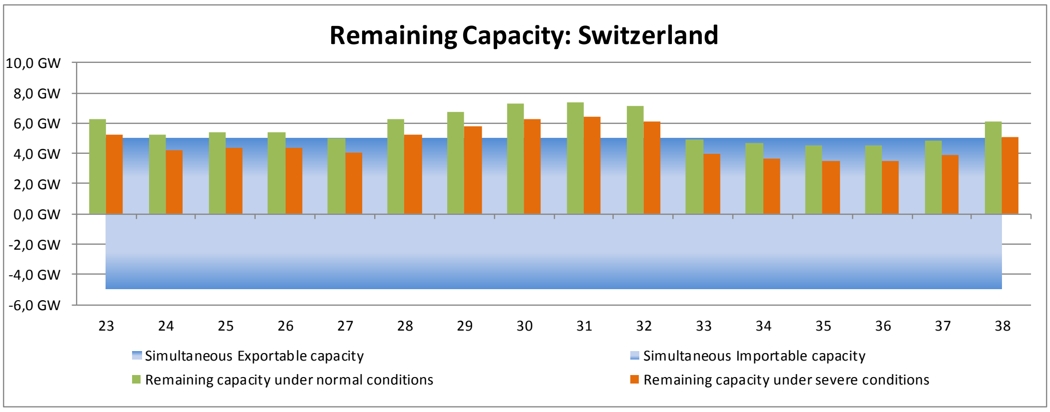
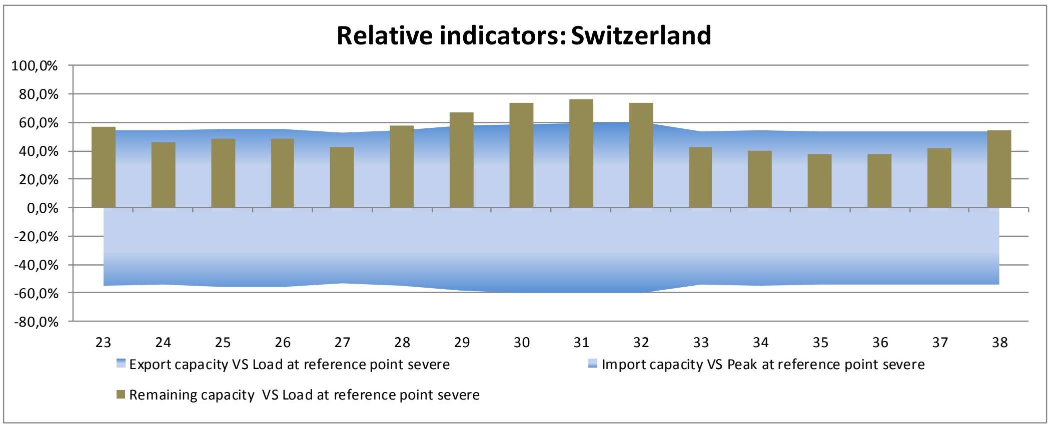
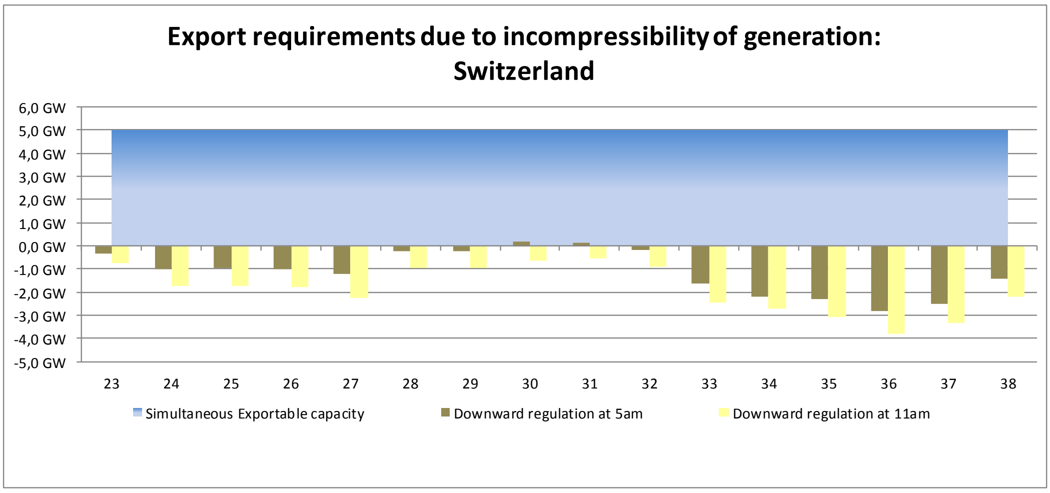
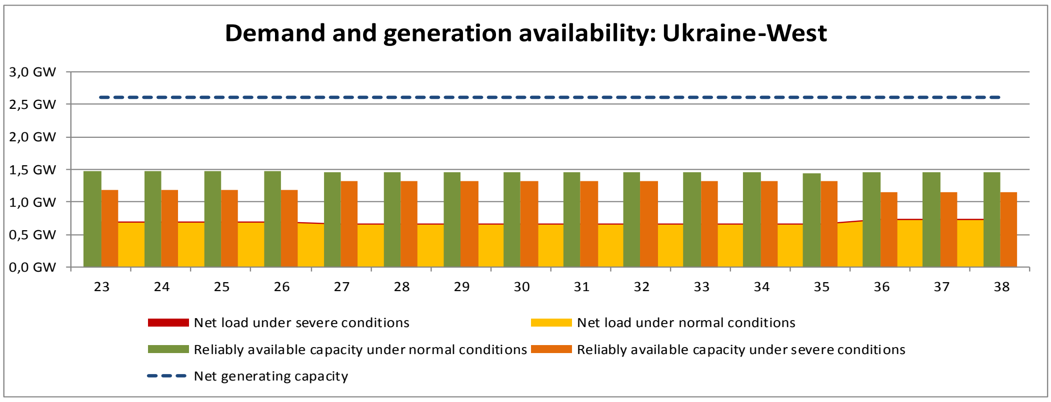

Demand and generation availability: Switzerland
20,0 GW
18,0 GW
16,0 GW
14,0 GW
12,0 GW
10,0 GW
8,0 GW
6,0 GW
4,0 GW
2,0 GW
0,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Net load under severe conditions
Net load under normal conditions
Reliably available capacity under normal conditions
Reliably available capacity under severe conditions
Net generating capacity

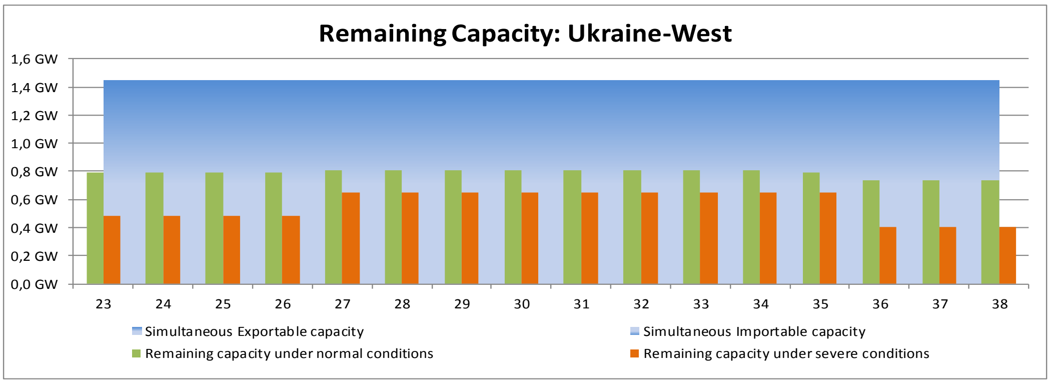

Remaining Capacity: Switzerland
10,0 GW
8,0 GW
6,0 GW
4,0 GW
2,0 GW
0,0 GW
-2,0 GW
-4,0 GW
-6,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Simultaneous Importable capacity
Remaining capacity under normal conditions
Remaining capacity under severe conditions

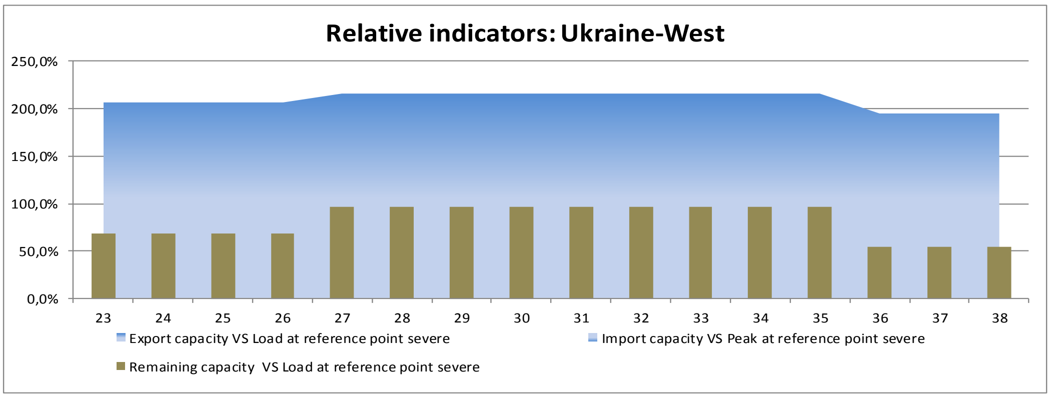

Relative indicators: Switzerland
100,0%
80,0%
60,0%
40,0%
20,0%
0,0%
-20,0%
-40,0%
-60,0%
-80,0%
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Export capacity VS Load at reference point severe
Import capacity VS Peak at reference point severe
Remaining capacity VS Load at reference point severe

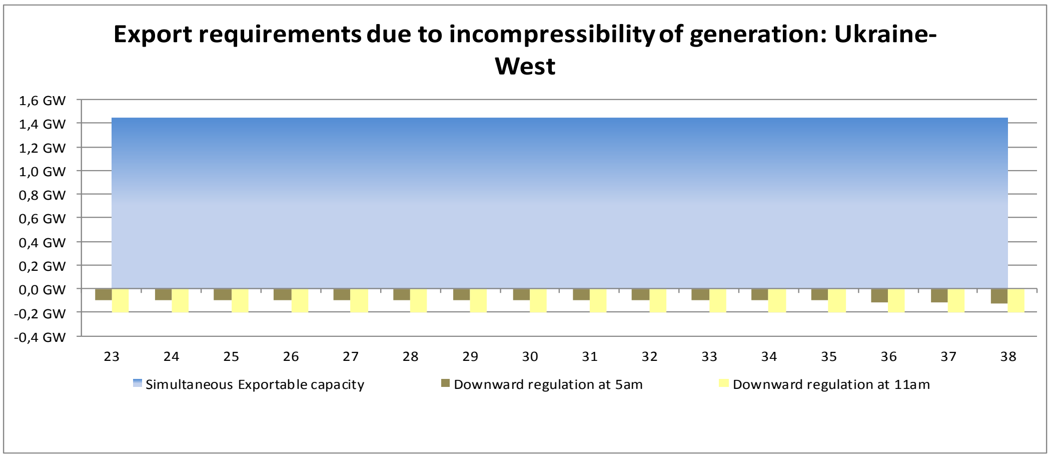

Export requirements due to incompressibility of generation: Switzerland
6,0 GW
5,0 GW
4,0 GW
3,0 GW
2,0 GW
1,0 GW
0,0 GW
-1,0 GW
-2,0 GW
-3,0 GW
-4,0 GW
-5,0 GW
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Simultaneous Exportable capacity
Downward regulation at 5am
Downward regulation at 11am

Ukraine West









Appendix 2: Individual country comments to Winter Review

Albania

General comments on the main trends and climatic conditions

The winter 2014-15 was a mild one with an exception of several days in January, and we can say that we did not face with severe conditions during that period of winter. Temperatures in the lower and coastal areas, where the most of electricity consumption is concentrated, did not exceed the foreseen values. The average daily temperature in these areas was about 8 degrees centigrade, and the low one was around 2 degrees centigrade. During that period, especially in February, we had abundant inflows in reservoirs of Drini cascade power plants, the main source of generation in the country.

Occurrence of the identified risks

During the winter period, we did not face with the risk identified in the previous report of winter outlook.

Unexpected situations

We did not faced with problems or difficulties relating to the transmission system, so we had no reduction in transmission capacity either in internal network or in interconnection network. Availability (transmission capacity) of import/ export was in the full capacity.

Effects of external factors on demand

During that period, especially in January and February, we faced a reduction of the demand with about 8% compared with a year ago, due to the actions undertaken by DSO for reduction of non-technical losses in the distribution system, as shown in the attached graphs.

An indication of the most stressed periods for system adequacy

Due to abundant inflows and available generating capacity, we did not faced stressed periods for system adequacy.

Specific events occurred during the winter

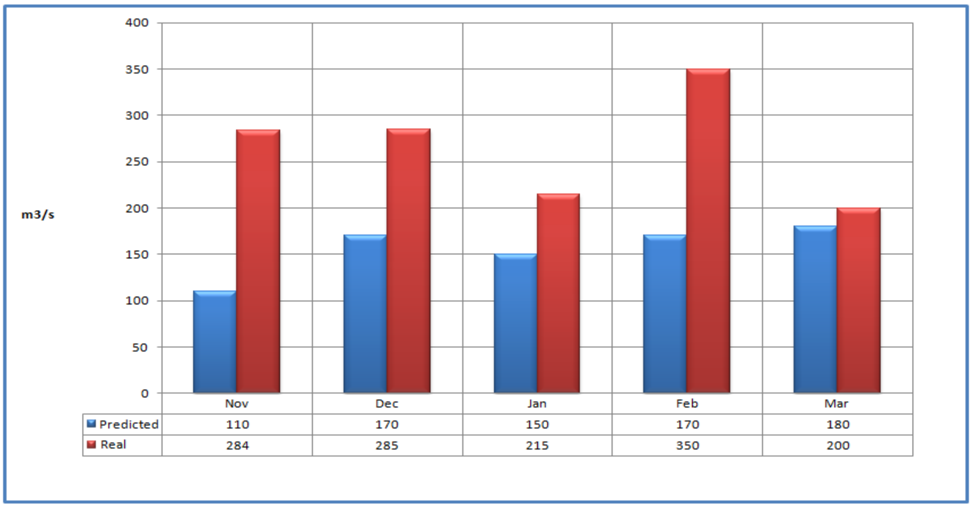
Our power system did not face with specific events such as extreme temperatures, increased outage rates, and other events of this nature.

Detailed review of the most stressed periods

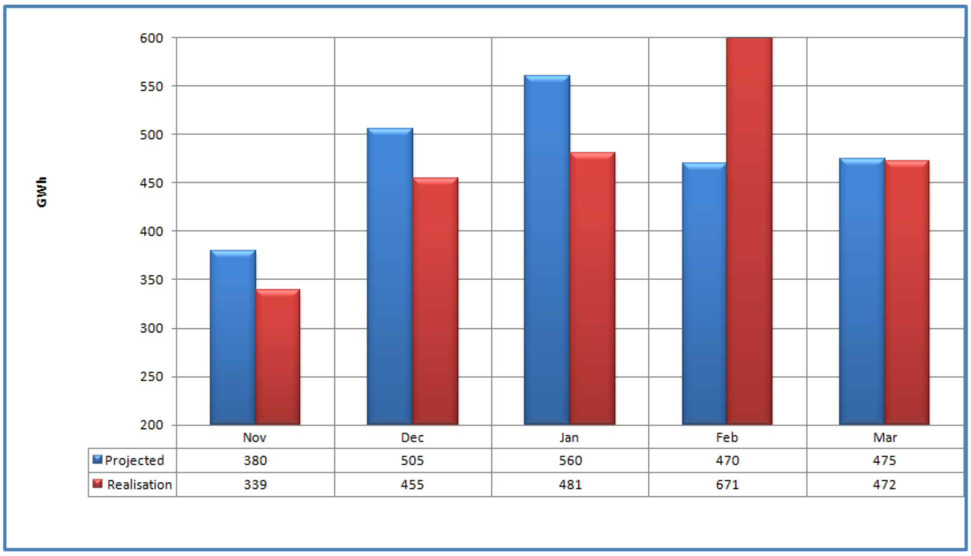
Regarding energy parameters, following the demand reduction and abundant inflows in Drini cascade, there were some changes in generation and imports compared with the plan for these parameters.
In the next worksheet there are some graphics showing the implementation of key energy parameters, monthly basis, and comparison with the values previously planned by us. It should be noted that during the winter period we have had no problems of grid congestions because the maintenance works have been completed around the end of October. Meanwhile there have been some short-term supply interruptions for periods of several hours announced in advance, due to rehabilitation works that still continue in our 400 and 220 kV substations.

Lessons Learned for next winter

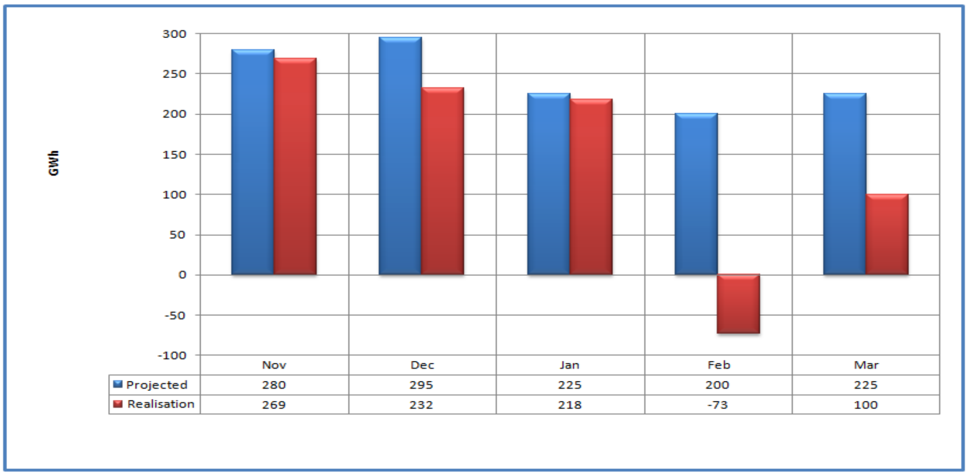
It is clear that we have to go ahead and accelerate the projects in Generation and Transmission system, in order to diversify generating sources and reduce the dependence from electricity import



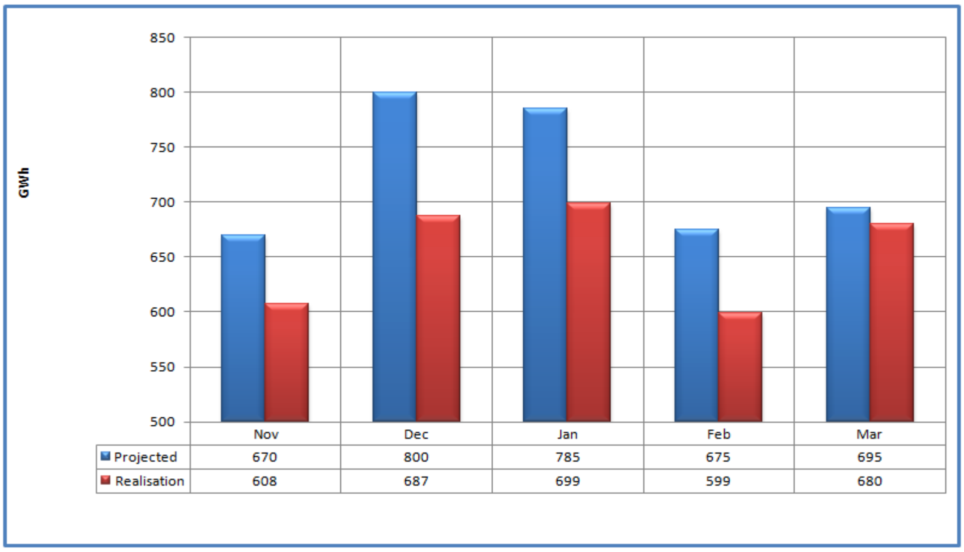
Monthly inflows at Fierza HPP



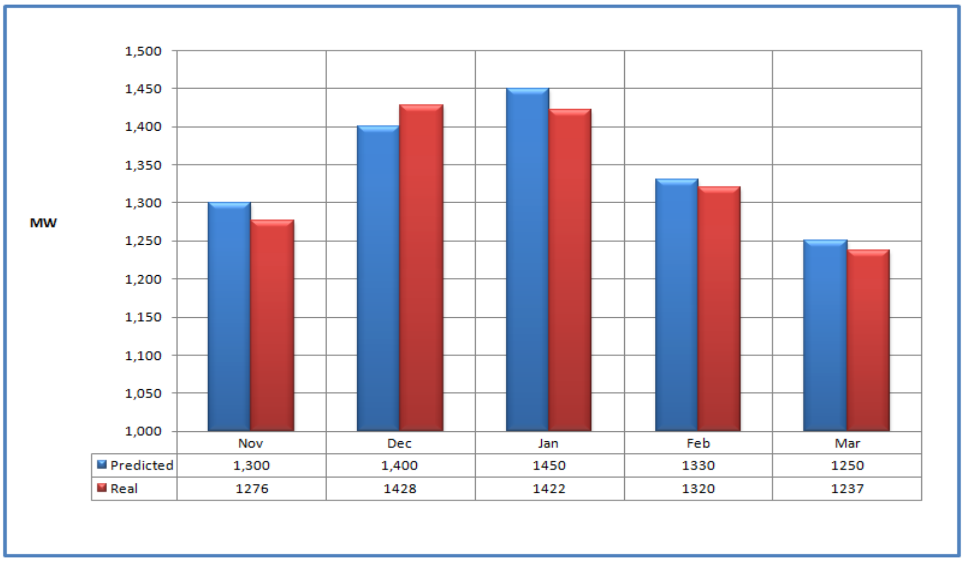
Monthly total production



Monthly import



Monthly consumption



Monthly peak load

Austria

General comments on the main trends and climatic conditions

Winter 2014/2015 was outstanding mild compared to previous winters.

Occurrence of the identified risks

Low thermal production and increased renewable infeed in Germany lead - as expected - again to high imports throughout winter time. Due to the rise of redispatch (e.g. cross border redispatch) there were less imports than during winter 2013/2014.

Unexpected situations

Due to two new 380-kV-lines connecting the substations Dürnrohr and Wien Südost the security of supply of the city of Vienna has been improved. Compared to winter 2013/2014 wind power and solar power has been expanded a lot in Austria.

Effects of external factors on demand

Due to economic conditions a slight decrease of load was detected.

Belgium

General comments on the main trends and climatic conditions

In general, climatic conditions were mainly close to average values past winter. Temperature-wise, past winter can for Belgium be considered as a mild winter, with very few days with extreme temperatures and no significant cold spells. This resulted in average demand levels with very limited spikes caused by extreme temperatures, also because the few days with low temperatures were mainly concentrated in the holiday period, where demand levels are traditionally lower. Secondly, wind infeed throughout winter was above average, positively contributing to the generation-demand balance. Thirdly, a very good availability of the conventional generation fleet was obtained, partially thanks to good preparations for the winter. Apart from a few single days and a more extende period at the end of March, no significant amount of Forced Outages was experienced. Additionally the planned return to service of the Doel 4 nuclear unit was honoured and even exceeded with an early return.

Occurrence of the identified risks

Before winter, significant risks for the Belgian system were identified in case extreme conditions would materialize. For this reason a strategic reserve was constituted in Belgium. In hindsight, all parameters (weather, renewables infeed, Forced Outages, etc.) considered, past winter was a normal to mild winter, which resulted in a situation close to the "Normal Conditions" as expressed in the Winter Outlook. As was foreseen in such a scenario, no activation of strategic reserves was needed, and therefore also no acute risk of scarcity is experienced.

Unexpected situations

At November 30th, an unexpected outage of a 1000 MW nuclear unit was experienced. However unexpected, an event of this size was accounted for under the "severe conditions" in the Winter Outlook. Therefore no "out-of-scenario" situation was encountered past winter.

Effects of external factors on demand

No significant difference (growth nor decrease) in demand with respect to past winter could be identified.

An indication of the most stressed periods for system adequacy

As previously described, the most stressed period for system adequacy was driven by the Forced Outage of a 1000 MW nuclear unit on Sunday, November 30th. Mainly the weekdays after the event could potentially be stressed; however a swift return of the unit in the system has resulted in limited impact on system adequacy in practice. Additionally, a combination of Forced Outages of conventional units occurred on the 26th of March, leading to high prices on the Day-Ahead Market for Belgium and for some hours. The market however reacted appropriatedly which led to a disappearance of those high prices for the days after.

Specific events occurred during the winter

No extreme temperatures, nor extreme Forced Outage levels were experienced. Import levels were high throughout winter, which was expected due to the structural depence on imports of the Belgian system.

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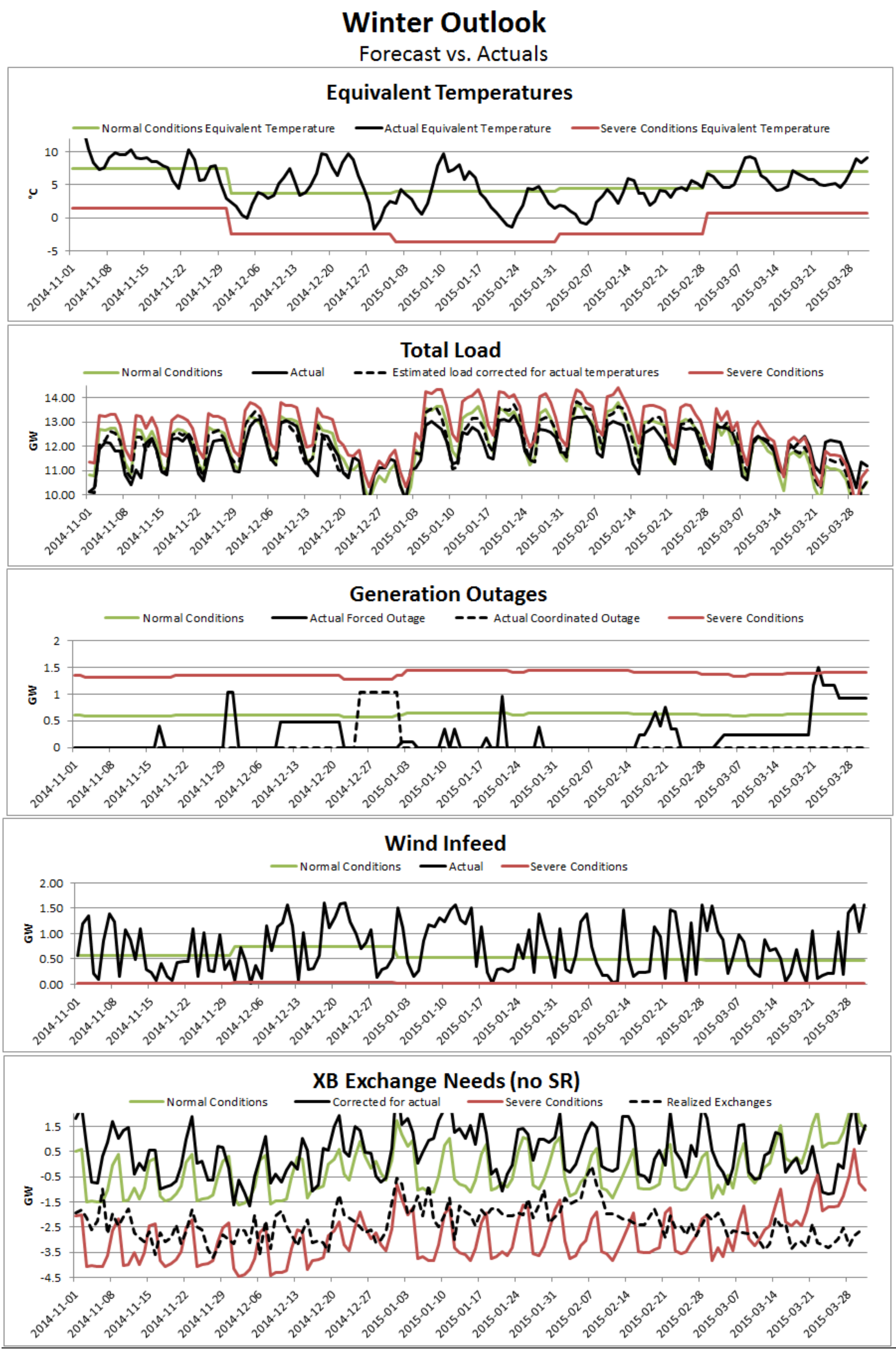

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Bosnia and Herzegovina

General comments on the main trends and climatic conditions

During the winter period 2014/2015 there were not significant unusual events in the electric power system of Bosnia and Herzegovina. Maximum load occurred on December 31 at 18:00, and it was 2207 MW. Maximum load on January was registered on January 5, at 18:00, and it was 1997 MW.

Bulgaria

General comments on the main trends and climatic conditions

There were no balancing problems during the past winter period. The monthly consumption during the winter period compared with the same period of the previous year is as follows: drop by 2.8 % in December, increase by 4.3 % in January and increase by 6.1 % in February. The highest load for the past winter period was observed on 31 December 2014 – 7106 MW. Compared with the peak load of the previous winter (6915 MW on 31 January 2014) the increase is by 2.8 %. Water levels in the big reservoirs were quite high because of substantial snowfall and rainfall during the period which forced continuous controlled discharge of large water masses from some cascades. Compared with the previous winter period exports have increased by 39 %. There were no critical outages in the transmission network.

Croatia

General comments on the main trends and climatic conditions

During winter 2014/2015 climatic conditions were as usual. Extremely low temperatures occurred in last days of year 2014, snow and ice mainly at first half of February 2015.

Occurrence of the identified risks

The risks identified in the Winter Outlook Report 2014/2015 mainly did not occur.

Unexpected situations

There was not any unexpected situation with an effect on Croatian power system.

Effects of external factors on demand

During winter 2014/2015 the highest load was around 200 MW lower than historical maximum from February 2012, and average load was also lower. Reason for that are slightly higher temperatures, but energy efficiency policy has also an important role.

An indication of the most stressed periods for system adequacy

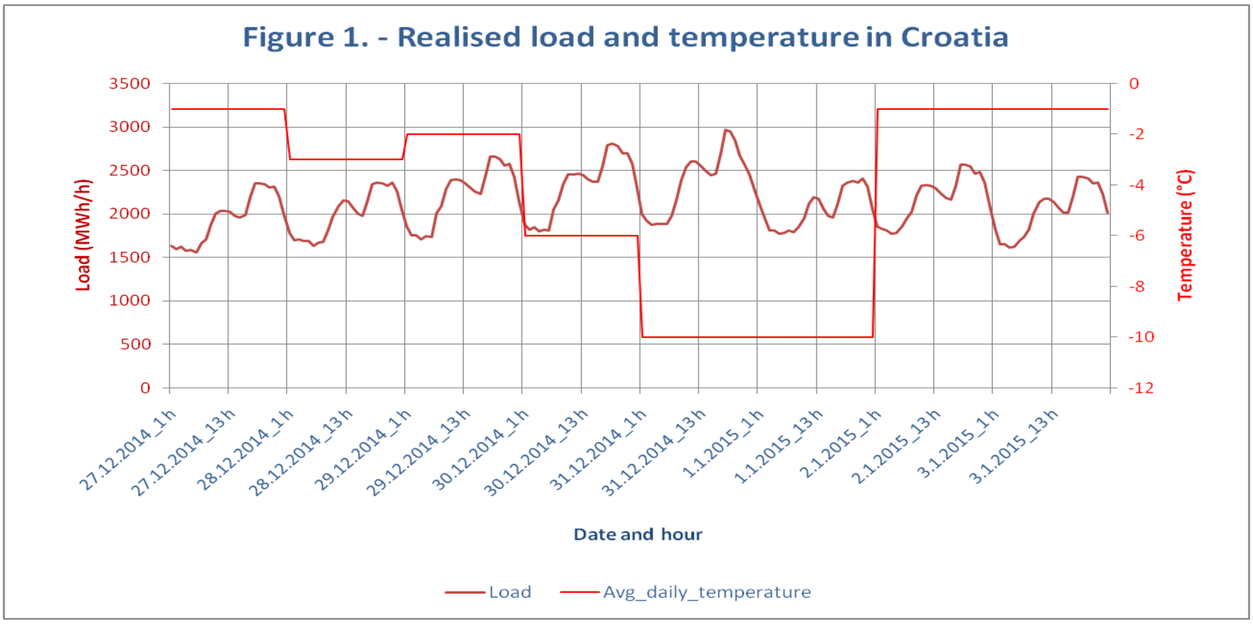
Most stressed periods were in the last week of year 2014 (low temperatures) and beginning of February 2015 (snow and strong wind at some parts of Croatia).

Specific events occurred during the winter

Extremely low temperatures appeared in last days of year 2014. Consequence was the highest load of that year, but the system stayed stable. Snow, ice and strong wind caused some difficulties in supply during February 2015. The objects of voltage level lower than 110 kV were mostly affected.

Detailed review of the most stressed periods

Figure 1. at the sheet "Optional explanatory graphs" shows arise of the consumption during the period with the highest load in winter 2014/2015. At that time the temperatures were the lowest in Croatia. Structure of generation and import is shown on Figure 2. It is remarkable that engagement of the gas using thermo power plants is not dominant. The generation-demand balance is met mainly by production from hydro power plants and by net import.



Cyprus

General comments on the main trends and climatic conditions

Load demand recorded was within expected range for normal weather conditions.

Occurrence of the identified risks

No risks were identified.

Detailed review of the most stressed periods

No stressed periods were observed.

Czech Republic

General comments on the main trends and climatic conditions

The main factors influencing winter conditions were significant fluctuations in weather from December 2014 to February 2015. Temperatures were above the average. This winter is also represented by the lack of snow.

Occurrence of the identified risks

No significant risks were identified in the Winter Outlook report.

Unexpected situations

Unexpected situations were represented by significant fluctuations in weather from December 2014 to February 2015, but they had no significant effect on the power system. There were no unexpected situations with an effect on the power system.

Effects of external factors on demand

There were no significant external factors with effects on demand in CZ.

Specific events occurred during the winter

Specific events during the last winter period were significant fluctuations in weather from December 2014 to February 2015. Specific events during winter 2014/2015 were represented by temperatures above the average and lack of snow.

Detailed review of the most stressed periods

Significant fluctuations in weather were not expected from December 2014 to February 2015. However they did not have any significant effect on the power system. There were no stress periods with significant effect on the power system.

Denmark

General comments on the main trends and climatic conditions

It has been a relatively calm winter with a few storms, one in December 2014 and one in January 2015. The storms haven't had any influence on the grid and the winter didn't give any occasion to galloping lines or snow.
The fall and winter presented many projects, New Skagerrak 4 connection to Norway is almost brought to end and Energinet.dk has assigned the 150 kV grid from Western Jutland.
The assignment for the last part of the 132 kV grid on Zealand is started primo January and expected to be completed to June this year. This have until know gone smoothly. Projects in relations to the cable action plan runs sideways. Overall, the first months of 2015 have passed by without any problems.
There haven't been any power balance problems. The power stations, which have been available during the winter, has been running. The demand for district heating have caused the power stations to operate by their own willingness. Nothing to comment on electricity surplus, days with high electricity production have been handled in the day ahead market.

Konti-Skan 1 is disconnected as a result of a transformer outage and will be disconnected for the following months to come. The trade capacity at the border against TTG has been characterized by large limitations especially in the southbound direction, caused by a large amount of wind in the grid and modification of the grid in Northern Germany.

Estonia

General comments on the main trends and climatic conditions

The winter 2014/2015 was similar to the last year's winter. The peak load was only 1423 MW which is 5,8% less than in previous winter. Peak load was measured in 2.12.14 14:20 and the temperature was -11 °C. The average temperature of winter (December until March) was around -1 °C, for comparison in previous winter the same period it was -2,59°C. During this winter was typical that cold weeks alternated with the thaw. The generation was sufficient to cover the load, even during peak load and the system was in net export.

Occurrence of the identified risks

There were now particular risks identified and no risks occurred, partly due to mild winter.

Finland

General comments on the main trends and climatic conditions

Winter 2014 - 2014 was mild in Finland. Temperatures were 2 to 4 degrees above long term average. January was the coldest month but it was warmer than in average, too.

Occurrence of the identified risks

No extreme temperatures were reached and no remarkable failures occurred at the time of peak load. However, available generation capacity was roughly 300 MW lower than estimated in autumn. Two units were unavailable till the end of January.

Unexpected situations

No remarkable failures occurred at the time of peak load.

An indication of the most stressed periods for system adequacy

Peak load was registered in week 4 when low temperatures were reached also in southern parts of the country within couple of days. Peak load was covered with domestic generation and import from neighboring areas as in previous winters. Major part of domestic generation capacity was in use. Import capacity from Sweden was almost fully utilized and there was low export to Estonia in peak demand hour. Import from Russia could have been increased.

Detailed review of the most stressed periods

A 13.5 GW peak demand was recorded in January when colder temperatures were reached within couple of days. The peak demand was less than estimated 15 GW including 0.5 GW load reduction in severe conditions. In colder temperatures, higher demand values would have occurred.

Peak load was covered with domestic generation and import from neighboring areas as in previous winters. There were no failures and no need to start the national peak load reserve at the time of peak load. Domestic generation in peak demand hour was 10.9 GW whereas the estimation of the available generation capacity was 12.5 GW including 0.4 GW peak load reserve. Two units were unavailable till the end of January. Output of hydro power and combined heat and power plants could have been higher. Import capacity from Sweden was almost fully utilized and there was low export to Estonia in peak demand hour. Import from Russia could have been increased.

France

General comments on the main trends and climatic conditions

This winter was relatively warm from October 2014 to January 2015, the average temperature was around 1.2°C under normal conditions (+0.8°C in 2013). In November 2014, the warmest temperatures were recorded since 1994.
The average cloud covering was mild for the whole winter.

Occurrence of the identified risks

In the winter outlook, weeks 5 and 6 were identified as the most constrained weeks with a maximum forecast of consumption estimated at 84 000 MW (under normal conditions).
Maximum consumption has finally been recorded the 26/01/15 at 7:00 pm with 86 343 MW. (84 100 MW in 2013)

Unexpected situations

No unexpected situation arose during this winter.

Effects of external factors on demand

In November, there was a drop of 10% in demand, due to warmer temperatures this month. After many years of decrease, the industrial sector demand has started to increase. A fall of demand in SMI/SME sectors has been observed.

An indication of the most stressed periods for system adequacy

No stressed periods for system adequacy has been registered for this winter.

Specific events occurred during the winter

There is no specific event that occurred this winter. Concerning the use of the interconnection capacity, the monthly balance of RTE was in export during all winter, mainly because of high export rates at Belgium, United Kingdom and Italy borders, even if high import rates were reached with Germany, because of favorable wind conditions.

Detailed review of the most stressed periods

Winter was quite peaceful this year, no stressed periods have been registered. RTE was ready to confront a potential Belgium Crisis that could have been caused by a loss of production capacity during the winter, in addition of the 30% loss since winter 2013-2014: however no significant event occurred and there was no need to activate such crisis organisation.
Moderate national consumption combined with a high level of nuclear availability (highest nuclear power production in January 2014 since 2011), a high hydro-power availability and a good availability of the interconnection lines have enabled France to have a calm winter.
The winter was in keeping with the winter outlook.

FYR of Macedonia

General comments on the main trends and climatic conditions

There wasn't any unexpected situation during the winter period. The operation of power system was secure and reliable over all winter period.
From the point of view of system adequacy, load – generation balance was not at risk during the whole period of winter 2014/2015 in the Macedonian System.

Germany

General comments on the main trends and climatic conditions

On average so far a mild and windy winter all over Germany. In January, the highest temperature since records began occurred (over 20 degrees) followed by a colder February.

Occurrence of the identified risks

No longer and German-wide cold spell and no gas shortage have occurred in the last winter so far. The expected high utilization of the interconnectors occurred.

An indication of the most stressed periods for system adequacy

The holidays around Christmas and New Year's Eve and the solar eclipse which will occur on 20th March.

Specific events occurred during the winter

Extremely high level of wind feed-in.

Detailed review of the most stressed periods

Germany saw an all-time high wind feed-in twice on the 09.12.2014 (29.7GW) and 09.01.2015 (30GW) and generally a period of a high average wind generation in December and January. These situations caused a high level of system stress which was mainly solved by extensive measures of redispatch (national and international redispatch) and curtailment of wind. On December 20th 96MW of previously contracted reserve power in Northern Italy were requested by the German TSO based on day-ahead network safety calculations to support internal redispatch measures. Contrary to the expectations there were no situations of high balancing power demand during the holidays around Christmas and New Year's Eve.
There were no major outages or unexpected load/demand situations.

Lessons learned for next winter

An increasing share of critical system states in the distribution system led to more curtailment of wind arranged by the Distribution System Operators.

Greece

General comments on the main trends and climatic conditions

The situation of the Greek System the last winter was in a normal level with wet winter and the average temperature was around to the 9°C. The peak was reached on the 8 of January 2015 18:18 (CET) around to 9284MW.

Occurrence of the identified risks

No risk occurred during last winter for the Greek System.

Unexpected situations

The only unexpected event that was arise during the winter was the destruction of two generator units with total capacity 450MW (Ptolemaida No.3 & No.4) due to fire damage at the 09/11/2014.

Effects of external factors on demand

The effects of external factors on demand:
- Economic conditions.
- Climate change.

An indication of the most stressed periods for system adequacy

The most stressed period for the system adequacy was the 51th and 52th week of 2014.

Specific events occurred during the winter

The basic event was the high inflows in the reservoirs during the end of January and the beginning of February. The power system did not face other events.

Detailed review of the most stressed periods

During the past period the consumption did not reach extremely high values. Cold weather followed by snow and ice at the some days of January and February caused some difficulties in transmission network and interruption of supply. Extremely high floods has been occur this winter (end of January and beginning of February).

Lessons learned for next winter

The amount of RES penetration in the system must to be scheduled in cooperation of the conventional units.

Great Britain

General comments on the main trends and climatic conditions

The UK mean temperature for winter was near average. The mean temperature was slightly above average for December, but near average for January and February, with anomalies of +0.5 °C, +0.1 °C and -0.1 °C respectively. The winter peak demand occurred on the 19 January 2015. It was metered at 53.3 GW including station load and exports and was well below the forecast Average Cold Spell (ACS) of 55.0 GW. Over the winter there was sufficient generation available and demand was met in full and no system warnings were issued.

Occurrence of the identified risks

Wind levels were not at a low level over the peaks this winter which was highlighted as a risk. Interconnectors were also importing strongly over the peaks .With the favorable above conditions no NISMs were issued and our new products of SBR and DSBR were not called upon.

Unexpected situations

We had a large over run of planned outages at the beginning of clock change but this did not have a serious impact on power system.

Effects of external factors on demand

Demand was on forecast. The level of customer demand management (CDM) at peak demands was thought to be up to 1,200 MW.

An indication of the most stressed periods for system adequacy

On four occasions we were warming oil which meant we were down to our last unit for contingency. There were no substantial losses of generation throughout the winter and the system was not put under any additional stress. There was sufficient generation available and demand was met in full and no system warnings were issued.

Specific events occurred during the winter

Gas prices remained high over the winter and coal prices eased slightly, making coal significantly more economic than gas-fired generation. As a result, coal took a larger proportion of the total generation than gas.

Detailed review of the most stressed periods

The tightest margin was on the 29/10/2014 which was the Wednesday straight after clock change. This was due to the demand ramping up and generators not returning from planned outages on time.
On this day a total 9.2GW of plant was on planned outage, 5.0GW of conventional, 4.2GW of nuclear. Out of this a total 5.3GW of plant had a delayed return to service. Assessment at 1600hrs on 28th for Wednesday

29th October indicated we were only one large machine loss (c. 500MW) away from NISM over the peak period.

Hungary

General comments on the main trends and climatic conditions

Winter of 2014-2015 was very calm for the Hungarian power system. The total demand was slightly higher than in the last year. Outages of generators were rather low. The grid was reliable and controllable. MAVIR, the Hungarian TSO procured the necessary amount of reserve power by concluding market maker contracts, which put an obligation on the market participants to offer their capacities on the daily market of ancillary services. This solution proved to be effective.

Unexpected situations

Albertirsa–Göd I-II. 400 kV TL had been tripped on 02.12.2014 early morning, due to heavy icing. 13 pylons have been collapsed, further 8 pylons have been seriously damaged. (17 pylons of Ócsa-Zugló 220 kV TL in the same area have been seriously damaged as well). Reconstruction of the TLs will last several months. Considering this changed situation, we are still scheduling the planned maintenance for February-March.

Effects of external factors on demand

The effects of external factors on demand:
- Climate change
- Holidays

Specific events occurred during the winter

The imports from neighboring states were higher than in the last year.
Albertirsa–Göd I-II. 400 kV TL had been tripped on 02.12.2014 early morning, due to heavy icing. 13 pylons have been collapsed, further 8 pylons have been seriously damaged. (17 pylons of Ócsa-Zugló 220 kV TL in the same area have been seriously damaged as well.) Reconstruction of the TLs will last several months. Considering this changed situation, we are still scheduling the planned maintenance for February-March.

Detailed review of the most stressed periods

There weren't any weeks, when the actual demand was more than 500 MW higher than the expected demand. Generator outages were under 500 MW in the whole winter period, excluding only a few days (11.04-11.05.), when they were over 1000 MW.

Iceland

General comments on the main trends and climatic conditions

The installed generation capacity provided acceptable system adequacy during the winter period 2014 – 2015. The total yearly fed into the transmission system was 17.5 TWh in 2014. The peak load observed tis winter was 2203 MW. In the first half of 2014, the curtailment of primary load was quite high due to low water levels and transmission bottlenecks. Landsnet has ongoing plans for reinforcing the transmission system for removing these bottlenecks. These plans are published in the System Planning report, issued yearly.

Ireland (IE)

General comments on the main trends and climatic conditions

Ireland experienced no major weather events in winter 2014/2015. The lowest temperature recorded was in December 2014 (-6.9 °C). January was the windiest in 22 years, nearly 2/3 of the days with Force 9 or 10 winds.

Occurrence of the identified risks

The capacity margin in Ireland for the winter period remained well above critical levels. There was one gas plant on outage during October and November but this did not impact significantly on the overall security of supply.

Unexpected situations

The East-West Interconnector experienced an unexpected forced outage in December but this did not impact significantly on the overall security of supply. When the interconnector was available, it was capable of 530MW import capacity 500MW export capability. It usually operated in an import capacity which made it the largest single infeed and, as a consequence, provided greater security of supply. The generation and transmission capacity for the period was adequate for the predicted demand levels.

Effects of external factors on demand

The peak in winter 2014/2015 was 4704 MW (19th Jan 2015 17:45), an increase on the 2013/2014 winter system peak of 188MW.

An indication of the most stressed periods for system adequacy

The most stressed time on the system occurred on 17th December during the highest demand period of the system. However on this day demand remained 147MW below that predicted for the Winter Outlook in 2014. Therefore the system was well equipped to deal with the highest demand period of the year.

Italy

General comments

The adequacy evaluations for the winter period has not evidenced particular risk for capacity adequacy and load covering.

The winter 2014-2015 recorded a values of the average temperatures slightly lower than the same period the previous year, especially in February, but not enough to cause significant impact on energy demand.
Over this period, the total volume of demand decreasing of 1,6% respect the same period of last year. Meanwhile, the peak of consumption has been reached on December 10th with 51.466 MW (-0,1% respect previous year).

Use of interconnections

The new HVAC cable Italy-Malta is operational from March

Italian northern interconnection has been characterized, for the most of the time, by import conditions from the neighbouring systems bordering at the northern interconnection. In several occasions, due to high generation from renewable sources, the Italian interconnection has recorded export towards the neighbouring systems.

Latvia

General comments on the main trends and climatic conditions

Load sensitivity mostly is dependent on air temperature in winter and air temperature is one of the significant indicator for load deviations from yearly average peak load. During the winter period the peak load has tendency to increase when air temperature is decreasing below 10 °C. During December the load was lower as expected although the average air temperature was lower by 3,4 °C. In the end of December and during January the load was higher as expected in normal and severe conditions although air temperature was higher by 4,6 °C as in the same time period in previous winter. From February the load is lower all the time as expected in normal and severe conditions. No high floods and rapid melting of snow/ice observed. During the winter the air temperature also influencing NTC values on cross-borders therefore during the winter period the NTC values on EE-LV cross-border were increased. The NTC values from EE to LV and LV to EE almost whole winter period were lower as expected before, but at the same time the NTC values from LT to LV and LV to LT were higher as expected before.

Occurrence of the identified risks

Due to the very high electricity deficit in Latvia and Lithuania the electrical flows were from north to south and the congestions on the border EE-LV in Baltic States occurred. The EE-LV boarder is the weakest point for electricity flows in Baltic States.

Lithuania

General comments on the main trends and climatic conditions

The weather in winter 2014/2015 was warmer than in last winter. The average temperature during December and January in 2014/2015 was 3°C higher than previous year. Despite the warmer weather in winter 2014/2015 the load increased approx. by 3,6 % mainly due to higher consumption of industrial customers. The maximum load 1783MW was reached in the first week of December 2014 when the average daily temperature was -6°C.

Occurrence of the identified risks

The risk related with wind turbine icing didn’t occur. There were few short wind farm icing events during low wind speed period, therefore balancing reserves were sufficient to compensate actual imbalances.

Unexpected situations

There were no unexpected situations for system adequacy during the last winter period.

Effects of external factors on demand

The main reason influencing the variable load demand is the climate change. The weather this winter was 3 degree warmer than last year. There are no any identified effects for demand changing.

An indication of the most stressed periods for system adequacy

There were no stressed periods for system adequacy during the winter period.

Montenegro

General comments on the main trends and climatic conditions

The electric power balance for this period was positive due to good hydrological conditions.

Occurrence of the identified risks

We did not face with risk identified in previous reports.

The Netherlands

General comments on the main trends and climatic conditions

The winter of 2014-2015 was a relatively mild winter and one of the warmest of the last decades. There have not been any difficulties within the Dutch grid during this period. The expected winter period peak was around 18,350 MW, the actual peak was somewhat lower, to be specific 18,029 MW and occurred on the 3rd of December (18:00 CET). The maximum temperature on that day was 1,0 and the lowest -3,0 degrees Celsius. The lowest load (9,574 MW) during the winter period 2014-2015 was reached on November 2nd, 2015 (05:00 CET).

Occurrence of the identified risks

There was a general risk identified within Belgium due to a shortage of available capacity. Due to the, amongst others, mild winter no problems occurred.

Unexpected situations

No unexpected situations arouse.

An indication of the most stressed periods for system adequacy

The most stressed week was week 50 where we had the lowest amount of remaining capacity, but due to the fact that the remaining capacity during stressed periods was still 7,52 GW it was not a problem area

Northern Ireland

General comments on the main trends and climatic conditions

There were no major weather events during the winter period that had an effect on operations.

Occurrence of the identified risks

No, the risks identified based on planned outages in Northern Ireland did not occur.

Unexpected situations

An amber alert was issued in Northern Ireland on the 3rd of December.

Detailed Review of the Most Stressed Periods

Northern Ireland were in "Amber Alert - Level 2" on the 3rd of December. Forced outages of two generating units in Northern Ireland and low wind levels resulted in the amber alert.

Norway

General comments on the main trends and climatic conditions

2014 were about 2,5 °C warmer than normal and a little lower inflow than normal. High temperature, especially in the consumption areas in the south of Norway, resulted in low demand. High inflow and low production resulted in normal reservoir levels. It was mostly net export during the year.

Detailed review of the most stressed periods

The energy balance can change very fast, from a high surplus before the winter period, to a deficit at the end. This can be worse if the spring period arrives some weeks later than normal.

Poland

General comments on the main trends and climatic conditions

There was no problem with balance the system last winter as winter was mild, however operational conditions were difficult periodically, because Polish power system is affected by high unscheduled transit flows through the system from the west to the south. The flows limit capacity on the whole synchronous DE/CZ/SK profile, which could be offered to the market and on top of that, occasionally causes congestions on the western border (violation of n-1 rule). To keep system safe PSE had to activate some remedial actions – like e.g. bilateral cross-border redispatching – many times. In the period from November 2014 till end of March 2015 the number of days, when the activation of bilateral cross-border redispatching was necessary, is almost three times more than in the same period of winter 2013/2014. At the same time the volume of energy used for bilateral cross border redispatching action increased nearly by 4 times.

Portugal

General comments on the main trends and climatic conditions

This winter season temperatures were generally lower than average, which boosted electricity demand. The winter peak load (8618 MW) occurred on the 7th January, having an increase of about 500MW from last year level, however still remained 800 MW below the historical record of 2010. During this season conditions were not so favorable for renewables as in previous year, both for wind and hydro, so thermal generation had a higher level of utilization. However, the Portuguese system registered some interesting figures this winter: The 2921 MW export record, the 4128MW wind generation record and, on 2nd February at 18:45, the grid transmitted the highest power level registered in Portugal: 10661MW.

Occurrence of the identified risks

The secure margins identified in WOSR were generally confirmed.

Unexpected situations

No situations with a significant impact on generation/demand balance or transmission capacity to report.

Romania

General comments on the main trends and climatic conditions

During the December 2014, January and February 2015 the temperature and the total precipitation amounts had registered normal values. As a conclusion, there were not special phenomena during the last winter.

Occurrence of the identified risks

The Winter Outlook Report 2014-2015 did not identify any risk in terms of adequacy. Also, during the last winter 2014-2015 any risk did not occur in terms of adequacy.

Unexpected situations

There were not any situations that could have affect the power system adequacy during the winter 2014-2015.

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Detailed review of the most stressed periods
During the last winter certain unplanned disconnections of internal lines occurred, but without any influences on interconnection capacities. The interconnectors were used to facilitate the exchange schedule (export/import) according to the allocated NTC values on the market.

Serbia

General comments on the main trends and climatic conditions

The Serbian power system passed through the winter without any problems. Climatic conditions were normal and energy import was realized in December, January and February as it was planned.

Occurrence of the identified risks

All three risks mentioned in the Winter Outlook didn't occur this winter. Temperatures were normal, gas supply was normal and arranged energy imports were more than enough to cover lack of energy due to restricted coal supply as consequence of flooded coal mines.

Unexpected situations

In early December, cold wave followed by ice and stormy wind hit the eastern part of Serbia and caused serious damages of 110 kV power lines in that region. As a consequence, many households were left without electricity for a long period but in general the impact on the transmission network was not significant.

Effects of external factors on demand
In Serbian power system demand is very sensitive to climate change.

Slovakia

General comments on the main trends and climatic conditions

During the winter period the Slovak Power System did not encounter any unexpected and unusual events or conditions.
The weather conditions of winter 2014/2015 were normal. December 2014 was warmer than in 2015. The average temperatures in January and February 2015 were lower than in 2014, especially in February 2015 (1.1 °C compared with February 2014: 3.8 °C), but February 2014 was unusually warm. The average temperature during winter months from December to February was 1.8 °C (the previous winter it was 2.1 °C).
The temperature had impact on the consumption. Following are preliminary results of energy balance of this winter (from December to February). There was an increase of consumption (1.45 %) and also an increase of production (2.02 %) of electricity in Slovakia compared with winter 2013/2014. The increase of production and consumption was in particular recorded in January and February 2015. The high increase of production was from hydro (20.5 %) and non-identifiable (11.2 %) power plants. By contrast, decrease in production was from thermal conventional (-10.5 %) and nuclear (-0.75 %) power plants. The winter peak load was recorded on Thursday, 7th January 2015 at 17:00, 4 150 MW (2nd week), in the previous winter it was 4 175 MW.
There was import of electricity into the power system of Slovakia during all winter months. The following figures are preliminary. The share of imported electricity on the consumption in winter 2014/2015 was about 4.3 %. The import of electricity was about 328 GWh in total. In the winter before (2013/2014) there was also import of electricity during the whole winter period (in total 364 GWh, share on consumption 5.0 %).
There were no critical outages and situations in the transmission network during the whole period.

Slovenia

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General comments on the main trends and climatic conditions

The average winter temperatures were above and the total amount of precipitation a little below the average. There were less days with snow cover and more sunny weather than usually.

Occurrence of the identified risks

No risk were identified in the Winter Outlook Report.

Unexpected situations

No unexpected situations aroused during the winter.

Specific events occurred during the winter

Since september 2014, the new lignite unit with net power of 545.5 MW in the Šoštanj thermal power plant is being tested. Several unexpected outages of this unit have occurred during the winter period but none of them had any significant impact on the system operation.

Spain

General comments on the main trends and climatic conditions

In general, the temperatures are being similar to average values during winter. Wind production is also similar to average. Water inflows are slightly lower than 2014.

Month by month:
December 2014:
Temperatures have been similar to average.
Water inflows in reservoirs were also similar to average.
Slightly lower wind production than in December 2013 (decrease of 3.7%).
January 2015:
Average temperatures have been similar to average.
Water inflows in reservoirs were lower than the average level (40% lower).
The wind production was lower than in January 2014, which was remarkably high. (decrease of 24% from 2014 to 2015)
February 2015:
Temperatures have been lower than average during the first half of December.
Water inflows in reservoirs were similar to average.
The wind production was slightly higher than in February 2014 (increase of 3%)

Occurrence of the identified risks

Not significant operational risks had been foreseen. System operation and system adequacy functioned without any larger problems during 14-15 winter.

Unexpected situations

No unexpected situations aroused.

Effects of external factors on demand

The demand values have been lower than last year in December, and have increased during January and February. The temperature had a negative effect on demand during December (-0.5%), and a positive effect on January (0.4%).

An indication of the most stressed periods for system adequacy

There has not been significant stress level for the system adequacy.

Detailed review of the most stressed periods

Actual demand was slightly lower than expected for the months of winter. Nevertheless, the demand monthly forecasts had a suitable accuracy.
The winter peak demand was lower than the estimation for extreme conditions, and it was reached on the first half of February 2015 (40.726 MW, 6.4% higher than last winter's peak). However, this winter peak demand is still much lower than the historical peak demand (44900 MW, reached during winter 2007).

Sweden

General comments on the main trends and climatic conditions

The winter of 2014/2015 has been very mild with no major problems for security of supply during the peak hours. Temperatures have been over average and the precipitation has been moderate.

Occurrence of the identified risks

To secure the power adequacy Svenska kraftnät contracts a so called Peak Load Reserve for the winter, consisting of production and load reduction. This reserve is available between November 15th and March 15th. The Peak Load Reserve can be activated on the Nordic electricity market, Nord Pool Spot (NPS), when there is a risk for curtailment. The Peak Load Reserve has not been activated this year. The availability of the nuclear units is the biggest risk outlined in the Winter Outlook Report concerning the Swedish power balance. Ringhals 2 was expected to be available during the winter, but the plans were changed and the plant was unavailable during the whole period. The power balance in Sweden could however still be maintained in a satisfactory way.

Unexpected situations

The nuclear power plant Ringhals 2 was unavailable during the winter. A reduced availability of nuclear units reduces the transmission capacity in the Swedish national grid, but no greater problems occurred due to this event.

An indication of the most stressed periods for system adequacy

During the winter some storms occurred, but this did not caused any major problems. Due to the mild temperature there was no problem at peak load hours.

Specific events occurred during the winter
In the beginning of February there were some unexpected faults on two transmission lines with the result of an N-2 fault in the system. This caused a strained situation and led to large volumes of countertrade.

Detailed review of the most stressed periods

The winter 2014/2015 was warmer than the average Swedish winter. The peak load of this winter occurred on February 5th, at 17:00-18:00. The load was then 22 695, 05 MW. This is lower than expected in the winter forecast, which said 25 600 MW. The trend of decreasing electricity consumption continues and compared to the winter of 2013/2014, this year’s peak load was 2 000 MW lower.

Switzerland

General comments on the main trends and climatic conditions

The winter was characterized by relatively mild temperatures and low precipitations.

Occurrence of the identified risks

No risks were identified with the current adequacy methodology.

Effects of external factors on demand

There is no load shedding in Switzerland, the effect of climate change is still difficult to detect in demand and the effect of demand side management cannot yet be felt.

An indication of the most stressed periods for system adequacy

There were no stressed periods in terms of the 'classical' system adequacy.

Specific events occurred during the winter

The temperatures very unusually mild

Detailed review of the most stressed periods

This description does not concern 'most stressed periods' but it is general. There was no generation overhaul, as the overhaul of nuclear power plants takes place in the summer. The interconnectors were used as usual for importing and exporting, but nothing particular in that respect should be mentioned.

Appendix 3: Daily average temperatures for normal weather conditions – reference sets

Calculation of country's population weighted monthly average temperatures daily average temperatures

The steps for calculating the normal population weighted monthly average temperatures are as follows:

1. Collect data for the number of population ($\mathbf{NP_{country}}$) based on the latest census of each country7

2. Defining the number of cities in each country to be weighted ($\mathbf{NC_{weighted}}$). The lower threshold for calculating the weight is set to 3.000.000 millions inhabitants.

NC_weighted=INT(NP_country/3000000)+1

3. Taking data for the number of population ($\mathbf{CP_i}$) of each of the first $\mathbf{NC_{weighted}}$ biggest cities (cities preliminary arranged in descending order by number of population)

4. Defining the weighting coefficient (Ki) of each city using the formula:

$$K_i = \frac{CP_i}{\sum_i CP_i} \quad , i = 1 \text{ to } \mathrm{NC}_{weighted}$$

5. Collect data for the normal monthly average temperatures of the selected cities8:

$$NMAT_{ij} \quad , i = 1 \text{ to } \mathrm{NC}_{weighted}, \; j = 1 \text{ to } 12 \;\; (1 = \text{January}, 2 = \text{February}, \ldots.)$$

6. Defining the country's population weighted normal monthly average temperatures

$$CPWNMAT_j = K_i \times NMAT_{ij} \, ,$$
$$i = 1 \text{ to } \mathrm{NC}_{weighted}, \; j = 1 \text{ to } 12 \;\; (1 = \text{January}, 2 = \text{February}, ..)$$

The resulting population weighed normal daily average temperatures which will be derived from the population weighed normal monthly average temperatures are obtained as

$$CPWNMAT_{ij}$$
$$j = 1,2,3,\ldots\ldots, ND_{i\,month}, \; i = 1 \text{ to } 12 \;\; (1 = \text{January}, 2 = \text{February}, ..)$$

$\mathbf{ND_{imonth}}$- number of days of month j

7 The source of data for the number of the countries and the corresponding cities population is www.cia.gov/library/publications/the-w orld-factbook/, world.bymap.org, www.citypopulation.de

8 Source: the climatology database of the World Meteorological Organization (WMO), based on 30 years of observation (www.worldweather.org). There is also a free access to these data via many other specialized websites for meteorological information

1. Assigning the population weighted normal monthly average temperatures $CPWNMAT_{ij} = CPWNMAT_j$
to the dates corresponding to the middle of each month:

$CPWNDAT_{1\,16} = CPWNDAT_1$ 16 January
$CPWNDAT_{2\,14} = CPWNDAT_2$ 14 February
$CPWNDAT_{3\,16} = CPWNDAT_3$ 16 March
$CPWNDAT_{4\,15} = CPWNDAT_4$ 15 April
$CPWNDAT_{5\,16} = CPWNDAT_5$ 16 May
$CPWNDAT_{6\,16} = CPWNDAT_6$ 15 June
$CPWNDAT_{7\,16} = CPWNDAT_7$ 16 July
$CPWNDAT_{8\,16} = CPWNDAT_8$ 14 August
$CPWNDAT_{9\,15} = CPWNDAT_9$ 15 September
$CPWNDAT_{10\,16} = CPWNDAT_{10}$ 16 October
$CPWNDAT_{11\,15} = CPWNDAT_{11}$ 15 November
$CPWNDAT_{12\,16} = CPWNDAT_{12}$ 16 December

2. Defining the population weighted normal daily average temperatures $CPWNMAT_{ij}$
by linear interpolation between the 12 values corresponding to mid- month dates

3. Calculating two values for the annual average temperature (AAT) based on the two sets of data:

$$AAT_{monthly} = (\sum CPWNMAT_i/12)\text{, i = 1 to 12}$$
$$AAT_{daily} = (\sum\sum CPWNMAT_{ij}/365)\text{, i = 1 to 12, j = 1 to ND}_{i\ month}$$

4. Calibrating $CPWNMAT_i$ in order to reach the equality:

$$AAT_{daily} = AAT_{monthly}$$

by shifting $CPWNMAT_{ij}$ up or down with the correction value:

$$DT_{shift} = (AAT_{monthly} - AAT_{daily})\,/\,365$$

Polynomial 6-th order approximation is applied to the time series of $CPWNMAT_{ij}$ (i = 1 to 12, j = 1 to NDi month). The resulting set of 365 smoothly approximated values is ready to be used as the first reference set for the Normal Daily Average Temperatures valid for Normal Weather conditions **TEM$_{REF_SET1}$**

Methodology for load sensitivity calculation

Because of the clearly defined diurnal pattern of the activities typical for the residential and business customers, the temperature sensitivities of hourly loads experience similar profile – lower values during the night and higher values during the "active" hours of the day. The highest temperature sensitivity is observed for the peak loads during the working days and since this is the reference load for the short term and long term adequacy reports, the method for calculating the sensitivity of this type of load is presented below. The steps of calculation for any country are as follows:

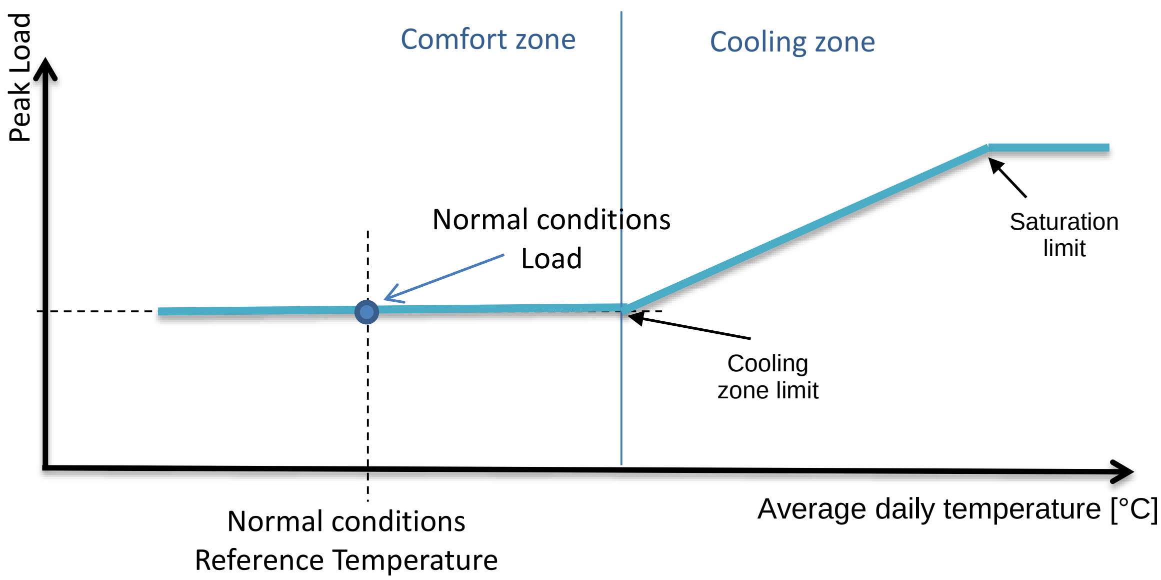
1. Defining the peak load for every day of the reference year;
2. Removing values for Saturday, Sundays and official holidays for the assessed country from the time series of peak loads (P_{peak}) and daily average temperatures (T_{avd}) creating in this way resulting time series only for working days;
3. Arranging the daily average temperatures in ascending order with corresponding arrangement of the peak load values;
4. Using step-wise linear regression iteration procedure, the following two important points are defined (for countries concerned by cooling need in summer):
   - **saturation temperature for cooling zone** (**T_{satur}**) - this is the value above which further increase of the temperature does not cause increase of the electricity demand (practically all available cooling devices have been switched on). This saturation concerns few countries in Southern Europe.
   - **starting temperature for the cooling zone (**T_{start}**)**- this is the value above which the cooling devices are started.
5. Modelling the relation between the peak load and the daily average temperature in the range **T_{start} - T_{satur}** by simple linear regression:

$$P_{peak} = a + b * T_{avd}$$

   where the regression coefficient **b** being the **peak load temperature sensitivity** valid for the cooling zone.

In this calculation the rescaled values of the population weighted normal monthly average temperatures T_{avd} are used.

The figure below provides a visual explanation of the main points above



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Appendix 4: Capacity factors used for the renewable infeed for upward regulation analyses

Table 9 - CAPACITY FACTORS USED FOR THE NORMAL CONDITIONS UPWARD ADEQUACY ANALYSIS[9]

Values	Country	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Solar Capacity Factor	AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT	0.51	0.53	0.54	0.54	0.53	0.53	0.53	0.54	0.53	0.49	0.52	0.52	0.51	0.47	0.46	0.41
	BA	0.54	0.56	0.56	0.55	0.55	0.55	0.55	0.54	0.55	0.54	0.54	0.54	0.53	0.54	0.52	0.48
	BE	0.50	0.51	0.54	0.53	0.53	0.52	0.54	0.52	0.49	0.49	0.47	0.47	0.38	0.41	0.35	0.30
	BG	0.55	0.55	0.55	0.55	0.54	0.55	0.56	0.55	0.54	0.55	0.55	0.55	0.55	0.54	0.54	0.53
	CH	0.50	0.49	0.52	0.54	0.51	0.50	0.51	0.52	0.51	0.48	0.50	0.51	0.51	0.47	0.47	0.44
	CY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CZ	0.54	0.55	0.56	0.57	0.55	0.56	0.54	0.54	0.54	0.52	0.53	0.52	0.51	0.49	0.44	0.38
	DE	0.52	0.55	0.55	0.55	0.53	0.54	0.54	0.53	0.51	0.51	0.49	0.50	0.45	0.42	0.39	0.33
	DK	0.57	0.54	0.56	0.53	0.52	0.51	0.53	0.49	0.51	0.46	0.46	0.43	0.42	0.41	0.37	0.35
	EE	0.57	0.57	0.58	0.56	0.55	0.53	0.54	0.53	0.52	0.51	0.52	0.47	0.41	0.37	0.35	0.24
	ES	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.51	0.51	0.51	0.50	0.49	0.49	0.48	0.47	0.45
	FI	0.56	0.55	0.55	0.53	0.51	0.51	0.48	0.48	0.48	0.46	0.43	0.37	0.31	0.28	0.21	0.16
	FR	0.48	0.49	0.50	0.51	0.50	0.50	0.50	0.50	0.48	0.46	0.46	0.46	0.43	0.42	0.39	0.35
	GB	0.41	0.42	0.42	0.42	0.41	0.39	0.40	0.37	0.36	0.33	0.30	0.29	0.27	0.27	0.23	0.22
	GR	0.57	0.56	0.56	0.56	0.55	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.55	0.55	0.54
	HR	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.54	0.54	0.53	0.54	0.53	0.52	0.53	0.51	0.48
	HU	0.56	0.56	0.55	0.56	0.56	0.56	0.55	0.54	0.54	0.53	0.54	0.53	0.53	0.53	0.52	0.50
	IE	0.33	0.39	0.35	0.35	0.32	0.32	0.31	0.26	0.24	0.25	0.23	0.22	0.21	0.18	0.14	0.13

[9] Values that are statistically expected to be exceeded in 50% of the relevant hours. By default 0% for Albania, Cyprius, Island, Malta and Ukraine West, since no data are available in the ENTSO-E Pan European Climate Database.

	IT	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.51	0.49
	LT	0.58	0.57	0.57	0.55	0.54	0.53	0.54	0.53	0.52	0.53	0.51	0.50	0.47	0.46	0.34	0.32
	LU	0.50	0.52	0.52	0.54	0.51	0.52	0.54	0.52	0.49	0.49	0.48	0.50	0.40	0.39	0.33	0.22
	LV	0.58	0.56	0.57	0.56	0.54	0.52	0.54	0.53	0.52	0.51	0.51	0.48	0.44	0.39	0.33	0.28
	ME	0.54	0.56	0.57	0.56	0.55	0.56	0.56	0.56	0.55	0.55	0.55	0.55	0.54	0.55	0.54	0.52
	MK	0.55	0.55	0.56	0.55	0.54	0.56	0.56	0.55	0.54	0.54	0.55	0.54	0.54	0.54	0.54	0.53
	MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NL	0.53	0.55	0.56	0.55	0.54	0.54	0.54	0.53	0.50	0.49	0.45	0.48	0.40	0.42	0.36	0.35
	NO	0.53	0.50	0.49	0.46	0.47	0.45	0.44	0.42	0.42	0.40	0.37	0.35	0.34	0.30	0.28	0.23
	PL	0.55	0.57	0.56	0.56	0.55	0.54	0.55	0.52	0.52	0.52	0.52	0.53	0.50	0.48	0.42	0.38
	PT	0.49	0.50	0.47	0.49	0.48	0.49	0.49	0.48	0.48	0.49	0.46	0.44	0.44	0.40	0.41	0.40
	RO	0.55	0.54	0.54	0.54	0.54	0.55	0.54	0.53	0.52	0.52	0.53	0.53	0.52	0.53	0.52	0.48
	RS	0.55	0.54	0.55	0.55	0.54	0.54	0.54	0.54	0.54	0.53	0.54	0.53	0.53	0.54	0.53	0.52
	SE	0.55	0.52	0.54	0.51	0.50	0.47	0.47	0.43	0.43	0.42	0.38	0.34	0.33	0.29	0.26	0.22
	SI	0.55	0.55	0.55	0.55	0.56	0.55	0.55	0.55	0.55	0.54	0.53	0.53	0.52	0.52	0.53	0.47
	SK	0.55	0.56	0.56	0.56	0.56	0.55	0.55	0.53	0.53	0.53	0.53	0.54	0.53	0.52	0.51	0.45
	UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Onshore Wind Capacity Factor	AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT	0.04	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.02	0.03	0.02	0.02	0.02	0.03	0.06	0.05
	BA	0.03	0.03	0.02	0.02	0.03	0.01	0.02	0.02	0.04	0.02	0.03	0.01	0.01	0.04	0.05	0.04
	BE	0.02	0.02	0.04	0.03	0.04	0.07	0.06	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.06	0.06
	BG	0.03	0.03	0.03	0.02	0.02	0.04	0.04	0.02	0.04	0.04	0.04	0.03	0.03	0.04	0.04	0.04
	CH	0.05	0.03	0.04	0.02	0.02	0.03	0.04	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.05
	CY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CZ	0.05	0.03	0.02	0.04	0.04	0.06	0.05	0.04	0.02	0.02	0.02	0.02	0.04	0.05	0.06	0.06

DE	0.05	0.04	0.04	0.07	0.05	0.05	0.06	0.04	0.02	0.04	0.05	0.04	0.05	0.06	0.05	0.07
DK	0.10	0.09	0.10	0.13	0.07	0.07	0.10	0.05	0.04	0.05	0.10	0.07	0.09	0.07	0.12	0.17
EE	0.07	0.09	0.13	0.11	0.05	0.04	0.07	0.08	0.05	0.06	0.09	0.08	0.08	0.08	0.09	0.16
ES	0.06	0.09	0.08	0.05	0.05	0.05	0.07	0.05	0.06	0.06	0.06	0.06	0.08	0.06	0.08	0.08
FI	0.12	0.10	0.12	0.10	0.13	0.09	0.10	0.15	0.08	0.06	0.07	0.09	0.09	0.11	0.11	0.18
FR	0.08	0.08	0.06	0.05	0.05	0.07	0.07	0.06	0.04	0.06	0.05	0.06	0.06	0.07	0.07	0.09
GB	0.06	0.08	0.10	0.09	0.09	0.09	0.09	0.07	0.07	0.06	0.10	0.09	0.08	0.13	0.13	0.18
GR	0.08	0.11	0.14	0.16	0.12	0.15	0.18	0.17	0.15	0.15	0.15	0.24	0.16	0.13	0.15	0.09
HR	0.04	0.04	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.02	0.01	0.02	0.05	0.06	0.05
HU	0.05	0.05	0.04	0.05	0.05	0.04	0.06	0.06	0.04	0.03	0.03	0.03	0.04	0.04	0.05	0.06
IE	0.05	0.08	0.12	0.10	0.12	0.11	0.04	0.06	0.07	0.05	0.08	0.11	0.09	0.13	0.12	0.12
IT	0.06	0.05	0.04	0.03	0.04	0.04	0.06	0.04	0.04	0.04	0.04	0.03	0.03	0.05	0.06	0.07
LT	0.05	0.06	0.07	0.12	0.04	0.03	0.06	0.07	0.04	0.04	0.10	0.04	0.07	0.07	0.06	0.10
LU	0.01	0.00	0.00	0.00	0.00	0.02	0.04	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.02	0.02
LV	0.04	0.05	0.08	0.08	0.03	0.02	0.06	0.05	0.03	0.03	0.07	0.03	0.06	0.06	0.06	0.09
ME	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.02	0.03	0.02
MK	0.02	0.02	0.03	0.02	0.01	0.02	0.03	0.02	0.02	0.01	0.02	0.01	0.01	0.03	0.04	0.02
MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NI	0.05	0.08	0.09	0.07	0.10	0.08	0.03	0.06	0.07	0.04	0.08	0.08	0.08	0.11	0.12	0.14
NL	0.03	0.04	0.05	0.07	0.06	0.06	0.08	0.04	0.02	0.03	0.06	0.05	0.05	0.05	0.08	0.09
NO	0.07	0.05	0.06	0.07	0.06	0.06	0.07	0.07	0.04	0.06	0.06	0.07	0.10	0.11	0.18	0.17
PL	0.09	0.08	0.07	0.09	0.06	0.08	0.08	0.07	0.06	0.06	0.08	0.06	0.07	0.08	0.07	0.09
PT	0.06	0.06	0.08	0.06	0.05	0.07	0.08	0.05	0.05	0.08	0.05	0.04	0.06	0.05	0.04	0.07
RO	0.07	0.05	0.05	0.05	0.05	0.06	0.06	0.04	0.04	0.04	0.05	0.03	0.05	0.06	0.06	0.07
RS	0.03	0.03	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.01	0.02	0.04	0.04	0.05
SE	0.11	0.09	0.12	0.11	0.08	0.08	0.10	0.10	0.06	0.06	0.07	0.10	0.10	0.13	0.12	0.18

	SI	0.04	0.05	0.02	0.03	0.04	0.03	0.04	0.05	0.03	0.04	0.02	0.02	0.03	0.06	0.06	0.06
	SK	0.05	0.04	0.04	0.05	0.04	0.05	0.04	0.05	0.04	0.03	0.04	0.03	0.04	0.04	0.05	0.07
	UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offshore Wind Capacity Factor	AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BE	0.14	0.11	0.20	0.14	0.15	0.20	0.21	0.13	0.09	0.13	0.13	0.15	0.15	0.19	0.24	0.26
	BG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CZ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DE	0.19	0.20	0.22	0.24	0.23	0.19	0.17	0.17	0.14	0.16	0.21	0.18	0.23	0.24	0.30	0.37
	DK	0.28	0.22	0.21	0.32	0.21	0.21	0.24	0.17	0.15	0.17	0.22	0.20	0.26	0.23	0.32	0.44
	EE	0.10	0.12	0.15	0.13	0.06	0.07	0.09	0.11	0.08	0.07	0.10	0.11	0.11	0.13	0.16	0.20
	ES	0.16	0.16	0.17	0.12	0.13	0.14	0.20	0.13	0.11	0.16	0.14	0.10	0.15	0.16	0.15	0.19
	FI	0.16	0.12	0.17	0.13	0.14	0.12	0.11	0.13	0.08	0.10	0.09	0.11	0.12	0.16	0.18	0.27
	FR	0.12	0.12	0.12	0.13	0.12	0.17	0.15	0.10	0.09	0.11	0.11	0.14	0.18	0.12	0.16	0.22
	GB	0.12	0.15	0.19	0.16	0.16	0.17	0.16	0.15	0.12	0.13	0.19	0.19	0.17	0.24	0.25	0.32
	GR	0.05	0.04	0.04	0.06	0.07	0.06	0.08	0.09	0.11	0.11	0.11	0.20	0.13	0.10	0.15	0.08
	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	HU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	IE	0.07	0.10	0.14	0.14	0.14	0.13	0.06	0.09	0.10	0.08	0.13	0.15	0.11	0.14	0.17	0.16
	IT	0.11	0.11	0.10	0.06	0.07	0.06	0.09	0.08	0.11	0.09	0.08	0.07	0.06	0.09	0.10	0.13
	LT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	LU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	LV	0.10	0.11	0.15	0.14	0.08	0.09	0.11	0.10	0.06	0.08	0.09	0.10	0.11	0.12	0.13	0.13

	ME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NI	0.09	0.13	0.17	0.15	0.19	0.14	0.07	0.13	0.11	0.09	0.15	0.14	0.12	0.16	0.21	0.20
	NL	0.15	0.15	0.23	0.19	0.20	0.19	0.22	0.12	0.11	0.16	0.17	0.19	0.19	0.20	0.26	0.31
	NO	0.17	0.15	0.22	0.11	0.14	0.16	0.15	0.18	0.11	0.13	0.11	0.14	0.19	0.23	0.33	0.38
	PL	0.18	0.13	0.11	0.13	0.10	0.10	0.14	0.09	0.08	0.09	0.12	0.13	0.13	0.12	0.16	0.17
	PT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SE	0.18	0.17	0.17	0.20	0.17	0.15	0.18	0.14	0.12	0.12	0.15	0.15	0.17	0.20	0.20	0.28
	SI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 10 - CAPACITY FACTORS USED FOR THE SEVERE CONDITIONS UPWARD ADEQUACY ANALYSIS[10]

Values	Country	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Solar Capacity Factor	AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT	0.33	0.40	0.43	0.38	0.40	0.38	0.36	0.39	0.40	0.33	0.34	0.33	0.31	0.26	0.26	0.20
	BA	0.37	0.45	0.46	0.44	0.44	0.44	0.44	0.42	0.38	0.41	0.42	0.39	0.38	0.36	0.27	0.20
	BE	0.20	0.18	0.26	0.25	0.24	0.21	0.23	0.26	0.19	0.20	0.15	0.19	0.11	0.14	0.10	0.07
	BG	0.49	0.49	0.50	0.50	0.46	0.50	0.50	0.50	0.48	0.48	0.50	0.49	0.49	0.46	0.44	0.38

[10] Minimum values that are statistically expected to be exceeded in 90% of the relevant hours. By default 0% for Albania, Cyprius, Island, Malta and Ukraine West, since no data are available in the ENTSO-E Pan European Climate Database.

CH	0.28	0.31	0.37	0.39	0.35	0.36	0.32	0.38	0.34	0.28	0.29	0.33	0.30	0.24	0.24	0.17
CY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CZ	0.27	0.36	0.42	0.39	0.35	0.35	0.35	0.37	0.35	0.33	0.29	0.33	0.31	0.24	0.17	0.14
DE	0.31	0.36	0.40	0.38	0.35	0.36	0.33	0.35	0.32	0.31	0.27	0.31	0.24	0.21	0.16	0.14
DK	0.25	0.24	0.24	0.24	0.25	0.19	0.25	0.20	0.23	0.18	0.17	0.13	0.13	0.12	0.14	0.09
EE	0.46	0.34	0.40	0.33	0.33	0.31	0.35	0.30	0.33	0.23	0.28	0.18	0.14	0.12	0.10	0.08
ES	0.30	0.29	0.30	0.31	0.30	0.29	0.30	0.29	0.28	0.27	0.26	0.24	0.22	0.20	0.19	0.17
FI	0.42	0.45	0.43	0.40	0.39	0.32	0.36	0.32	0.32	0.28	0.24	0.18	0.15	0.12	0.09	0.07
FR	0.25	0.28	0.30	0.30	0.28	0.28	0.29	0.28	0.27	0.24	0.24	0.25	0.21	0.20	0.18	0.14
GB	0.17	0.18	0.20	0.19	0.17	0.16	0.16	0.16	0.14	0.12	0.11	0.09	0.09	0.08	0.06	0.05
GR	0.51	0.51	0.51	0.52	0.51	0.52	0.52	0.51	0.50	0.50	0.51	0.50	0.49	0.47	0.47	0.44
HR	0.42	0.47	0.47	0.47	0.46	0.46	0.47	0.45	0.45	0.42	0.44	0.42	0.40	0.39	0.35	0.29
HU	0.46	0.49	0.48	0.49	0.49	0.49	0.49	0.47	0.46	0.46	0.46	0.46	0.44	0.43	0.39	0.30
IE	0.09	0.12	0.09	0.09	0.08	0.08	0.07	0.06	0.05	0.05	0.05	0.04	0.04	0.03	0.02	0.01
IT	0.45	0.45	0.45	0.45	0.45	0.44	0.44	0.44	0.43	0.42	0.40	0.40	0.38	0.36	0.34	0.30
LT	0.38	0.39	0.40	0.31	0.29	0.30	0.32	0.26	0.29	0.28	0.26	0.23	0.17	0.16	0.11	0.08
LU	0.14	0.15	0.15	0.17	0.14	0.14	0.15	0.14	0.12	0.12	0.10	0.12	0.08	0.07	0.06	0.04
LV	0.44	0.37	0.42	0.36	0.35	0.33	0.38	0.29	0.31	0.30	0.24	0.20	0.18	0.14	0.12	0.09
ME	0.35	0.43	0.46	0.42	0.41	0.44	0.45	0.44	0.41	0.40	0.40	0.42	0.41	0.34	0.28	0.25
MK	0.48	0.47	0.50	0.49	0.47	0.49	0.50	0.49	0.46	0.47	0.48	0.48	0.47	0.44	0.44	0.40
MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NL	0.23	0.28	0.32	0.27	0.33	0.29	0.26	0.30	0.25	0.23	0.17	0.21	0.11	0.11	0.11	0.09
NO	0.37	0.34	0.37	0.32	0.32	0.31	0.29	0.27	0.27	0.26	0.23	0.21	0.20	0.16	0.15	0.11
PL	0.35	0.45	0.47	0.38	0.38	0.39	0.42	0.36	0.38	0.38	0.36	0.40	0.34	0.30	0.19	0.16
PT	0.21	0.20	0.17	0.20	0.17	0.21	0.21	0.17	0.18	0.20	0.18	0.15	0.15	0.13	0.11	0.11

	RO	0.49	0.49	0.49	0.48	0.47	0.49	0.48	0.47	0.46	0.46	0.46	0.47	0.45	0.42	0.39	0.34
	RS	0.44	0.44	0.47	0.46	0.41	0.44	0.46	0.44	0.39	0.42	0.45	0.43	0.45	0.40	0.39	0.32
	SE	0.40	0.38	0.41	0.35	0.31	0.30	0.30	0.25	0.26	0.25	0.21	0.18	0.16	0.12	0.11	0.08
	SI	0.40	0.44	0.44	0.45	0.46	0.45	0.42	0.42	0.45	0.39	0.37	0.37	0.31	0.30	0.29	0.20
	SK	0.39	0.40	0.44	0.44	0.45	0.44	0.44	0.40	0.41	0.38	0.40	0.43	0.39	0.34	0.30	0.20
	UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Onshore Wind Capacity Factor	AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
	CH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CZ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DE	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
	DK	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	EE	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01
	ES	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02
	FI	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.03
	FR	0.02	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
	GB	0.02	0.01	0.02	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.04	0.03
	GR	0.02	0.03	0.04	0.05	0.04	0.05	0.06	0.06	0.05	0.04	0.05	0.06	0.05	0.04	0.03	0.03
	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	HU	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
	IE	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.02	0.01
	IT	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01

	LT	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	LU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	LV	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	NL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NO	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.02	0.01	0.05	0.06
	PL	0.02	0.01	0.01	0.02	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.02
	PT	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
	RO	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01
	RS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SE	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.04
	SI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	SK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offshore Wind Capacity Factor	AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BE	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00
	BG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CZ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DE	0.04	0.02	0.03	0.04	0.03	0.02	0.03	0.01	0.01	0.02	0.04	0.02	0.03	0.02	0.06	0.04

DK	0.05	0.04	0.05	0.04	0.01	0.04	0.03	0.01	0.02	0.03	0.04	0.03	0.04	0.02	0.07	0.03
EE	0.00	0.01	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.03
ES	0.04	0.04	0.05	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.05	0.02	0.03	0.04	0.04	0.04
FI	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.02	0.01	0.02
FR	0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.01	0.02	0.01	0.02	0.03	0.03	0.03	0.03
GB	0.03	0.04	0.04	0.03	0.03	0.04	0.04	0.03	0.02	0.03	0.05	0.03	0.04	0.03	0.06	0.06
GR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IE	0.00	0.01	0.01	0.01	0.02	0.01	0.00	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.04
IT	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
LT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LV	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NI	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.02	0.03
NL	0.02	0.01	0.02	0.01	0.02	0.03	0.01	0.01	0.01	0.02	0.02	0.01	0.03	0.01	0.05	0.02
NO	0.03	0.03	0.02	0.01	0.02	0.03	0.02	0.02	0.01	0.01	0.02	0.01	0.02	0.03	0.06	0.06
PL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
PT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.06	0.04	0.04	0.05	0.03	0.05	0.04	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.06	0.06
SI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	SK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix 5: Capacity factors used for the renewable infeed for downward regulation analyses

Table 11 - FACTORS USED FOR THE DAYTIME DOWNWARD ADEQUACY ANALYSIS[11]

Values	Country	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Solar Capacity Factor	AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT	0.60	0.60	0.60	0.61	0.60	0.60	0.60	0.60	0.58	0.59	0.58	0.57	0.57	0.58	0.55	0.54
	BA	0.60	0.61	0.60	0.61	0.60	0.60	0.60	0.59	0.58	0.60	0.59	0.58	0.59	0.59	0.58	0.56
	BE	0.59	0.60	0.60	0.60	0.60	0.60	0.59	0.57	0.57	0.57	0.57	0.54	0.54	0.52	0.50	0.51
	BG	0.59	0.59	0.59	0.59	0.59	0.60	0.60	0.58	0.59	0.59	0.58	0.58	0.59	0.59	0.58	0.57
	CH	0.61	0.60	0.61	0.61	0.60	0.60	0.61	0.61	0.59	0.59	0.59	0.59	0.59	0.58	0.57	0.56
	CY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CZ	0.61	0.60	0.61	0.61	0.61	0.61	0.60	0.60	0.59	0.58	0.58	0.57	0.57	0.56	0.53	0.54
	DE	0.59	0.60	0.60	0.59	0.59	0.59	0.58	0.57	0.57	0.56	0.56	0.55	0.55	0.53	0.50	0.50
	DK	0.63	0.62	0.62	0.61	0.60	0.60	0.59	0.58	0.58	0.57	0.56	0.55	0.55	0.53	0.52	0.49
	EE	0.62	0.62	0.61	0.60	0.59	0.59	0.58	0.57	0.57	0.57	0.55	0.54	0.54	0.50	0.50	0.48
	ES	0.57	0.57	0.57	0.57	0.56	0.57	0.56	0.56	0.56	0.56	0.55	0.55	0.55	0.54	0.54	0.52
	FI	0.60	0.58	0.59	0.57	0.57	0.56	0.55	0.56	0.55	0.51	0.52	0.48	0.46	0.42	0.40	0.34
	FR	0.58	0.57	0.58	0.57	0.57	0.57	0.57	0.55	0.55	0.54	0.55	0.53	0.53	0.52	0.49	0.50
	GB	0.54	0.54	0.54	0.54	0.53	0.53	0.49	0.49	0.47	0.45	0.44	0.42	0.44	0.39	0.37	0.35
	GR	0.60	0.59	0.59	0.59	0.59	0.59	0.60	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.58	0.58
	HR	0.60	0.59	0.58	0.59	0.59	0.59	0.58	0.59	0.58	0.58	0.57	0.57	0.58	0.57	0.56	0.55
	HU	0.60	0.60	0.59	0.60	0.60	0.60	0.59	0.58	0.57	0.58	0.57	0.57	0.58	0.57	0.56	0.55
	IE	0.56	0.56	0.56	0.55	0.53	0.52	0.50	0.43	0.48	0.44	0.44	0.41	0.44	0.36	0.32	0.38

[11] Maximum values that are statistically not expected to be exceeded in more than 10% of the relevant hours. By default 0% for Albania, Cyprius, Island, Malta and Ukraine West, since no data are available in the ENTSO-E Pan European Climate Database.

	IT	0.58	0.58	0.58	0.57	0.58	0.58	0.58	0.58	0.57	0.58	0.57	0.56	0.57	0.57	0.57	0.55
	LT	0.62	0.62	0.61	0.60	0.58	0.59	0.59	0.58	0.57	0.58	0.57	0.55	0.56	0.53	0.49	0.51
	LU	0.61	0.61	0.61	0.60	0.60	0.61	0.60	0.59	0.58	0.58	0.58	0.55	0.56	0.55	0.51	0.52
	ME	0.62	0.62	0.62	0.62	0.61	0.62	0.62	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.59	0.59
	MK	0.61	0.61	0.60	0.61	0.60	0.61	0.61	0.59	0.60	0.60	0.59	0.59	0.60	0.61	0.59	0.59
	MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NL	0.60	0.61	0.61	0.60	0.60	0.60	0.59	0.58	0.58	0.57	0.57	0.54	0.55	0.53	0.51	0.49
	NO	0.59	0.57	0.55	0.57	0.55	0.53	0.52	0.52	0.52	0.48	0.45	0.43	0.41	0.36	0.36	0.30
	PL	0.60	0.61	0.60	0.61	0.59	0.60	0.58	0.58	0.57	0.58	0.57	0.57	0.56	0.55	0.51	0.51
	PT	0.56	0.56	0.55	0.55	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.53	0.51	0.52	0.49
	RO	0.59	0.59	0.59	0.59	0.59	0.58	0.58	0.57	0.57	0.57	0.56	0.56	0.57	0.57	0.56	0.54
	RS	0.59	0.59	0.59	0.60	0.59	0.59	0.59	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.57	0.56
	SE	0.59	0.59	0.58	0.58	0.55	0.55	0.55	0.53	0.51	0.50	0.48	0.45	0.44	0.42	0.40	0.34
	SI	0.61	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.59	0.59	0.58	0.57	0.58	0.58	0.58	0.56
	SK	0.60	0.61	0.61	0.61	0.61	0.60	0.59	0.59	0.58	0.59	0.58	0.58	0.57	0.58	0.56	0.55
	UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Onshore Wind Capacity Factor	AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT	0.30	0.17	0.25	0.19	0.22	0.18	0.30	0.22	0.17	0.27	0.24	0.15	0.26	0.41	0.29	0.30
	BA	0.29	0.19	0.16	0.18	0.19	0.15	0.20	0.26	0.16	0.22	0.11	0.11	0.20	0.27	0.20	0.27
	BE	0.13	0.24	0.28	0.16	0.33	0.30	0.29	0.17	0.17	0.21	0.29	0.24	0.21	0.29	0.32	0.24
	BG	0.22	0.16	0.12	0.18	0.21	0.21	0.14	0.11	0.11	0.14	0.13	0.10	0.23	0.22	0.22	0.23
	CH	0.18	0.14	0.20	0.11	0.23	0.17	0.17	0.14	0.09	0.17	0.19	0.21	0.17	0.25	0.20	0.26
	CY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CZ	0.23	0.18	0.28	0.20	0.28	0.18	0.24	0.21	0.17	0.20	0.24	0.16	0.25	0.36	0.30	0.21
	DE	0.20	0.20	0.24	0.24	0.26	0.22	0.25	0.15	0.15	0.20	0.23	0.18	0.19	0.32	0.32	0.22

DK	0.32	0.44	0.43	0.40	0.22	0.33	0.30	0.23	0.27	0.38	0.38	0.35	0.42	0.59	0.56	0.47
EE	0.38	0.62	0.40	0.29	0.24	0.28	0.33	0.33	0.23	0.46	0.36	0.29	0.42	0.38	0.58	0.51
ES	0.27	0.26	0.20	0.18	0.15	0.19	0.21	0.16	0.18	0.20	0.19	0.22	0.21	0.22	0.23	0.26
FI	0.41	0.43	0.38	0.29	0.30	0.35	0.35	0.34	0.33	0.25	0.37	0.21	0.33	0.55	0.46	0.43
FR	0.21	0.19	0.22	0.14	0.28	0.24	0.21	0.15	0.13	0.16	0.21	0.20	0.18	0.23	0.21	0.24
GB	0.21	0.27	0.41	0.30	0.33	0.29	0.33	0.22	0.27	0.24	0.35	0.35	0.41	0.46	0.56	0.48
GR	0.31	0.39	0.37	0.30	0.43	0.37	0.44	0.33	0.46	0.43	0.44	0.46	0.38	0.48	0.39	0.41
HR	0.31	0.22	0.23	0.21	0.22	0.19	0.24	0.32	0.25	0.23	0.17	0.13	0.27	0.34	0.35	0.36
HU	0.34	0.19	0.32	0.24	0.29	0.21	0.29	0.30	0.24	0.29	0.21	0.15	0.29	0.34	0.27	0.31
IE	0.41	0.39	0.52	0.44	0.39	0.26	0.33	0.29	0.35	0.31	0.36	0.37	0.33	0.45	0.79	0.54
IT	0.20	0.17	0.25	0.16	0.17	0.17	0.16	0.22	0.17	0.20	0.10	0.10	0.21	0.25	0.24	0.30
LT	0.42	0.51	0.36	0.30	0.30	0.34	0.33	0.23	0.22	0.41	0.41	0.32	0.38	0.42	0.44	0.45
LU	0.14	0.15	0.28	0.13	0.31	0.26	0.22	0.15	0.13	0.18	0.27	0.21	0.17	0.29	0.24	0.25
ME	0.22	0.16	0.19	0.19	0.19	0.16	0.20	0.20	0.19	0.19	0.10	0.12	0.24	0.33	0.26	0.30
MK	0.17	0.21	0.13	0.25	0.15	0.17	0.21	0.14	0.15	0.18	0.12	0.09	0.26	0.33	0.17	0.25
MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NI	0.24	0.40	0.50	0.37	0.37	0.27	0.37	0.25	0.40	0.27	0.40	0.30	0.39	0.50	0.89	0.57
NL	0.19	0.21	0.38	0.26	0.29	0.35	0.34	0.17	0.23	0.26	0.28	0.27	0.31	0.47	0.42	0.30
NO	0.23	0.27	0.28	0.17	0.18	0.29	0.19	0.19	0.19	0.15	0.23	0.25	0.41	0.39	0.44	0.41
PL	0.22	0.28	0.33	0.33	0.28	0.22	0.24	0.23	0.20	0.22	0.23	0.21	0.33	0.38	0.28	0.29
PT	0.27	0.28	0.24	0.22	0.24	0.23	0.26	0.19	0.28	0.29	0.23	0.27	0.29	0.25	0.34	0.36
RO	0.26	0.19	0.22	0.20	0.24	0.23	0.21	0.20	0.15	0.19	0.14	0.13	0.25	0.33	0.25	0.29
RS	0.25	0.16	0.14	0.19	0.16	0.17	0.15	0.14	0.10	0.16	0.11	0.09	0.22	0.23	0.18	0.20
SE	0.33	0.37	0.29	0.26	0.22	0.29	0.31	0.23	0.30	0.22	0.29	0.27	0.36	0.44	0.46	0.35
SI	0.30	0.22	0.48	0.22	0.24	0.27	0.24	0.43	0.28	0.29	0.25	0.17	0.31	0.34	0.51	0.44
SK	0.25	0.21	0.37	0.22	0.25	0.19	0.25	0.38	0.21	0.20	0.24	0.14	0.25	0.34	0.22	0.29

	UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offshore Wind Capacity Factor	AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BE	0.52	0.67	0.94	0.48	0.74	0.77	0.82	0.44	0.51	0.54	0.75	0.76	0.82	0.96	0.97	0.88
	BG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CZ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DE	0.73	0.69	0.70	0.72	0.56	0.74	0.73	0.46	0.50	0.69	0.60	0.62	0.75	0.88	0.92	0.84
	DK	0.68	0.83	0.74	0.76	0.53	0.68	0.65	0.59	0.56	0.78	0.74	0.74	0.85	0.89	0.93	0.87
	EE	0.43	0.59	0.53	0.36	0.30	0.43	0.47	0.46	0.32	0.45	0.47	0.40	0.58	0.68	0.82	0.84
	ES	0.47	0.40	0.39	0.40	0.34	0.38	0.45	0.27	0.28	0.37	0.36	0.39	0.36	0.41	0.41	0.45
	FI	0.49	0.48	0.53	0.45	0.53	0.55	0.54	0.49	0.43	0.39	0.60	0.41	0.62	0.78	0.73	0.74
	FR	0.55	0.58	0.68	0.41	0.82	0.64	0.65	0.42	0.47	0.54	0.66	0.64	0.49	0.74	0.68	0.73
	GB	0.45	0.54	0.70	0.51	0.47	0.53	0.58	0.43	0.45	0.53	0.56	0.57	0.60	0.70	0.84	0.74
	GR	0.31	0.37	0.45	0.34	0.52	0.38	0.59	0.42	0.63	0.59	0.63	0.67	0.68	0.56	0.65	0.64
	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	HU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	IE	0.45	0.52	0.65	0.55	0.53	0.36	0.57	0.40	0.49	0.38	0.62	0.52	0.49	0.72	0.93	0.76
	IT	0.38	0.32	0.41	0.23	0.29	0.29	0.38	0.40	0.29	0.36	0.25	0.23	0.34	0.40	0.44	0.45
	LT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	LU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	NI	0.40	0.63	0.74	0.60	0.58	0.46	0.59	0.50	0.65	0.51	0.72	0.59	0.63	0.77	0.97	0.87
	NL	0.42	0.55	0.87	0.62	0.54	0.76	0.74	0.42	0.49	0.59	0.65	0.64	0.80	0.90	0.91	0.84
	NO	0.49	0.57	0.59	0.54	0.47	0.53	0.44	0.45	0.60	0.48	0.58	0.61	0.69	0.78	0.74	0.83
	PL	0.51	0.70	0.64	0.89	0.39	0.54	0.44	0.63	0.45	0.58	0.51	0.47	0.56	0.72	0.87	0.70
	PT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SE	0.49	0.56	0.55	0.44	0.37	0.54	0.41	0.44	0.39	0.44	0.54	0.55	0.59	0.69	0.73	0.69
	SI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 12 - FACTORS USED FOR THE NIGHTTIME DOWNWARD ADEQUACY ANALYSIS[12]

Values	Country	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Onshore Wind Capacity Factor	AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT	0.32	0.24	0.29	0.22	0.27	0.22	0.32	0.30	0.25	0.34	0.33	0.24	0.29	0.41	0.34	0.32
	BA	0.36	0.28	0.25	0.24	0.26	0.18	0.25	0.31	0.22	0.26	0.23	0.22	0.28	0.30	0.26	0.30
	BE	0.25	0.28	0.30	0.25	0.29	0.28	0.26	0.22	0.25	0.25	0.31	0.32	0.27	0.39	0.35	0.32
	BG	0.28	0.22	0.23	0.24	0.30	0.31	0.22	0.24	0.19	0.23	0.20	0.19	0.33	0.28	0.26	0.29
	CH	0.25	0.24	0.29	0.20	0.31	0.23	0.29	0.24	0.19	0.23	0.29	0.28	0.25	0.34	0.27	0.34
	CZ	0.28	0.24	0.26	0.22	0.28	0.23	0.28	0.24	0.20	0.25	0.26	0.22	0.26	0.32	0.31	0.27
	DE	0.23	0.23	0.25	0.23	0.23	0.22	0.25	0.20	0.22	0.22	0.24	0.22	0.22	0.33	0.28	0.25
	DK	0.31	0.33	0.34	0.40	0.26	0.31	0.26	0.22	0.26	0.30	0.35	0.34	0.37	0.42	0.51	0.45

[12] Maximum values that are statistically not expected to be exceeded in more than 10% of the relevant hours. By default 0% for Albania, Cyprius, Island, Malta and Ukraine West, since no data are available in the ENTSO-E Pan European Climate Database.

	EE	0.36	0.42	0.34	0.26	0.23	0.28	0.27	0.32	0.27	0.37	0.33	0.29	0.37	0.37	0.59	0.42
	ES	0.36	0.38	0.33	0.31	0.27	0.30	0.32	0.27	0.32	0.30	0.27	0.31	0.29	0.29	0.31	0.32
	FI	0.36	0.37	0.32	0.29	0.28	0.27	0.28	0.28	0.30	0.24	0.32	0.25	0.31	0.47	0.45	0.36
	FR	0.29	0.26	0.31	0.24	0.30	0.28	0.28	0.21	0.22	0.22	0.26	0.28	0.25	0.29	0.27	0.30
	GB	0.24	0.30	0.39	0.30	0.32	0.30	0.28	0.23	0.26	0.23	0.32	0.33	0.39	0.42	0.60	0.53
	GR	0.42	0.54	0.49	0.46	0.54	0.52	0.55	0.44	0.52	0.51	0.52	0.53	0.49	0.54	0.48	0.48
	HR	0.33	0.32	0.30	0.32	0.33	0.30	0.31	0.41	0.34	0.33	0.24	0.24	0.37	0.40	0.36	0.41
	HU	0.41	0.37	0.41	0.38	0.41	0.35	0.40	0.38	0.31	0.33	0.29	0.33	0.40	0.39	0.38	0.39
	IE	0.37	0.34	0.44	0.40	0.42	0.31	0.35	0.27	0.35	0.28	0.40	0.34	0.34	0.41	0.72	0.57
	IT	0.30	0.26	0.31	0.27	0.30	0.25	0.27	0.30	0.25	0.25	0.21	0.22	0.28	0.29	0.29	0.32
	LT	0.33	0.38	0.36	0.30	0.28	0.30	0.31	0.26	0.26	0.33	0.31	0.31	0.37	0.37	0.41	0.46
	LU	0.31	0.30	0.34	0.25	0.33	0.31	0.30	0.26	0.25	0.25	0.28	0.27	0.29	0.35	0.30	0.32
	LV	0.27	0.27	0.27	0.21	0.18	0.25	0.24	0.21	0.21	0.28	0.28	0.26	0.29	0.31	0.38	0.37
	ME	0.28	0.25	0.27	0.29	0.32	0.24	0.33	0.35	0.29	0.34	0.25	0.27	0.37	0.38	0.28	0.36
	MK	0.29	0.30	0.29	0.33	0.29	0.29	0.30	0.27	0.26	0.30	0.23	0.21	0.36	0.35	0.28	0.33
	MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NI	0.30	0.36	0.45	0.37	0.39	0.33	0.33	0.28	0.36	0.29	0.35	0.39	0.40	0.40	0.76	0.64
	NL	0.26	0.27	0.33	0.25	0.29	0.31	0.30	0.24	0.24	0.27	0.30	0.29	0.31	0.50	0.44	0.32
	NO	0.26	0.25	0.22	0.20	0.21	0.27	0.24	0.20	0.22	0.18	0.29	0.27	0.38	0.38	0.45	0.40
	PL	0.28	0.29	0.34	0.34	0.31	0.28	0.25	0.28	0.24	0.26	0.31	0.29	0.39	0.39	0.33	0.38
	PT	0.43	0.42	0.42	0.40	0.40	0.41	0.42	0.41	0.46	0.41	0.34	0.45	0.40	0.37	0.44	0.41
	RO	0.33	0.30	0.31	0.25	0.33	0.29	0.29	0.29	0.26	0.29	0.27	0.27	0.35	0.37	0.37	0.38
	RS	0.32	0.24	0.24	0.23	0.30	0.25	0.22	0.23	0.20	0.24	0.22	0.23	0.34	0.27	0.26	0.31
	SE	0.36	0.38	0.27	0.29	0.21	0.27	0.28	0.27	0.29	0.21	0.29	0.28	0.31	0.44	0.46	0.35
	SI	0.39	0.37	0.50	0.38	0.36	0.37	0.41	0.46	0.40	0.38	0.38	0.34	0.39	0.44	0.48	0.49
	SK	0.33	0.30	0.39	0.28	0.30	0.27	0.27	0.35	0.27	0.27	0.27	0.28	0.34	0.39	0.28	0.35

	UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offshore Wind Capacity Factor	AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BE	0.72	0.74	0.90	0.70	0.85	0.80	0.83	0.49	0.64	0.71	0.84	0.78	0.84	0.98	0.98	0.92
	BG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CZ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DE	0.67	0.70	0.73	0.76	0.60	0.70	0.73	0.57	0.58	0.72	0.66	0.63	0.74	0.89	0.92	0.85
	DK	0.71	0.74	0.76	0.82	0.56	0.71	0.65	0.61	0.59	0.72	0.74	0.73	0.82	0.84	0.91	0.85
	EE	0.47	0.63	0.51	0.37	0.32	0.45	0.44	0.54	0.37	0.46	0.57	0.38	0.57	0.64	0.82	0.74
	ES	0.43	0.43	0.38	0.37	0.34	0.34	0.47	0.25	0.29	0.32	0.36	0.34	0.38	0.41	0.41	0.44
	FI	0.57	0.59	0.51	0.50	0.53	0.52	0.49	0.49	0.49	0.36	0.53	0.43	0.66	0.76	0.75	0.67
	FR	0.64	0.58	0.70	0.54	0.81	0.69	0.62	0.50	0.53	0.53	0.65	0.74	0.49	0.76	0.77	0.72
	GB	0.47	0.60	0.73	0.58	0.54	0.51	0.56	0.41	0.47	0.51	0.59	0.59	0.67	0.71	0.88	0.81
	GR	0.33	0.41	0.52	0.49	0.74	0.55	0.70	0.47	0.72	0.71	0.74	0.73	0.75	0.60	0.76	0.70
	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	HU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	IE	0.41	0.51	0.60	0.66	0.63	0.40	0.48	0.40	0.55	0.40	0.60	0.60	0.52	0.57	0.89	0.85
	IT	0.39	0.38	0.49	0.27	0.36	0.33	0.39	0.43	0.36	0.40	0.27	0.27	0.37	0.41	0.41	0.43
	LT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	LU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	LV	0.44	0.63	0.58	0.38	0.30	0.52	0.36	0.43	0.31	0.36	0.49	0.43	0.49	0.61	0.78	0.84
	ME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	NI	0.45	0.59	0.75	0.68	0.69	0.53	0.58	0.53	0.69	0.47	0.68	0.73	0.68	0.68	0.95	0.92
	NL	0.60	0.68	0.84	0.73	0.66	0.68	0.73	0.48	0.57	0.67	0.65	0.69	0.79	0.94	0.91	0.86
	NO	0.45	0.56	0.57	0.60	0.42	0.49	0.45	0.40	0.52	0.48	0.56	0.62	0.65	0.69	0.78	0.82
	PL	0.61	0.69	0.59	0.92	0.48	0.64	0.58	0.52	0.38	0.59	0.63	0.46	0.72	0.78	0.88	0.73
	PT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SE	0.53	0.59	0.52	0.48	0.41	0.56	0.45	0.39	0.37	0.40	0.49	0.49	0.56	0.64	0.72	0.65
	SI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	UA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix 6: Load and generation data (all values in GW)

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Albania																
Net generation capacity	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**
Reliable available capacity under normal conditions	5.63	6.14	6.14	6.27	6.42	6.23	6.42	6.28	6.28	5.82	5.81	6.29	6.90	6.33	6.50	6.46
Reliable available capacity in severe conditions	5.54	6.06	6.06	6.19	6.34	6.14	6.34	6.20	6.20	5.74	5.72	6.21	6.82	6.25	6.42	6.38
Net load at reference point under normal conditions	4.26	4.23	4.29	4.21	4.14	4.16	4.32	4.23	4.08	4.15	4.18	4.15	4.28	4.18	4.17	4.30
Net load at reference point in severe conditions	4.42	4.40	4.46	4.38	4.30	4.33	4.49	4.40	4.24	4.31	4.34	4.31	4.45	4.35	4.34	5.16
Austria																
Net generation capacity	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**
Reliable available capacity under normal conditions	13.24	13.02	13.38	12.79	13.54	13.62	13.67	13.74	13.88	13.98	13.13	13.22	13.38	13.88	13.42	13.29
Reliable available capacity in severe conditions	11.80	11.59	11.97	11.41	12.20	12.30	12.38	12.45	12.59	12.71	11.88	12.01	12.23	12.79	12.37	12.29
Net load at reference point under normal conditions	9.41	9.26	9.40	9.52	9.45	9.55	8.97	9.05	8.80	8.82	9.13	9.43	9.48	9.37	9.36	9.16
Net load at reference point in severe conditions	9.88	9.72	9.87	10.00	9.93	10.03	9.42	9.51	9.24	9.26	9.58	9.90	9.95	9.83	9.83	9.62
Belgium																
Net generation capacity	**20.35**	**20.34**	**20.34**	**20.33**	**20.34**	**20.34**	**20.34**	**20.34**	**20.34**	**20.34**	**20.34**	**20.34**	**20.34**	**20.34**	**20.34**	**20.34**
Reliable available capacity under normal conditions	12.05	12.03	11.96	10.97	11.09	11.10	11.10	11.10	11.05	10.95	11.14	11.14	10.88	9.71	9.71	10.36
Reliable available capacity in severe conditions	10.05	10.02	10.11	9.18	9.01	9.02	9.02	9.02	9.02	9.13	9.13	9.13	8.90	7.56	7.56	8.18
Net load at reference point under normal conditions	11.13	11.15	11.25	11.26	11.24	11.24	10.84	10.31	10.15	10.59	10.71	11.09	11.38	11.34	11.37	11.30
Net load at reference point in severe conditions	11.45	11.47	11.57	11.58	11.41	11.41	11.01	10.48	10.32	10.76	10.89	11.27	11.56	11.61	11.64	11.58
Bosnia and Herzegovina																
Net generation capacity	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**	**3.63**
Reliable available capacity under normal conditions	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08
Reliable available capacity in severe conditions	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08
Net load at reference point under normal conditions	1.55	1.55	1.55	1.55	1.55	1.60	1.60	1.60	1.60	1.60	1.60	1.55	1.55	1.55	1.55	1.55
Net load at reference point in severe conditions	1.62	1.62	1.62	1.62	1.62	1.67	1.67	1.67	1.67	1.67	1.67	1.62	1.62	1.62	1.62	1.62
Bulgaria																
Net generation capacity	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**	**12.72**
Reliable available capacity under normal conditions	10.02	10.02	10.02	10.02	10.02	10.02	10.02	10.02	10.02	10.02	10.02	10.02	10.02	10.02	10.02	10.02
Reliable available capacity in severe conditions	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30
Net load at reference point under normal conditions	3.91	3.98	4.04	4.09	4.13	4.17	4.19	4.21	4.21	4.21	4.20	4.17	4.14	4.10	4.06	4.00
Net load at reference point in severe conditions	4.18	4.26	4.32	4.38	4.42	4.45	4.48	4.50	4.50	4.50	4.49	4.46	4.43	4.39	4.34	4.28
Croatia																
Net generation capacity	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**	**4.20**
Reliable available capacity under normal conditions	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38	3.38
Reliable available capacity in severe conditions	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21
Net load at reference point under normal conditions	2.06	2.38	2.09	1.97	2.15	2.26	2.32	2.33	2.32	2.19	2.33	2.27	2.28	2.21	2.23	2.11
Net load at reference point in severe conditions	2.37	2.74	2.40	2.27	2.47	2.60	2.67	2.68	2.67	2.52	2.68	2.61	2.62	2.54	2.56	2.43

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Cyprus																
Net generation capacity	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**	**1.71**
Reliable available capacity under normal conditions	1.37	1.39	1.39	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.43	1.32
Reliable available capacity in severe conditions	1.57	1.59	1.59	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.63	1.52
Net load at reference point under normal conditions	0.71	0.74	0.79	0.83	0.86	0.90	0.93	0.95	0.95	0.91	0.83	0.87	0.91	0.84	0.77	0.75
Net load at reference point in severe conditions	0.51	0.53	0.57	0.59	0.61	0.64	0.67	0.68	0.68	0.65	0.60	0.62	0.65	0.60	0.55	0.53
Czech Republic																
Net generation capacity	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**	**20.77**
Reliable available capacity under normal conditions	9.29	10.01	10.47	11.13	11.08	10.74	9.55	10.17	10.28	10.77	11.14	11.09	10.77	10.97	11.12	11.27
Reliable available capacity in severe conditions	9.07	9.79	10.24	10.90	10.85	10.51	9.32	9.95	10.05	10.55	10.91	10.86	10.54	10.74	10.90	11.04
Net load at reference point under normal conditions	8.12	8.01	8.02	8.01	7.86	7.74	7.80	7.74	7.55	7.68	7.77	7.92	7.99	8.06	7.98	8.14
Net load at reference point in severe conditions	8.12	8.01	8.02	8.01	7.86	7.74	7.80	7.74	7.55	7.68	7.77	7.92	7.99	8.06	7.98	8.14
Denmark																
Net generation capacity	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**
Reliable available capacity under normal conditions	5.63	6.14	6.14	6.27	6.42	6.23	6.42	6.28	6.28	5.82	5.81	6.29	6.90	6.33	6.50	6.46
Reliable available capacity in severe conditions	5.54	6.06	6.06	6.19	6.34	6.14	6.34	6.20	6.20	5.74	5.72	6.21	6.82	6.25	6.42	6.38
Net load at reference point under normal conditions	4.26	4.23	4.29	4.21	4.14	4.16	4.32	4.23	4.08	4.15	4.18	4.15	4.28	4.18	4.17	4.30
Net load at reference point in severe conditions	4.42	4.40	4.46	4.38	4.30	4.33	4.49	4.40	4.24	4.31	4.34	4.31	4.45	4.35	4.34	5.16
Estonia																
Net generation capacity	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**	**2.80**
Reliable available capacity under normal conditions	1.62	1.62	1.62	1.43	1.43	1.43	1.43	1.43	1.62	1.46	1.46	1.46	1.63	1.44	1.44	1.44
Reliable available capacity in severe conditions	1.30	1.30	1.30	0.94	0.94	0.94	0.94	0.94	1.30	1.00	1.00	1.00	1.32	0.96	0.96	0.96
Net load at reference point under normal conditions	0.96	0.94	0.95	0.95	0.93	0.91	0.90	0.89	0.93	0.94	0.94	0.94	0.96	0.97	0.97	0.97
Net load at reference point in severe conditions	0.96	0.94	0.95	0.95	0.93	0.91	0.90	0.89	0.93	0.94	0.94	0.94	0.96	0.97	0.97	0.97
Finland																
Net generation capacity	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**	**17.76**
Reliable available capacity under normal conditions	10.14	10.02	10.13	10.06	9.76	9.66	9.50	10.31	10.21	10.06	10.06	10.19	10.19	9.95	10.05	10.79
Reliable available capacity in severe conditions	9.58	9.46	9.56	9.49	9.20	9.09	8.94	9.75	9.64	9.50	9.50	9.62	9.62	9.38	9.49	10.22
Net load at reference point under normal conditions	9.40	9.30	9.00	9.00	9.00	8.90	8.80	8.80	8.90	9.30	9.40	9.40	9.40	9.50	9.60	9.70
Net load at reference point in severe conditions	9.60	9.40	9.30	9.30	9.30	9.10	8.90	8.90	9.00	9.40	9.60	9.60	9.60	9.70	9.70	9.80
France																
Net generation capacity	**123.60**	**123.60**	**123.60**	**123.60**	**123.54**	**123.54**	**123.54**	**123.54**	**123.52**	**123.52**	**123.52**	**123.52**	**123.52**	**123.66**	**123.66**	**123.66**
Reliable available capacity under normal conditions	71.63	72.03	71.70	72.59	71.04	71.41	71.89	70.89	72.30	72.30	72.69	72.16	70.78	69.02	71.12	68.09
Reliable available capacity in severe conditions	66.01	66.12	65.67	66.95	65.95	65.87	66.23	65.25	66.58	65.51	65.44	64.59	62.94	60.83	62.32	59.03
Net load at reference point under normal conditions	52.28	52.33	52.42	52.52	52.59	52.62	52.59	52.50	50.27	45.66	44.34	46.90	50.04	51.57	51.74	52.05
Net load at reference point in severe conditions	53.20	53.20	53.40	53.50	53.60	53.67	53.65	53.54	51.34	46.70	45.39	47.93	51.04	52.51	52.58	52.74

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
FYR of Macedonia																
Net generation capacity	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**	**1.82**
Reliable available capacity under normal conditions	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Reliable available capacity in severe conditions	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Net load at reference point under normal conditions	0.81	0.82	0.82	0.82	0.79	0.86	0.78	0.81	0.83	0.88	0.88	0.81	0.84	0.87	0.81	0.78
Net load at reference point in severe conditions	0.87	0.89	0.89	0.89	0.85	0.93	0.85	0.88	0.91	0.95	0.95	0.88	0.91	0.94	0.88	0.85
Germany																
Net generation capacity	**186.25**	**186.25**	**186.25**	**186.25**	**186.74**	**186.74**	**186.74**	**186.74**	**186.74**	**187.28**	**187.28**	**187.28**	**187.28**	**187.78**	**187.78**	**187.78**
Reliable available capacity under normal conditions	92.04	94.21	93.53	93.12	97.70	96.97	97.61	98.69	98.20	98.57	98.22	100.70	101.02	104.32	103.98	104.09
Reliable available capacity in severe conditions	74.68	76.85	76.17	75.76	80.27	79.53	80.18	81.26	80.77	81.06	80.72	83.19	83.51	86.74	86.40	86.50
Net load at reference point under normal conditions	70.39	71.94	68.75	70.54	70.10	71.44	70.91	70.29	69.84	65.25	65.13	65.76	67.14	67.97	68.46	68.77
Net load at reference point in severe conditions	72.70	72.70	72.70	72.70	72.70	72.70	72.70	72.70	72.70	72.70	72.70	72.70	72.70	72.70	72.70	72.70
Great Britain																
Net generation capacity	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**	**70.60**
Reliable available capacity under normal conditions	42.13	42.11	41.49	42.05	41.58	42.31	42.34	41.35	42.28	40.38	40.64	42.21	42.31	43.31	44.01	45.20
Reliable available capacity in severe conditions	39.45	39.44	38.82	39.38	38.91	39.64	39.66	38.67	39.61	37.71	37.96	39.53	39.63	40.63	41.34	42.53
Net load at reference point under normal conditions	36.60	36.70	36.50	36.60	36.80	36.40	36.30	36.00	35.40	35.50	35.80	36.60	36.60	37.50	38.70	39.80
Net load at reference point in severe conditions	38.10	38.20	38.00	38.10	38.30	37.90	37.80	37.50	36.90	37.00	37.30	38.10	38.10	39.00	40.20	41.30
Greece																
Net generation capacity	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**	**16.49**
Reliable available capacity under normal conditions	11.66	12.00	12.41	12.59	12.88	12.88	12.88	12.88	12.88	12.88	12.88	12.62	12.62	12.23	11.80	11.68
Reliable available capacity in severe conditions	10.79	11.13	11.54	11.72	12.01	12.01	11.98	11.98	11.98	12.01	12.11	11.85	11.85	11.46	11.03	10.91
Net load at reference point under normal conditions	6.70	6.92	7.75	8.40	8.55	8.65	8.85	9.00	9.10	8.70	8.50	8.20	8.30	7.90	7.10	6.95
Net load at reference point in severe conditions	6.93	7.15	8.00	8.70	8.90	9.05	9.30	9.50	9.60	9.20	8.90	8.55	8.60	8.20	7.35	7.15
Hungary																
Net generation capacity	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**	**8.29**
Reliable available capacity under normal conditions	5.07	5.07	5.07	5.11	5.02	4.75	4.75	4.75	4.74	4.76	4.70	4.80	4.75	4.80	5.32	4.57
Reliable available capacity in severe conditions	4.81	4.81	4.81	4.86	4.76	4.49	4.49	4.49	4.48	4.50	4.44	4.54	4.49	4.54	5.06	4.31
Net load at reference point under normal conditions	5.10	5.20	5.30	5.40	5.40	5.40	5.40	5.40	5.30	5.10	5.10	4.70	5.00	5.10	5.20	5.20
Net load at reference point in severe conditions	5.70	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.80	5.70	5.45	5.45	5.55	5.55
Ireland																
Net generation capacity	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**	**9.30**
Reliable available capacity under normal conditions	5.55	5.78	5.65	5.65	5.53	5.46	5.49	5.36	5.36	4.91	5.12	5.12	5.28	5.58	5.34	5.70
Reliable available capacity in severe conditions	4.28	4.54	4.43	4.43	4.31	4.20	4.23	4.10	4.10	3.66	3.87	3.87	4.02	4.33	4.11	4.45
Net load at reference point under normal conditions	3.59	3.61	3.63	3.64	3.68	3.66	3.67	3.60	3.50	3.58	3.74	3.82	3.79	3.65	3.70	3.71
Net load at reference point in severe conditions	3.59	3.61	3.63	3.64	3.68	3.66	3.67	3.60	3.50	3.58	3.74	3.82	3.79	3.65	3.70	3.71

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Italy																
Net generation capacity	**119.54**	**119.66**	**119.78**	**119.90**	**120.02**	**120.15**	**120.27**	**120.39**	**120.52**	**120.64**	**120.77**	**120.89**	**121.02**	**121.15**	**121.28**	**121.40**
Reliable available capacity under normal conditions	62.14	61.12	62.08	65.53	66.78	67.08	67.39	66.91	66.21	64.65	62.01	61.90	63.57	63.92	62.85	62.41
Reliable available capacity in severe conditions	60.93	59.95	60.89	64.33	65.54	65.85	66.16	65.68	64.97	63.38	60.53	60.41	62.31	62.68	61.60	61.15
Net load at reference point under normal conditions	42.00	45.00	45.68	46.27	46.77	47.16	47.45	47.61	47.66	38.40	34.00	34.40	40.20	46.02	45.34	44.56
Net load at reference point in severe conditions	45.60	48.60	49.28	49.87	50.37	50.76	51.05	51.21	51.26	42.00	37.60	38.00	43.80	49.62	48.94	48.16
Latvia																
Net generation capacity	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**	**2.92**
Reliable available capacity under normal conditions	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	0.85	1.26	0.98	0.98
Reliable available capacity in severe conditions	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	0.62	1.03	0.75	0.75
Net load at reference point under normal conditions	0.93	0.91	0.90	0.91	0.91	0.94	0.92	0.92	0.99	0.98	0.93	0.96	0.94	0.89	0.92	0.93
Net load at reference point in severe conditions	0.97	0.95	0.94	0.94	0.95	0.98	0.95	0.96	1.03	1.02	0.97	1.00	0.98	0.93	0.95	0.96
Lithuania																
Net generation capacity	**3.99**	**3.99**	**3.99**	**3.99**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**	**4.13**
Reliable available capacity under normal conditions	2.07	2.08	1.98	1.97	2.11	2.03	2.04	2.04	2.05	2.06	2.17	2.17	2.18	2.17	2.20	2.20
Reliable available capacity in severe conditions	2.05	2.06	1.96	1.95	2.10	2.02	2.03	2.03	2.03	2.05	2.15	2.16	2.17	2.16	2.19	2.19
Net load at reference point under normal conditions	1.38	1.39	1.40	1.15	1.41	1.40	1.38	1.39	1.41	1.45	1.45	1.44	1.42	1.41	1.42	1.44
Net load at reference point in severe conditions	1.43	1.45	1.46	1.20	1.47	1.46	1.44	1.45	1.47	1.51	1.51	1.50	1.47	1.47	1.48	1.49
Luxembourg																
Net generation capacity	**1.92**	**1.92**	**1.92**	**1.92**	**1.92**	**2.01**	**2.01**	**2.01**	**2.01**	**1.92**	**1.92**	**2.02**	**2.02**	**1.92**	**2.01**	**1.92**
Reliable available capacity under normal conditions	1.38	1.38	1.38	1.38	1.38	1.47	1.47	1.47	1.47	1.38	1.38	1.38	1.37	1.37	1.46	1.37
Reliable available capacity in severe conditions	1.16	1.16	1.16	1.16	0.26	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
Net load at reference point under normal conditions	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.82	0.82	0.82	0.82	0.82	0.83	0.84	0.86	0.86
Net load at reference point in severe conditions	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.85	0.85	0.85	0.85	0.85	0.86	0.87	0.89	0.89
Montenegro																
Net generation capacity	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**
Reliable available capacity under normal conditions	0.64	0.64	0.64	0.64	0.64	0.50	0.50	0.50	0.64	0.44	0.44	0.44	0.44	0.64	0.64	0.64
Reliable available capacity in severe conditions	0.69	0.69	0.69	0.69	0.69	0.55	0.55	0.55	0.69	0.49	0.49	0.49	0.49	0.69	0.69	0.69
Net load at reference point under normal conditions	0.41	0.41	0.42	0.42	0.47	0.48	0.49	0.50	0.51	0.52	0.52	0.50	0.49	0.45	0.43	0.42
Net load at reference point in severe conditions	0.40	0.40	0.41	0.41	0.46	0.46	0.47	0.49	0.50	0.53	0.53	0.54	0.53	0.49	0.46	0.43

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
The Netherlands																
Net generation capacity	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**	**33.37**
Reliable available capacity under normal conditions	23.65	23.65	24.01	23.17	23.98	22.13	23.85	21.82	22.99	22.99	24.86	24.19	24.27	24.35	23.88	24.35
Reliable available capacity in severe conditions	19.95	19.95	20.31	20.12	20.27	18.42	20.15	19.71	19.28	19.28	21.15	21.15	20.56	20.64	20.64	20.64
Net load at reference point under normal conditions	15.32	14.70	14.99	15.19	15.60	14.75	14.55	14.67	13.98	13.97	15.15	15.14	15.02	15.01	14.68	14.70
Net load at reference point in severe conditions	15.32	14.70	14.99	15.19	15.60	14.75	14.55	14.67	13.98	13.97	15.15	15.14	15.02	15.01	14.68	14.70
Norway																
Net generation capacity	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**	**32.89**
Reliable available capacity under normal conditions	24.69	24.69	24.69	25.99	25.99	25.99	25.99	25.99	24.69	24.69	24.69	24.69	24.04	24.04	24.04	24.04
Reliable available capacity in severe conditions	23.08	23.08	23.08	24.38	24.38	24.38	24.38	24.38	23.08	23.08	23.08	23.08	22.43	22.43	22.43	22.43
Net load at reference point under normal conditions	12.36	12.62	12.49	12.41	12.20	11.73	11.33	11.12	11.36	11.73	11.98	12.17	12.40	12.50	12.54	13.02
Net load at reference point in severe conditions	13.10	13.38	13.24	13.15	12.93	12.44	12.01	11.79	12.05	12.43	12.70	12.90	13.14	13.25	13.30	13.80
Poland																
Net generation capacity	**36.46**	**36.46**	**36.46**	**36.46**	**37.28**	**37.28**	**37.28**	**37.28**	**37.28**	**37.31**	**37.31**	**37.31**	**37.31**	**37.38**	**37.38**	**37.38**
Reliable available capacity under normal conditions	20.47	20.86	20.75	20.90	21.37	21.25	21.25	21.35	21.17	21.35	21.29	21.57	21.88	22.64	21.77	21.91
Reliable available capacity in severe conditions	18.97	19.36	19.25	19.41	19.84	19.72	19.72	19.82	19.64	19.82	19.76	20.04	20.35	21.11	20.24	20.38
Net load at reference point under normal conditions	18.87	19.43	19.43	19.52	19.52	19.80	19.89	19.89	19.89	19.69	19.60	19.60	19.69	19.11	19.58	19.76
Net load at reference point in severe conditions	19.72	20.09	20.09	20.09	20.28	20.28	20.28	20.28	20.28	20.17	20.17	20.17	20.17	20.15	20.15	20.15
Portugal																
Net generation capacity	**18.13**	**18.13**	**18.13**	**18.13**	**18.14**	**18.14**	**18.14**	**18.14**	**18.14**	**18.16**	**18.16**	**18.16**	**18.16**	**18.16**	**18.17**	**18.17**
Reliable available capacity under normal conditions	10.41	10.41	10.52	10.98	10.63	10.58	10.58	10.56	10.20	10.12	10.05	10.11	10.06	10.19	9.96	9.93
Reliable available capacity in severe conditions	8.61	8.63	8.72	9.22	9.08	9.03	9.02	8.95	8.70	8.61	8.59	8.63	8.66	8.84	8.63	8.59
Net load at reference point under normal conditions	6.68	4.80	6.71	6.42	6.81	6.90	7.01	7.10	7.11	6.63	6.53	6.12	6.17	6.87	6.87	6.90
Net load at reference point in severe conditions	7.04	7.14	7.12	7.22	7.29	7.46	7.58	7.55	7.14	6.96	6.60	6.58	7.48	7.28	7.29	7.22
Romania																
Net generation capacity	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**	**21.92**
Reliable available capacity under normal conditions	9.66	9.76	10.03	9.94	9.69	9.57	9.54	9.52	9.53	9.27	9.25	9.37	9.81	9.53	9.47	9.29
Reliable available capacity in severe conditions	9.26	9.63	9.72	9.78	9.47	9.41	9.38	9.30	9.39	9.04	9.11	9.32	9.47	9.31	9.23	8.92
Net load at reference point under normal conditions	6.23	6.54	6.32	6.36	6.34	6.77	6.53	6.63	6.60	6.46	7.06	6.43	6.56	6.33	6.15	5.95
Net load at reference point in severe conditions	6.73	7.04	6.82	6.86	6.84	7.27	7.03	7.13	7.10	6.96	7.56	6.93	7.06	6.83	6.65	6.45
Serbia																
Net generation capacity	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**
Reliable available capacity under normal conditions	5.63	6.14	6.14	6.27	6.42	6.23	6.42	6.28	6.28	5.82	5.81	6.29	6.90	6.33	6.50	6.46
Reliable available capacity in severe conditions	5.54	6.06	6.06	6.19	6.34	6.14	6.34	6.20	6.20	5.74	5.72	6.21	6.82	6.25	6.42	6.38
Net load at reference point under normal conditions	4.26	4.23	4.29	4.21	4.14	4.16	4.32	4.23	4.08	4.15	4.18	4.15	4.28	4.18	4.17	4.30
Net load at reference point in severe conditions	4.42	4.40	4.46	4.38	4.30	4.33	4.49	4.40	4.24	4.31	4.34	4.31	4.45	4.35	4.34	5.16

Week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Slovakia																
Net generation capacity	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**	**8.08**
Reliable available capacity under normal conditions	3.91	3.91	3.91	3.91	3.90	3.90	4.40	4.42	4.42	4.42	4.41	4.51	4.52	4.48	4.48	4.47
Reliable available capacity in severe conditions	3.29	3.36	3.38	3.34	3.31	3.34	3.81	3.89	3.85	3.85	3.86	3.97	3.95	3.96	4.01	4.08
Net load at reference point under normal conditions	3.43	3.60	3.44	3.44	3.46	3.51	3.51	3.54	3.32	3.23	3.40	3.37	3.50	3.54	3.61	3.60
Net load at reference point in severe conditions	3.55	3.60	3.66	3.67	3.66	3.58	3.60	3.54	3.50	3.52	3.48	3.64	3.55	3.71	3.75	3.78
Slovenia																
Net generation capacity	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**	**3.77**
Reliable available capacity under normal conditions	2.72	2.69	2.66	2.63	2.62	2.66	2.57	2.63	2.51	2.64	2.61	2.62	2.57	2.48	2.51	2.66
Reliable available capacity in severe conditions	2.51	2.53	2.49	2.41	2.50	2.39	2.39	2.38	2.25	2.34	2.27	2.41	2.30	2.13	2.20	2.41
Net load at reference point under normal conditions	1.84	1.84	1.93	1.85	1.90	1.88	1.89	1.81	1.70	1.67	1.71	1.86	1.88	1.87	1.85	1.85
Net load at reference point in severe conditions	1.93	1.93	2.03	1.94	2.00	1.97	1.98	1.90	1.78	1.75	1.80	1.96	1.98	1.96	1.95	1.94
Spain																
Net generation capacity	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**	**100.96**
Reliable available capacity under normal conditions	52.15	53.09	54.57	54.99	55.69	56.71	57.71	57.71	57.71	57.03	57.03	57.03	57.03	56.33	56.33	56.32
Reliable available capacity in severe conditions	48.53	49.47	50.95	51.37	52.40	53.57	54.57	54.57	54.57	53.39	53.39	53.39	53.39	52.99	52.99	52.97
Net load at reference point under normal conditions	35.62	36.56	36.56	36.56	35.15	35.15	35.34	35.53	36.09	35.62	35.15	34.68	34.21	33.27	32.33	31.86
Net load at reference point in severe conditions	37.60	38.59	38.59	38.59	37.11	37.11	37.30	37.50	38.10	37.60	37.11	36.61	36.12	35.13	34.14	33.64
Sweden																
Net generation capacity	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**	**39.30**
Reliable available capacity under normal conditions	22.60	23.48	25.86	25.86	26.93	25.81	25.81	26.93	26.93	25.76	24.82	24.82	24.82	25.45	25.45	25.45
Reliable available capacity in severe conditions	20.18	21.06	23.44	23.44	24.51	23.39	23.39	24.51	24.51	23.34	22.40	22.40	22.40	23.03	23.03	23.03
Net load at reference point under normal conditions	14.88	14.79	15.04	15.15	14.88	14.25	13.13	12.54	12.45	13.64	14.62	15.01	15.20	15.08	15.07	15.11
Net load at reference point in severe conditions	15.38	15.29	15.54	15.65	15.38	14.75	13.63	13.04	12.95	14.14	15.12	15.51	15.70	15.58	15.57	15.61
Switzerland																
Net generation capacity	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**	**18.78**
Reliable available capacity under normal conditions	14.42	13.43	13.43	13.43	13.43	14.42	14.42	14.79	14.79	14.41	13.21	12.84	12.84	12.84	13.22	14.42
Reliable available capacity in severe conditions	14.42	13.43	13.43	13.43	13.43	14.42	14.42	14.79	14.79	14.41	13.21	12.84	12.84	12.84	13.22	14.42
Net load at reference point under normal conditions	8.18	8.22	8.05	8.04	8.40	8.14	7.64	7.51	7.40	7.28	8.26	8.18	8.32	8.33	8.35	8.34
Net load at reference point in severe conditions	9.18	9.22	9.05	9.04	9.40	9.14	8.64	8.51	8.40	8.28	9.26	9.18	9.32	9.33	9.35	9.34
Ukraine (Wext Power System)																
Net generation capacity	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**	**2.61**
Reliable available capacity under normal conditions	1.48	1.48	1.48	1.48	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.45	1.46	1.46	1.46
Reliable available capacity in severe conditions	1.19	1.19	1.19	1.19	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.15	1.15	1.15
Net load at reference point under normal conditions	0.69	0.69	0.69	0.69	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.73	0.73	0.73
Net load at reference point in severe conditions	0.70	0.70	0.70	0.70	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.74	0.74	0.74

Appendix 7: Glossary

Downward Regulation Reserve: The Active Power reserves kept available to contain and restore System Frequency to the Nominal Frequency and for restoring power exchange balances to their scheduled value;

Downward Regulation: The minimum amount of Downward Regulation Reserve, which is required by the TSO to be able to reduce output on the system;

Firm import/export contracts: Bilateral contracts for the import or export of electrical energy, agreed for a certain period of time in advance;

Generation adequacy: An assessment of the ability of the generation in the power system to match the Load on the power system at all times;

Highest expected proportion of installed renewable generation running: Maximum expected renewable infeed which should be taken into account in downward regulation analysis. This is set at 65% for the wind and 95% for the solar as a default value but can be replaced as various TSOs will have historic experience of higher or lower output from renewables across the assessed period;

Capacity factor: The ratio of the available output capacity and installed capacity over a period of time for various types of power plants (used primarily to describe renewable output in this report);

Load Management: Load Management forecast is estimated as the potential load reduction under control of each TSO to be deducted from load in the adequacy assessment;

Load: Load on a power system is the net consumption corresponding to the hourly average active power absorbed by all installations connected to the transmission grid or to the distribution grid, excluding the pumps of the pumped-storage stations. "Net" means that the consumption of power plants' auxiliaries is excluded from the Load, but network losses are included in the Load;

Must Run Generation is the amount of output of the generators which, for various reasons, must be connected to the transmission/ distribution grid. Such reasons may include: network constraints (overload management, voltage control), specific policies, minimum number of units needed to provide system services, system inertia, subsidies, environmental causes etc.;

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

Net Transfer Capacity (NTC): The Net transfer capacity is the maximum total exchange program between two adjacent control areas compatible with security standards applicable in all control areas of the synchronous area, and taking into account the technical uncertainties on future network conditions;

Non-usable capacity at peak load under normal conditions: Aggregated reduction of the net generating capacities due to various causes, including, but not limited to temporary limitations due to constraints (e.g. power stations which are mothballed or in test operation, heat extraction for CHP's); limitations due to fuel constraints management; limitation reflecting the average availability of the primary energy source; power stations with output power limitation due to environmental and ambient constraints, etc.;

Pumping Storage Capacity: Net Generating Capacity of hydro units in which water can be raised by means of pumps and stored, to be used later for the generation of electrical energy;

Reference Points: Reference points are the dates and times data are collected for:

– Sundays of Winter on the 5th hour (05:00 CET) and on the 11th hour (11:00 CET)
– Wednesday of Winter on the 19th hour (19:00 CET)

Reliably Available Capacity (RAC): Part of National Generating Capacity that is actually available to cover the Load at a reference point;

Remaining capacity (RC): The RC on a power system is the difference between the RAC and the Load. The RC is the part of the NGC left on the system to cover any programmed exports, unexpected load variation and unplanned outages at a reference point;

Run of River: A hydro unit at which the head installation uses the cumulative flow continuously and normally operates on base load;

Severe conditions are related to what each TSO would expect under a 1 in a 10 year scenario.[13] For example, the demand will be higher than under normal conditions and in certain regions, the output from generating units (e.g. wind) may be very low or there may be restrictions in thermal plants which operate at a reduced output under very low or high temperatures.

Simultaneous exportable/importable capacity: Transmission capacity available for exports/imports to/from other Control Areas expected to be available each week. It is calculated taking into account the mutual dependence of flows on different profiles due to internal or external network constraints and may therefore differ from the sum of NTCs on each profile of a Control Area or country;

System services reserve under normal conditions: The capacity required to maintain the security of supply according to the operating rules of each TSO. It corresponds to the level required one hour before real time (additional short notice breakdowns are already considered in the amount of outages).

Time of Reference: Time in the outlook reports is expressed as the local time in Brussels.

[13] It is difficult to be very specific and hence a description of the scenario being considered should be provided in the data collection questionnaire by each TSO, if *for example* the 1 in 10 year scenario recommendation is not used, and a TSO only calculates at a 1 in 20 year demand level.

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