
Seasonal Outlook Report Evolutions

Consultation material

14 July 2014

1. Main stakeholder expectations

The main outcome of the inaugural stakeholder consultation workshop on ENTSO-E methodology improvements for adequacy assessments held by TF ADAM on April 16th was the identification and prioritisation of Stakeholders' expectations.

In this context, the following main areas of improvement in the ENTSO-E adequacy methodologies applied for the Outlook Reports have been identified.

2. Flexibility assessment

Due to the increase volatility of generation caused by renewables and rising fluctuations of load, a higher flexibility of the entire system is required. The current market structure does not provide the TSOs with sufficient conditions to meet the new flexibility requirements and this trend will continue in future. The overall goal is to measure the potential lack of flexible generation in the expected power system operation.

3. Harmonization of methodology

The scenarios should be harmonised on the whole geographical perimeter of the assessment to fully benefit from the assessment of the entire interconnected system as a whole. Thus, the datasets provided should have common underlying assumptions:

- TSOs should follow specific guidelines to calculate the figures requested (i.e. GDP used in the demand forecast)
- Some values could be built centrally to ensure consistency (RES capacity factors), and TSOs will have the opportunity to validate and modify these values.

The core methodology should be the basis for the short and mid-term reports (Outlook and SO&AF).

4. Data transparency

The transparency of this report's data is based on the public access and its quality. The data can be arranged into subcategories such as: scenarios, sources, input and output. These Subcategories can explain in more detail the evolution of the variables or parameters used in the methodology. Transparency of data in these subcategories will allow stakeholders to understand the evolution of the variables and parameters used in the methodology employed. However, confidence in the results and confidentiality issues might require some data to be publicly released in an aggregated manner.

Detailed specifications are an important part of the reports as it is necessary to have common understanding and procedure. The publication of this methodology is an important part for transparency of data and will be accessible to stakeholders through the public consultation.

5. Cross-border exchanges

An accurate adequacy assessment cannot avoid taking into account the role of interconnectors as a contribution to the ability of each area to balance its load and generation. In order to achieve this, a harmonized methodology to model the contribution of cross-border exchanges to adequacy is required. Such a model should consider the limited capacities between areas of the interconnected grid and properly evaluate the potential support provided by the interconnections to each area.

6. Probabilistic approach

The objective of the methodology review is to implement a probabilistic approach to better model the volatility and uncertainties of the system, and also to meet stakeholders' expectations.

7. Specific constraints on outlook reports

The seasonal outlook reports have some important specific constraints unlike the mid-term adequacy reports. This constraint is associated to time and the fact that the seasonal outlook report has tight time restrictions for publication. The publication data of the seasonal outlook reports will be established under the Network Code Operational, Planning and Scheduling (OP&S).

The goal is to reduce as much as possible the time needed to collate the data from TSOs and publish the report. During this period several processes have to be followed including: data verification, iterations with TSOs, input preparation, adequacy simulations, analyses of the results, drafting of the reports and finally TSO approval process. It is key to optimize every step as much as possible to avoid time delays, repetition of processes and early advancement of the start of data collection.

The key reason to avoid early advancement of data collection is the decreasing quality of the data collected. As the availability of maintenance plans and cross-border exchange capacities are linked to the processes described in the Network Codes, care has to be taken to ensure results of those processes are available when data is collected from TSOs.

To ensure an efficient data collection phase, ENTSO-E proposes to create default data centrally to provide a base value for the TSOs and a backup value for when data is not provided on time. TSOs will have the opportunity to validate and modify these values. As the methodology revolutionises further, care has to be taken on the time needed to perform simulations which is an issue especially for the seasonal outlook reports.

Apart from timing constraints, another specific constraint of the outlook reports is the ability for TSOs and other stakeholders to localize potential issues in, and linking them to the underlying reasons. This allows all stakeholders to search for the needed remedial actions for mitigating the potential risk. As this is a specific need of the outlook reports mainly due to their operational nature and purpose, this might mean that some differences in methodology and generated output will exist compared to the longer term adequacy reports.

8. Implementation timing of methodology evolutions

The transition of the current methodology for the outlook reports should be a gradual step by step approach in order to ensure transparency of the evolutionary process, to allow all stakeholders to have a clear comprehension of the improvements in the reports, and to enable them to take all the benefits deriving from these evolutions.

Additionally, the forthcoming Network Code on Operational Planning & Scheduling (OP&S) imposes a public consultation upon every evolution in the methodology used for the seasonal outlook reports. The time needed for ENTSO-E to effectively implement the changes, develop and test the necessary tools should be considered, this implies a minimal period required between subsequent evolutions in the used methodology.

For those reasons we would propose an approach where the methodology evolves gradually year by year. Starting with an improved methodology where additional results, graphs and tables will be introduced for every Summer Outlook Report reflecting additional or improved assessments. This same methodology will then be applied again for the next Winter Outlook. Using a gradual step by step approach will allow ENTSO-E to gain experience on the improved methods as well as identify any potential problems and create solutions.

It will also allow ENTSO-E to develop the necessary tools to improve the outlook reports and most importantly to gather feedback from stakeholders on this new process whilst still maintaining a steady pace in the outlook methodology improvements.

We propose retaining the existing methodology for the WO 2014/15. However, we propose adding a limited but important improvement, with a probabilistic assessment of RES and temperatures as will be described below. Further developments for the summer outlook reports 2015 are also described below. They will be more clearly specified after the conclusion of the online consultation.

9. Concise description of the currently used methodology, especially regarding cross-border exchanges

The current methodology used for the seasonal outlook reports already takes into account cross-border exchanges between countries in a simplified way. The current methodology is based on a Net Transfer Capacity (NTC) method where the weekly expected minimum NTC is collected from all TSOs for every border and every direction. Additionally the possibility is available for TSOs to define global import and export limits per country.

The simulation will then determine whether considering the given NTCs and the remaining margin for every country it is possible to route the energy needed from countries with a surplus to countries experiencing a deficit. In this simulation only the existence of sufficient interconnection capacity is assessed. Neither a market simulation nor a merit order is modelled, meaning that no conclusions can be drawn from the simulations about the use of interconnection capacity on specific borders. Only on the regional or country level some conclusions can be drawn on the importance of available interconnection capacity.

10. Proposed improvements for next Winter Outlook Report related to the five main issues identified by stakeholders

Step 1 (Winter outlook 2014/15)

In order to speed up the methodology improvement process, six main areas for the next Winter Outlook have been identified in line with stakeholder expectations:

- Harmonization of assumptions taken and data used
- Assessing the system flexibility
- Enhancing transparency towards stakeholders
- Improvement of the treatment of cross-border exchange capacities
- Extension of the outlook reports with a probabilistic assessment of RES and temperatures
- Assessing the impact of potential gas shortages on generation adequacy

Harmonization of assumptions taken and data used

Currently, all input data for the outlook reports is being collected using excel templates that are distributed to and filled in by the TSOs. The only central data that was used in previous outlook reports was the historical load factors for solar and wind in feed from the Pan-European climatic database (PECD).

A first important shortcoming of the current data collection methodology is the fact that it often is an iterative process taking a significant amount of time, which is an important constraint for the time-critical seasonal

outlook reports. Secondly the lack of harmonization especially in the definition of severe conditions is an important issue for stakeholders and can hinder a correct interpretation of the results.

To cope with these shortcomings, an approach is proposed where ENTSO-E produces selected data centrally to provide a default value to the TSOs. TSOs are asked to validate the centrally generated values, and provide alternative values if desired. This approach will allow ENTSO-E to decrease the risk of time delays due to late delivery of data by applying a deemed acceptance principle. For the Winter outlook 2014/15 RES load factors, sensitivity of load to temperature, severe conditions temperatures and forced outage rates would comprise the centrally produced data, subject to feasibility.

Additionally, ENTSO-E will provide a detailed description on how severe conditions should be interpreted. It will remain the responsibility of the individual TSO to determine the expected load under these severe conditions; however they will be asked to provide the temperature assumptions taken to ENTSO-E in order to allow central simulations of load fluctuations under different temperature conditions. This enables ENTSO-E to produce consistent regional severe conditions scenarios complementing the national severe conditions reported by the TSOs.

Assessing the system flexibility

Assessing the flexibility of generation is a complex issue. Considering the short implementation time left before the next winter outlook report, it is not feasible to already include such assessment in the used methodology. However, to evolve to a thorough assessment of flexibility in the system in the future, we will start collecting data on the amount of must-run generation at the different time points for the TSOs. These must-runs datasets could include nuclear generation, central heating systems, run-of-river, long-term gas contracts and must-runs for providing system services.

Enhancing transparency towards stakeholders

One of the main expectations of stakeholders, identified in the inaugural consultation workshop, was increased transparency towards stakeholders. In the current outlook report a high-level description of the methodology used is already included, as well as the RES load factors used for running the regional simulations.

We propose to increase transparency in the outlook reports, both on the methodology and the inputs and assumptions taken. First of all the applied methodology, including the models for considering cross-border exchanges and for RES scenarios will be described more in detail. Secondly more information will be published on the assumptions taken including the following:

- Evolution of installed generation capacity throughout Europe on a regional basis, separated by power plant type
- Sensitivity of consumption to temperature conditions
- Expected consumption per country for normal and severe conditions
- Load management

Improvement of the treatment of cross-border exchange capacities

Currently only a single NTC value is collected per week. Considering the fact that available capacities frequently change depending on the hour and especially between weekdays and weekends, we propose to improve the data collection procedure by also including a request for NTC values at the time points used for the downward adequacy analysis.

Extension of the outlook reports with a probabilistic assessment of RES and temperatures

Currently the outlook reports analyse the expected level of adequacy both in normal and severe conditions. This has been done through a national analysis using the data submitted by the individual TSOs followed by a regional analysis for which some of the data, including solar and wind in feed, is centrally generated using the Pan-European Climatic database (PECD) and taking into account potential cross-border exchanges. For regional analysis under severe conditions, worst case assumptions were taken per country, which allowed us to detect potential issues for certain countries or regions.

However, as those assumptions lead to a situation combining an unfavourable situation in all countries at the same time, without taking into account the correlation between wind, solar in feed and temperatures in different countries, we propose to extend this methodology by adding a more detailed analysis of the regions where issues are detected.

For each time point where countries have been identified where adequacy might be at stake, an additional analysis will be done using correlated time series for wind in feed, solar in feed and temperatures for those regions that might suffer a lack of adequacy. This will allow us to determine the probability of that particular country not being able to cover the peak load in certain regions, accounting for cross-border exchanges, together with the associated risk.

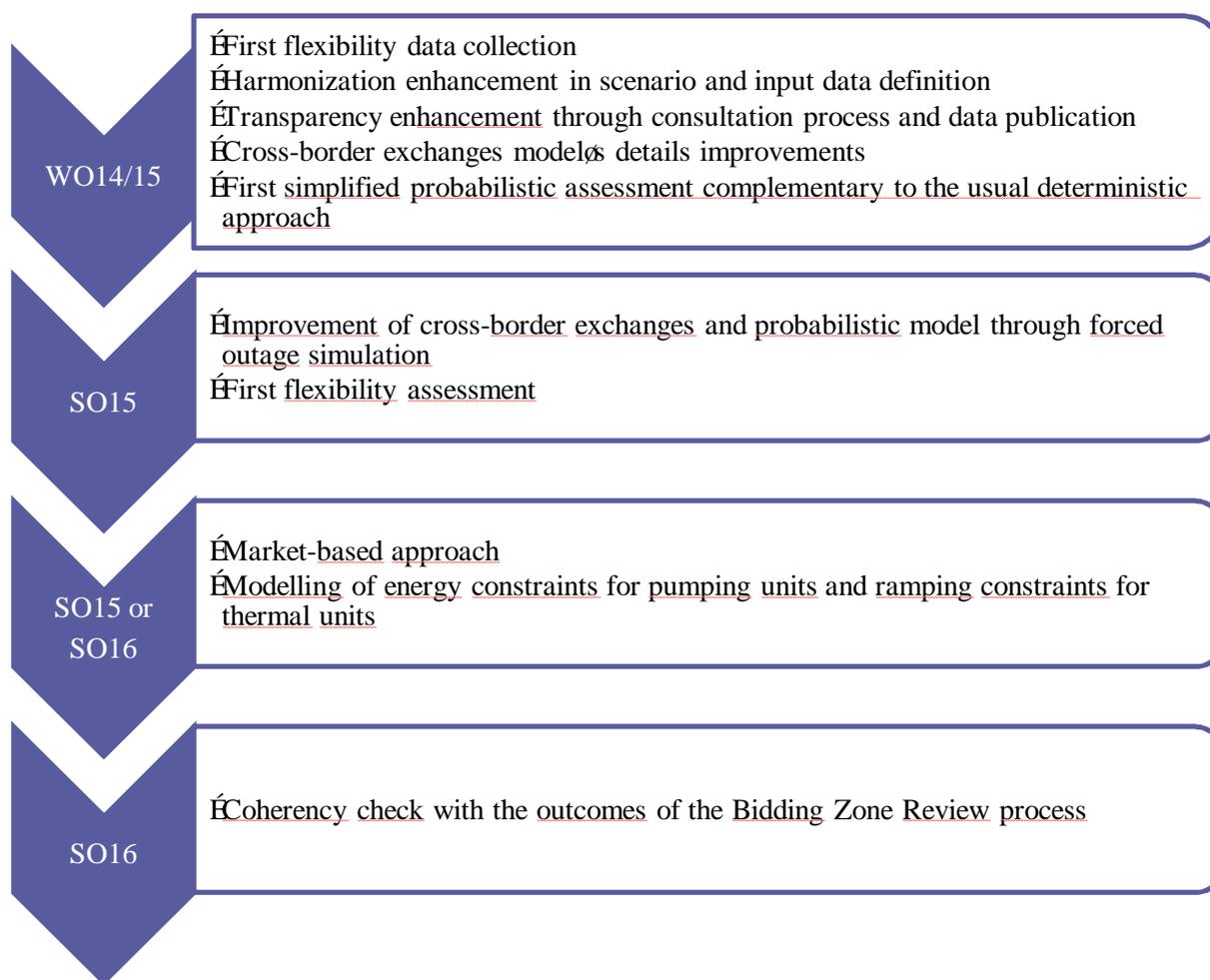
Assessing the impact of potential gas shortages on generation adequacy

Considering the recent events in Ukraine, many questions have arisen on the dependence of European countries on gas supplies from non-EU countries. As it has been identified that a gas shortage will affect the availability of gas-fuelled generation capacity as well as the level of electricity consumption, ENTSO-E has identified the need of performing an impact analysis on generation adequacy in relation to the Ukraine crises. Information on the impact of an interruption of supplied gas on the non-usability of their gas-powered units and on the electrical consumption will be requested from all TSOs. This will allow ENTSO-E to create an additional adequacy variant incorporating these limitations and identifying countries where generation adequacy might be impacted by potential gas shortages in the future.

A Coordination and harmonization process with ENTSO-G will be set up to ensure the coherency of forecasted scenarios. This analysis is foreseen for the WO 2014/15 after which it will be further determined if the assessment will be performed on a regular basis.

11. High level steps for forthcoming outlook reports

After the first improvement step described above, in order to evolve the current methodology towards a target methodology which efficiently takes into account all the identified improvements, with the best available mathematical techniques, the following successive steps have been identified:



Step 2 (Summer Outlook Report 2015)

A big improvement step will be made in the methodology which will be applied in the Summer Outlook Report 2015 creation process.

In order to improve the probabilistic approach, which will have already been introduced in a simplified way for the Winter Outlook Report 2014/15, the adequacy assessment will have an hourly resolution over the whole period covered by the study.

Additionally, forced outages of generators and interconnectors will also be simulated as a probabilistic variable in addition to RES in feed and temperatures which are already treated as probabilistic inputs. This evolution will allow a more detailed modelling of cross-border exchanges to take place. Moreover, this will allow not only the impacts of planned outages but also forced outages to be taken into account in the simulations of the interconnectors on the cross-border capacities.

This will therefore assess the level of reliability of the Pan-EU electricity system using an hourly Monte Carlo simulation covering the whole interconnected system. For every time point (one hour), an optimization procedure will cover the estimated load demand for each country using the generation capacity available both inside and in neighbouring countries taking interconnector constraints into account. However, it should be pointed out that in this step no market model will be introduced; hence a simple simulation of the exchange of capacity margins is performed.

Additionally, due to the complexity of such constraints and the high amount of data required, no links between subsequent hours of the simulation will be taken into account. For example, energy constraints of pumping units and ramping rates of thermal generators will not be modelled.

Moreover, a first simplified flexibility assessment will be introduced in the report, taking into account the data collected according to the evolution forecasted in step 1. This assessment will be performed separately from the Monte Carlo simulation and it will be aimed at assessing the ramp requirements to face with load and RES volatility, comparing these requirements with the ability of the generation park to follow such kind of ramp.

Step 3 (Summer Outlook Report 2015 or 2016, depending on available tools)

Although a model which simply simulates the exchange of capacity margins might be enough for an adequacy assessment, the future ENTSO-E adequacy studies will be integrated with appropriate market simulations. It is yet to be analysed what detail is appropriate for the seasonal outlook reports considering the specific constraints related to these reports.

These simulations will provide an estimation of the expected cross-border flows and, in addition, such modelling will allow ENTSO-E to produce an extensive range of indicators. For example, estimated marginal technology, CO₂ emissions, RES curtailment which have all been listed by stakeholders as the most interesting indicators.

To maximize the quality of the obtained results, the study will be improved with an appropriate modelling of the constraints which requires a link between subsequent hours of the simulation. For example, the energy constraints of hydro-pumping units and ramping rates of thermal generators.

Step 4 (Summer Outlook Report 2016)

To further improve the treatment of cross-border exchanges, complementary to today's national approach, existing Bidding Zone structures will have to be taken into account when simulating cross-border exchanges. This evolution will call for a more extensive data collection for countries consisting of multiple Bidding Zones such as Italy and a significant update of the Pan-European Climatic Database.

The early implementation pilot project concerning the Bidding Zone Review process is going to be completed in 2015 allowing the latest evolutions on this matter to be analysed.