

Public Consultation on Adequacy Methodology (14 July - 19 September 2014)
ENTSO-E Target Methodology for Adequacy Assessment document

Name	Company	Proposed	Comment	ENTSO-E Answer
Jasmina PIERRE	EdF	<p>The goal is to measure potential lack of flexible generation in the expected power system operation. For this reason it is all the more important to improve the adequacy methodology using probabilistic assessment methods to identify how often the system is not balanced or when availability of ancillary services might be affected. These changes are mostly caused by the actual hour-on-hour evolution of the climate situation and also by forecast errors in the planning processes.</p>	<p>The question of how to determine interconnector flows at times of system stress - whether of peak demand, or of other times due to the increasing significance of when peak RES generation occurs - is particularly vexing. Using probabilistic method is required for assessing both capacity and flexibility adequacies.</p> <p>We would not suggest developing a very precise method that would take into account every constraint - this, as an aim, would probably be over-optimistic, as it may not be practically achievable.</p>	<p>Having in mind that considering historical data as an input to modelling is always an option, ENTSO-E ambition is to be able to explore the ongoing and future evolutions of the power system such as an increasing renewable generation, the enforcement of the Industrial Emission Directive, changes in the national and European energy policies, network development, market design, etc. Therefore, it is of the utmost importance for ENTSO-E that its pan-European adequacy methodology is able to accommodate different forecast scenarios and not replicating the past only.</p> <p>The development of a model able to capture all the key features of the Pan-EU and regional power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary.</p> <p>In this context, ENTSO-E is aware of the differences between sequential and non-sequential simulation approaches. ENTSO-E is also aware that the choice of the approach will affect in a significant manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the two approaches will be further investigated in the next steps of the methodology improvement process, with focus on engagement of stakeholders through expert workshops and continuous consultations towards the final methodology.</p>
Nico Heinemann	German Ministry of Economic Affairs and Energy (BMWi)		<p>(1/7) On July 14, 2014 ENTSO-E launched a public consultation on the further development on a new system adequacy methodology, namely the projected improvements to be implemented in future Scenario Outlook & Adequacy Forecasts (SO&AF), which provide a mid-term view on system adequacy, as well as in Seasonal Outlooks, which bi-annually provide a short-term view on system adequacy from an operational perspective.</p> <p>The German Ministry of Economic Affairs and Energy (BMWi) is convinced that the current system adequacy methods have to be revised thoroughly due to new challenges arising from current developments towards a sustainable European electricity system with a functional internal market. We therefore welcome ENTSO-E's efforts to improve the current adequacy assessment methodology. Especially, we strongly support ENTSO-E's position regarding two fundamental aspects of the proposed methodology:</p> <ul style="list-style-type: none"> Whereas in the past guaranteeing system adequacy was considered to be a national task, the completion of the internal market for electricity and the increasing level of interconnection and subsequent energy exchanges leads to a strong interdependence between the different electricity systems in Europe. Hence, system adequacy can no longer be appropriately assessed on a national level and a supra-national assessment methodology is required. That methodology has to properly take into account the impact of cross-border interconnections. This means on the one hand that potential contributions to balance load and generation from imports and exports are considered in a way which fosters an efficient and market-based provision of system adequacy. On the other hand it has to be taken into account that such imports and exports are subject to limited physical transmission capacities which might also be depending on different time-variant parameters like temperature, RES infeed etc. <p>(2/7) • In the past balance between load and generation was mainly guaranteed by thermal power plants or large-scale hydro fleets, the contributions of which for system adequacy could be computed with comparatively simple methods for selected points in time, especially peak-load hours. Future energy systems, however, will be dominated by large amounts of intermittent RES generation accompanied by various flexibility options like storage units and demand-side flexibility. All these can and will contribute to system adequacy. Nonetheless, these contributions will be of a much more stochastic character. This requires proceeding from past deterministic assessments of system adequacy towards a more sophisticated probabilistic approach. Only such approach will be able to cope with challenges imposed on adequacy assessment by future electricity systems. Pursuing a probabilistic approach should also mean migrating from an adequacy assessment for certain points in time towards an assessment that inherently covers larger timeframes.</p> <p>Despite from these very fundamental issues we also support ENTSO-E's position with respect to several concrete measures to improve the adequacy assessment methodology:</p> <ul style="list-style-type: none"> We agree with ENTSO-E's ideas on the general timing of methodology evolutions. The proposed gradual step by step approach allowing a high level of stakeholder involvement, an experience-based decision making on sensible next steps and the consideration of potential problems seems to be preferential compared to a one-step approach. Though the gradual approach might make some more time to achieve the target model we consider it likely that it will deliver better results in the end. <p>(3/7) • We also underline that transparency on data, assumptions and methods used is of crucial importance for all stakeholders involved in the adequacy assessment process. This affects market parties as well as policy makers who both will and have to base important decisions on the results of the adequacy assessments. Though it is obvious that confidentiality concerns might prevent a full disclosure of data, assumptions and methods applied for the adequacy assessment we strongly encourage ENTSO-E to strive for a significantly increased level of transparency compared to previous assessments and to bring stakeholders in a position to verify and compare the results of the assessment with their own expectations. We are convinced that such transparent approach will be beneficial for the credibility of results and ease future discussions on system adequacy.</p> <ul style="list-style-type: none"> Regarding the modelling of transmission capacity we support ENTSO-E in using an ATC-based modelling of cross-border capacities. Though the alternative flow-based approach might be more appealing from a theoretical perspective the level of experience with flow-based capacity calculation in our eyes is by far not sufficient to use it for adequacy assessments. Depending on future experience with the flow-based approach an evolution towards this approach might be considered for the Seasonal Outlook the focus of which is on operational aspects. In contrast, we would recommend to stick to an ATC-based approach for SO&AF as the inherent advantages of the flow-based approach are of minor importance for the time horizon covered by SO&AF reports. 	

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Nico Heinemann	German Ministry of Economic Affairs and Energy (BMWi)		<p>(4/7) • As mentioned above for transmission capacities we acknowledge that also other aspects might require different approaches in Seasonal Outlook and SO&AF assessments. Hence, differences in the methodology applied are acceptable as long as the general prerequisites to future adequacy assessments underlined above (consideration of interconnection, probabilistic method) are fulfilled.</p> <p>While we are confident that the general ideas proposed by ENTSO-E will mean an important step forward for European adequacy assessment we see some room for discussion and improvement at the same time: We would ask ENTSO-E to consider and potentially revise the following aspects:</p> <ul style="list-style-type: none"> • ENTSO-E states that the future adequacy assessment methodology should not only consider adequacy questions in a more narrow sense but should also aim at an assessment of system flexibility. Though system flexibility might be understood as one aspect of system adequacy in a broader sense we would propose to stick to typical adequacy questions for the time being. The desire to assess system flexibility requires more sophisticated simulations methods and is therefore likely to decrease the transparency of results. Furthermore, it requires a lot of additional assumptions (e.g. on capabilities of different generation technologies, market developments etc.) which might have significant on the final outcome of the assessment. Current investigations commissioned by BMWi do not see any significant lack of system flexibility even for mid-term horizons. Furthermore, BMWi is convinced that the provision of an adequate flexibility level can be achieved by markets even within short-term time horizons as long as legal and regulatory boundary conditions are appropriately adjusted. In our eyes a mainly assumption-driven mid-term assessment of flexibility therefore does not deliver additional value but could encourage inefficient policy actions. <p>(5/7) • ENTSO-E explains that at least for the adequacy assessment target model they aim at providing an extensive range of indicators like expected cross-border flows, marginal technologies, CO2 emissions and RES curtailment. Though we acknowledge that this was demanded by some stakeholders we have severe doubts that the adequacy assessment should aim at perfectly mimicking other characteristics of energy markets than the consequences for system adequacy. This will increase the demand for data and the complexity of tools and by that reduce transparency of results. Furthermore, results will be much more exposed to criticism because of elements typically out of scope of an adequacy assessment.</p> <ul style="list-style-type: none"> • We furthermore acknowledge that future adequacy assessments will be a valuable contribution to the ongoing policy debate on electricity market design. At the same time we would like to underline that conclusions on functionality of markets and appropriate market designs – inevitably influenced by subjective reasoning – in our eyes should be clearly out of scope for the adequacy assessments. This is especially true for the SO&AF reports which focus on mid-term horizons and which conclusions therefore are largely driven by assumptions. On that backdrop we strongly reject subjective conclusions even before executing the assessment like the statement "The current market structure does not provide the TSOs with sufficient conditions to meet the new flexibility requirements [...]" which can be found in section 2 of the consultation document on SO&AF. • The discussion about the role of scenarios is related to the question of valid conclusions which can be drawn from SO&AF reports. We generally acknowledge the need for scenario definition and assumptions when trying to perform a mid-term adequacy assessment. We would recommend, however, that ENTSO-E is clearly transparent on the importance of assumptions for the conclusions of the adequacy assessment, e.g. by consulting scenario assumptions and/or delivering not only scenario calculations but also related sensitivity analyses. Furthermore it seems of utmost importance that related market mechanisms are appropriately reflected in the scenario definition. Purely exogenous scenarios as foreseen by ENTSO-E (assumptions on plant retirement or mothballing based on today's knowledge or typical technical lifetimes, no endogenous reaction of market actors to energy market outcome, no consideration of potential changes in market participants attitude over time) in our eyes will have difficulties to fulfill this criterion. Resulting uncertainties for results should at least be made transparent and considered in ENTSO-E's conclusions. <p>(6/7) • While we acknowledge that the harmonization of assumptions is an important field for improvements we see some danger that the approach proposed by ENTSO-E of a centralized production of data and assumptions combined with a voluntary validation by national TSOs might lead to suboptimal data quality. BMWi would prefer a subsidiary approach where national TSOs are obliged to provide necessary input data (potentially after stakeholder consultation) so that dispersed local knowledge can be taken into account. Harmonization of assumptions might be achieved by comparison with centrally produced data in a second step. Such approach obviously bears the risk of time delays compared to ENTSO-E's proposal but can avoid problems due to dependency on single misleading assumptions, non-mandatory crosschecks and lack of stakeholder engagement.</p> <ul style="list-style-type: none"> • ENTSO-E states that by considering cross-border exchanges a multi-area adequacy assessment will complement the local national perspective which obviously nevertheless shall remain part of SO&AF as well as Seasonal Outlook reports. As explained above BMWi is convinced that adequacy cannot be assessed properly on a national level. Any persistent national perspective therefore might encourage misleading conclusions. We would therefore urgently recommend to abandon assessments with national perspective on ENTSO-E level and completely migrate towards multi-area assessments (which still can make statements on differences in adequacy for different countries but take into account effects from cross-border exchanges). <p>(7/7) • Whereas ENTSO-E generally stresses the need to replace today's deterministic assessment for single points in time with a probabilistic approach covering longer timeframes some doubts have emerged from the consultation document whether ENTSO-E aims at pursuing a probabilistic approach with all consequences. Such doubts refer to the discussion of non-sequential or sequential simulation of interconnector capacity (report on target methodology, page 11), for instance. In our eyes one of the main drivers for a migration towards a probabilistic approach is the demand for considering correlations between different important import factors. As only a sequential approach is capable of considering correlations we would not see any relevant choice here. Also the discussion on RES capacity factors (report on target methodology, page 5) is confusing in that context. We understood that RES generation should be modelled on the basis of installed capacities on the one hand and normalized generation time series from the Pan-European Climate Database on the other hand which would be in line with the requirements of a probabilistic model. RES capacity factors instead seem to be a relic from deterministic adequacy assessments.</p> <ul style="list-style-type: none"> • Finally, BMWi is convinced that future adequacy assessments will have to thoroughly consider the contributions from demand-side management (DSM) which were more or less neglected in past assessments. Whilst ENTSO-E seems to acknowledge the general importance of DSM the proposed step by step approach for the methodological evolution does not show any concrete efforts to improve data basis and methods in order to appropriately reflect the role of DSM for system adequacy. We therefore explicitly ask ENTSO-E to increase its efforts on achieving a proper modelling of DSM as soon as possible. 	<p style="text-align: center;">ENTSO-E Answer</p> <p>We thank the stakeholder for his constructive comments which are in line with the target methodology and roadmap documents consulted.</p>
Paulo Lopes	Eurelectric		<p>The document under consultation lacks depth to truly understand the methodology that will be followed for the adequacy assessments. There is little clarity on how the assumptions for the assessment will be created. The methodology thus lacks transparency and further details should be published by ENTSO-E so all stakeholders can effectively contribute to developing this methodology. In this sense, EURELECTRIC would welcome the establishment of a development stakeholders' group.</p>	<p>The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with increased transparency from all parties.</p> <p><u>The purpose of the documents here consulted is to present a high level target methodology and roadmap for deployment first</u>, so those are consulted with stakeholders <u>before</u> further specification of the methodological details and implementation steps.</p> <p>The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and modeling of reserves.</p> <p>In-depth discussion with stakeholders on modelling principles, technological constraints and developments, regulatory and market design frameworks, etc.. is planned in the form of continuous consultations and dedicated expert workshops.</p>

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Jasmina PIERRE	EdF	Therefore, the assessment of flexibility and the addressing of balancing issues are of key importance for methodology improvement in order to measure potential lack of flexible generation.	Clarification: adequacy assessment should refer to quantitative studies. Local system operators are at risk of using different cost-benefit analyses and indicators in their local adequacy assessments, which is why the common method will help.	The ENTSO-E adequacy methodology considers that the large-scale exploitation of renewable energy sources of variable generation poses challenges for electricity system operation. In addition to sufficient levels of back-up capacity, additional resources of system flexibility will be needed in the future. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system. The focus is on need for physical sources of flexibility at the operation time. Flexibility in the adequacy assessments is based on weather-dependent effects related to load variation, generation patterns of wind and solar power plants with a one-hour resolution and the consideration of the resources of flexibility. The existing Pan-European Climate Database (PECD) will be used for this adequacy assessments. Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E; ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted. ENTSO-E is also aware that the choice of the mathematical approach will affect in a significant manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection of the assessment approach will be further investigated in the next steps of the methodology improvement process and the final methodology details will be properly consulted at each step in the form of continuous consultations and expert workshops.
Pekka Vile	Fortum Oyj	Adequacy assessment is a fundamental method to measure whether the generation of electricity in a system meets the expected requirements and energy demand (taking account of demand response) at a certain point of time.	Power demand should not be considered as inelastic, as it can provide both dynamic market-based flexibility reacting to hourly market prices, and system reserves through contracted load management by the TSOs.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of <u>Demand Side Management (DSM)</u> , hydro inflows, pump storage power plants and modeling of reserves. An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops.
Roland Tual	Smart Energy Demand Coalition	The goal is to measure potential lack of flexible resource in the expected power system operation	SEDC would insist on the importance of avoiding biased language, which favours generation over other types of resources. Demand side flexibility and storage should be assessed on their technical capabilities to fulfil the system needs, on an equal footing with generation. We ask that biased language, which excludes particular players from participating in the markets be systematically replaced with technology agnostic language throughout the document.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and modeling of reserves. An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and <u>the demand sector</u> .
Paulo Lopes	Eurelectric		In the generation adequacy assessments, ENTSO-E should not merely publish the outputs of its modelling. It should take those outputs and execute economic viability checks to verify whether the generation capacity it assumes will be available actually has the economic conditions to do so. More specifically, it should not only be assumed that capacity of certain providers will be available for the system just considering –for instance – its residual life, but it should also be verified whether current market / regulatory arrangements lead to a viable economic situation for those providers.	The purpose of the ENTSO-E target adequacy methodology under construction is the development of a sound methodology which will allow to perform regular pan-European and regional diagnosis of the evolving European power system with respect to adequacy risks. Considering any modelling implies simplifications, ENTSO-E adequacy target modelling is to focus on the hourly power balance modelling. Although these studies do not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E; ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. Finally whenever there is no official communication of decommissioning, it is considered that the units will be available for security of supply reasons.
Jasmina PIERRE	EdF	Thermal power plants are a dominant source of flexibility in power systems.	We see no reason to single out nuclear plants as a whole since their characteristics vary widely across Europe, and nuclear plants have higher ramp-rates than most other technologies. "Flexibility" therefore has to be assessed in a quantitative way through an adequate modelling of plants' main technical characteristics rather than through a single labelling based on fuel type.	We agree with the stakeholder there is no reason to single out nuclear plants as technology providing flexibility. Power plants of all fuel types can be subjected to <u>must-run</u> conditions as well as provide flexibility to the system, both due to technical or economic reasons. Furthermore the must-run level of a plant can differ throughout the year due to heat supply for instance. The TSOs are assessing the level of must run generation based on technical and economic characteristics of the power system. For this evaluation TSOs are consulting power plant operators on their own constraints. The goal is to extend the level of detail, so the information of must run constraints will be defined for the different types of units within a given technology to increase the knowledge about flexibility of the system.

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Pekka Vile	Fortum Oyj	As well as sufficient level of firm generation capacity, resources of system flexibility are needed both by market participants in the day-ahead and intraday markets and by TSOs as balancing reserves used during the operational hour.	The need of flexibility should be clearly divided into two categories: 1) Market participants' commercial needs for operating in the day-ahead and intraday markets, and 2) TSO needs for balancing reserves that are used during the operational hour only, but adequately contracted in advance at least before the day-ahead market closure	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the demand sector.
Roland Tual	Smart Energy Demand Coalition	[addition] The potential flexibility of DSM and DSR should be examined and assessed in terms of operational criteria important to the system operator(similar to generation criteria: e.g., type of consumer involved, ramp rates (up/down), minimum and maximum stable output, and minimum of on and off times.	In some markets in the US and Australia, 10% or more of peak load participates in some form of demand management. As DSM and DSR are expected to grow in capacity in the coming years, a genuine assessment of their contribution to resource adequacy is required. This could be based on the type of consumer involved and similar categories as those used for generation that provide critical operational capabilities to the system operator.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and modeling of reserves. An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the <u>demand sector</u> .
Paulo Lopes	Eurelectric		The need for both capacity and flexibility as elements of market design must be assessed to ensure effective power system operation. The document focuses too narrowly on flexibility or flexible generation.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and modeling of reserves. An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the <u>demand sector</u> .
Jasmina PIERRE	EdF	The information on generating assets will be extended by including additional parameters enabling a more accurate assessment and production simulation:	See above, it is essential to adopt an accurate description of generating assets characteristics.	Power plants of all fuel types can be subjected to <u>must - run</u> conditions as well as provide flexibility to the system, both due to technical or economic reasons. Furthermore the must run level of a plant can differ throughout the year due to heat supply for instance. The TSOs are assessing the level of must run generation based on technical and economic characteristics of the power system . For this evaluation TSOs are consulting power plant operators on their own constraints. The goal is to extend the level of detail, so the information of must run constraints will be defined for the different types of units within a given technology to increase the knowledge about flexibility of the system.
Pekka Vile	Fortum Oyj	At present, there is a risk that existing market designs (e.g. due to regulatory prices and price caps) might fail to deliver the necessary level of flexibility in the long term, affecting the availability of ancillary services, as well, if the ancillary services are not adequately contracted in advance.	When balancing reserves are contracted in advance, they are always available for the TSOs and thus the operational system balancing is secured even during tight situations and high prices in the day-ahead and intraday markets, caused by RES generation fluctuations.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the demand sector.
Roland Tual	Smart Energy Demand Coalition		The SEDC supports ENTSO-E's initiative in favour of transparency and will pay particular attention to the figures used to evaluate DSM programmes as current data appear significantly incomplete. (See our answer to the SOAF document).	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the demand sector.
Paulo Lopes	Eurelectric		Power demand should not be considered as inelastic, as it can provide both dynamic market-based flexibility reacting to hourly market prices, and system reserves through contracted load management by the TSOs. Industrial companies and other big electricity users can directly optimise their power purchase based on spot market prices. With hourly metering for all consumers now installed or being implemented in many countries, all consumers can react to market prices either individually or through contracted services provided by electricity retailers.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the demand sector.

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Jasmina PIERRE	EdF	Some plants are subject to must-run constraints resulting from technology, grid constraints, heat supply obligations etc.; this information should be collected and evaluated as well.	Must-run constraints can affect all types of plants including hydro storage for a broad range of reasons (tourism, agriculture, safety...). Any distinction between plants must rely on an accurate description of the constraints rather than a simplistic labeling based on the sole fuel-type.	Power plants of all fuel types can be subjected to <u>must - run</u> conditions as well as provide flexibility to the system, both due to technical or economic reasons. Furthermore the must run level of a plant can differ throughout the year due to heat supply for instance. The TSOs are assessing the level of must run generation based on technical and economic characteristics of the power system . For this evaluation TSOs are consulting power plant operators on their own constraints. The goal is to extend the level of detail, so the information of must run constraints will be defined for the different types of units within a given technology to increase the knowledge about flexibility of the system.
Pekka Vile	Fortum Oyj	Conventional power plants that can be considered as the main resources of flexibility in most countries have to face lower running hours resulting in reduced profitability while they are exposed to more changeable and variable load operating conditions. Demand response will thus be more and more important as flexibility provider.	For downward regulation in surplus situations, the TSOs can contract variable RES generation reductions, too.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the demand sector.
Zdenek Danielovsky	CZ Ministry of Industry and Trade	...to improve the adequacy methodology using probabilistic assessment methods to identify how often the system is not balanced and when availability of ancillary services might be affected.	"and" instead of "or" Both of these items are related, and the new methodology (or model) must take account of both.	The text has been corrected accordingly.
Paulo Lopes	Eurelectric		The concept of "flexibility" should be clearly defined before it is assessed (available ramp up/down in the system, capacity that can be started with a certain minimum prior notice, etc.). Such a definition is not put forward in the consultation document, thus additional iterations with stakeholders are needed in order to effectively contribute to developing this methodology. The need for flexibility should be clearly divided into two categories: 1) Market participants' commercial needs for operating in the day-ahead and intraday markets, and 2) TSO needs for balancing reserves that are used during the operational hour only, but adequately contracted in advance at least before the day-ahead market closure. When balancing reserves are contracted in advance, they are always available for the TSOs and thus the operational system balancing is secured even during tight situations and high prices in the day-ahead and intraday markets, caused by RES generation fluctuations. For downward regulation in surplus situations, the TSOs can contract variable RES generation reductions, too.	One of the main objectives is to be able to inform about the 'need for flexibility' in the system. The focus is on need for physical sources of flexibility at the operation time. Flexibility in the adequacy assessments is based on weather-dependent effects related to load variation, generation patterns of wind and solar power plants with a one-hour resolution and the consideration of the resources of flexibility. The existing Pan-European Climate Database (PECD) will be used for this adequacy assessments. Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted. Power plants of all fuel types can be subjected to must run conditions, due to technical or economic reasons. Furthermore the must run level of a plant can differ throughout the year due to heat supply for instance. The TSOs are assessing the level of must run generation based on technical and economic characteristics of the power system . For this evaluation TSOs are consulting power plant operators on their own constraints. The goal is to extend the level of detail, so the information of must run constraints will be defined for the different types of units within a given technology to increase the knowledge about flexibility of the system.
Jasmina PIERRE	EdF	At present, large-scale hydro storage is the most important resource of flexibility from storage. Similarly to the approach used for TYNDP 2014 market studies, data on minimum/maximum generation, pumping, inflow (time-series derived from climate models) and storage	EDF understands "minimum/maximum generation" as relating to the generation capacity of the plant, expressed in MW. In this case, another key parameter should be included as well: the storage capacity expressed in MWh.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), <u>hydro inflows</u> , pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the demand sector.
Pekka Vile	Fortum Oyj	For this reason we are proposing to improve the adequacy methodology using probabilistic assessment methods to identify how often the system is not balanced or when availability of ancillary services might be affected, if they are not contracted in advance.	Based on the new Network Codes, ancillary services should be adequately contracted by the TSOs in order to always secure their availability irrespective of the commercial market tightness.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and modeling of reserves. An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the demand sector. Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted.

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Zdenek Danielovsky	CZ Ministry of Industry and Trade		We point out the need to improve the content of the PECD (Pan-European Climate Database). It is necessary to be able to break down data in more details than the current structure of the database allows. It is necessary to divide the territory more in details depending on natural conditions for the production of electricity from solar and wind power. The result will be a more detailed structure of parameters connected with the locality (e.g. "RES capacity Fator").	The ENTSO-E adequacy methodology considers that the large-scale exploitation of renewable energy sources of variable generation poses challenges for electricity system operation. In addition to sufficient levels of back-up capacity, additional resources of system flexibility will be needed in the future. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system. The focus is on need for physical sources of flexibility at the operation time. Flexibility in the adequacy assessments is based on weather-dependent effects related to load variation, generation patterns of wind and solar power plants with a one-hour resolution and the consideration of the resources of flexibility. The existing Pan-European Climate Database (PECD) will be used for this adequacy assessments. Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted. ENTSO-E is also aware that the choice of the mathematical approach will affect in a significantive manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection of the assessment approach will be further investigated in the next steps of the methodology improvement process and the final methodology details will be properly consulted at eah step in the fomr of continuous consultations and expert workshops.
Paulo Lopes	Eurelectric		The adequacy assessments need to give transparent information on how much ancillary services / reserves are contracted by the TSOs.	The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation <u>with increased transparency from all parties</u> . The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the demand sector.
Jasmina PIERRE	EdF	The load management range and the demand side contribution to the provision of the control reserves can be considered as a resource of flexibility. Data on activation lead-time, maximum duration of activation, stock constraints (e.g. maximum number of activations in a row), resulting effetcs (e.g. energy postponement), and temperature sensitivity (expressed ion MW/°) can be used as a basis of flexibility assessment.	Load management also has its own technical characteristics that should be taken into consideration. For example, the volume of load (MW) that can respond to an activation signal sent half an hour ahead of real-time is different from the volume that can respond to a signal sent the day before the activation. Besides, ENTSO-E should provide more details about economical background. The assessment should be based on what has already proved reliable locally in recent years, and not on an optimistic forecast.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of <u>Demand Side Management (DSM)</u> , hydro inflows, pump storage power plants and modeling of reserves. An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the <u>demand sector</u> .
Pekka Vile	Fortum Oyj	Therefore the assessment of flexibility and the addressing of balancing issues are of key importance for methodology improvement in order to identify potential lack of flexible generation and the need for contracting balancing reserves in advance.	The adequacy assessments need to give transparent information on how much ancillary services are contracted by the TSOs, and if the TSOs count on additional non-contracted availability of balancing reserves.	The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation <u>with increased transparency from all parties</u> . The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the demand sector.
Zdenek Danielovsky	CZ Ministry of Industry and Trade	Thermal and nuclear power plants Thermal (including gas-fired) power plants (and to some extent nuclear power plants) are a dominant source of flexibility in power systems.	In our view, it is necessary to add, that gas power plants are also an important source of flexible power in the electricity system. Thermal and nuclear power are not the only sources capable of responding to the need for flexibility. The share of gas-fired power plants is not negligible.	Power plants of all fuel types can be subjected to <u>must - run</u> conditions as well as provide flexibilty to the system, both due to technical or economic reasons. Furthermore the must run level of a plant can differ throughout the year due to heat supply for instance. The TSOs are assessing the level of must run generation based on technical and economic characteristics of the power system . For this evaluation TSOs are consulting power plant operators on their own constraints. The goal is to extend the level of detail, so the information of must run constraints will be defined for the different types of units within a given technology to increase the knowledge about flexibility of the system.
Paulo Lopes	Eurelectric	The goal is to measure potential lack of capacity and flexibility in the expected power system operation	It is not only generation that plays a role in power system operation, but also other capacity and/or flexibility providers such as demand response and storage.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of <u>Demand Side Management (DSM)</u> , hydro inflows, pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the <u>demand sector</u> . The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with <u>increased transparency from all parties</u> .

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Jasmina PIERRE	EdF	<p>- Generation : Thermal and nuclear power plants and RES Thermal power plants [...] In addition to larger units, the potential flexibility of smaller-scale generation (modelled usually as an aggregated production) could be examined and assessed.-</p> <p>Besides, the modelisation of RES generation should take into account the volatility and the co-variance of their related outputs but also their potential flexibility provided to the system.</p>	<p>The treatment of RES generation in the short and long term adequacy assessments, should take into account the volatility of their related outputs both within each Member State, and their co-variance across the EU. For example, anticyclonic weather systems across the EU are typically larger, and longer-lasting, than cyclonic weather systems across the EU - these can be coincident with a widespread wind lull, at times of elevated demand due to markedly cold, or markedly hot, weather, according to season. Drier-than-average (low hydro output) years for one member state may co-incide dry years also, for others.</p>	<p>The ENTSO-E adequacy methodology considers that the large-scale exploitation of renewable energy sources of variable generation poses challenges for electricity system operation. In addition to sufficient levels of back-up capacity, additional resources of system flexibility will be needed in the future. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system. The focus is on need for physical sources of flexibility at the operation time. Flexibility in the adequacy assessments is based on weather-dependent effects related to load variation, generation patterns of wind and solar power plants with a one-hour resolution and the consideration of the resources of flexibility. The existing Pan-European Climate Database (PECD) will be used for this adequacy assessments.</p> <p>Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted.</p> <p>ENTSO-E is also aware that the choice of the mathematical approach will affect in a significant manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data.</p> <p>Hence, the selection of the assessment approach will be further investigated in the next steps of the methodology improvement process and the final methodology details will be properly consulted at each step in the form of continuous consultations and expert workshops.</p>
Pekka Vile	Fortum Oyj	<p>ENTSO-E will report on expected needs for flexibility in its adequacy assessments using a one-hour resolution as a first step. The need for balancing reserves should be reported separately as they are used only during the operational hour.</p>	<p>One-hour resolution cannot give any information of the need for balancing reserves that are only needed within the operational hour.</p>	<p>The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of <u>Demand Side Management (DSM)</u>, hydro inflows, pump storage power plants and <u>modeling of reserves</u>. An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the <u>demand sector</u>.</p> <p>The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with <u>increased transparency from all parties</u>.</p>
Zdenek Danielovsky	CZ Ministry of Industry and Trade	<p>The underlying assumptions should be harmonised to fully benefit from the assessment of the entire interconnected system as a whole. Thus, the datasets provided should have common underlying assumptions.</p> <ul style="list-style-type: none"> - TSO's should follow specific guidelines to calculate the figures requested. - Some values could be built centrally to ensure consistency (e.g. RES capacity factors), and TSO's will have the opportunity to validate and modify these values. A validation procedure will be designed. 	<p>We agree that it is appropriate to assess the system as a whole set of data based on two assumptions described in the text.</p> <p>Unfortunately, the example in the first case - the dependence of electricity demand to GDP - is inappropriate (see e.g. "Figure 1. Evolution of energy consumption and GDP in the EU 1995-2013" in Communication 2014/520, of 23 July 2014). The example shall be either removed, or replaced by another and more suitable example.</p> <p>In the latter case, we are missing any outline how it will look like, specifics on validation procedure and who will all its participants. The formulation therefore needs to be extended.</p>	<p>We agree that GDP is not the only driver of energy / electricity demand. This is just an example since for many countries is a main driver anyhow. The text has been adapted accordingly.</p> <p>Coordination processes between neighbouring TSOs will be further improved in further developments of the methodology. Some values could be built centrally to ensure consistency (e.g. RES capacity factors, etc.), and TSOs will have the opportunity to validate or modify these values. In the latter, a transparent justification will be provided.</p>
Paulo Lopes	Eurelectric		<p>There should be a focus on the assessment of resources of capacity as well as flexibility. The capacity and flexibility of renewables generators should be considered as well for this effect.</p>	
Jasmina PIERRE	EdF	<ul style="list-style-type: none"> - ENTSO-E will report on expected needs for flexibility as part of its adequacy forecast. - The adequacy analysis will be performed with an hourly resolution. - The Pan European Climate Database (PECD) will be used in modelling the volatility of load, hydro inflow, wind and solar generation. - All technically available resources should be modelled, including potential flexibility from demand response and RES curtailment, grounded in recent real data. 	<p>The volatility related to inflow can affect system adequacy and should consequently be modelled as any major sources of uncertainties. If need be, the Pan European Climate Database (PECD) should be completed.</p> <p>The modelisation of the load and RES generation should take into account the volatility of their related outputs but also their potential flexibility provided to the system.</p> <p>The assessment should be based on what has already proved reliable locally in recent years, and not on an optimistic forecast.</p>	
Pekka Vile	Fortum Oyj	<ul style="list-style-type: none"> - Generation and transmission failures (also creating need for flexibility) 	<p>Biggest needs for short-term flexibility are still in many countries due to failures of traditional generation or transmission lines.</p>	

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Zdenek Danielovsky	CZ Ministry of Industry and Trade	<p>The datasets provided should have common underlying assumptions.</p> <ul style="list-style-type: none"> - TSO's should follow specific guidelines to calculate the figures requested. - The data-structure must be extendable to future indicators depending on lessons learned from the process. - The delivered data have to be harmonized with the neighbouring control areas in order to avoid data mismatch. A validation procedure will be designed. - Some values could be built centrally to ensure consistency (e.g. RES capacity factors). A validation procedure will be designed. <p>The homogeneity of data shall be ensured.</p>	<p>The example regarding GDP shall be removed – see above.</p> <p>It is necessary to add at least an outline of procedures for the coordination of data between neighbouring TSOs for data transmitted to a common data set.</p> <p>Complete the validation procedure for data generated centrally.</p> <p>To the last sentence of the paragraph should be also added the need for homogeneity of input data.</p>	
Paulo Lopes	Eurelectric		<p>The Value of Lost Load should be listed under the values that could be outlined centrally in the methodology, with values set at a regional level, to ensure consistency of the assessments.</p>	<p>The development of a model able to capture all the key features of the Pan-EU and regional power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary. Main indicators will be assessed in order to quantify the system adequacy and the need for flexibility, e.g. expectancy LOLE, the loss of load probability LOLP, and the effective load carrying capability ELCC, etc.</p>
Jasmina PIERRE	EdF	<p>Some values could be built centrally to ensure consistency, and TSOs will have the opportunity to validate and modify these values.</p>	<p>EDF believes that the target methodology should be a probabilistic regional simulation based on detailed-enough data for load, but also renewable (wind, solar, hydro) infeed. With such a methodology there is no need for RES "capacity factor" as an input, or rather, it would be an output of the simulation.</p> <p>If capacity factors have to be used in intermediate steps, they must not be the same across all Europe but be dependant on the different local weather regimes, the installed capacity (capacity factor decreases with installed capacity) and correlation with other hazards (probability of co-variance in pan-regional RES output at times of system stress of smallest generation margins over demand).</p>	<p>A gradual evolution of the Pan-European Climate Database (PECD) is foreseen both in terms of years covered and scope of data. At present, PECD time series include solar PV load factors, wind load factors and temperature data for the period 2000-2011/2012-2013. In addition to the country level data, also regional time series are available for a few countries.</p> <p>An increased geographical granularity is essential to enable modelling at different levels including local market simulations. The ongoing technology evolutions like changes in wind turbine height, storm control facilities, blade pitching, the development of deep offshore floating turbines, PV tilt angles, CSP, etc., etc.. all have a fundamental impact on the characteristics of future generation equipment. These changes are to be reflected by the assumptions made on the composition of generation equipment when deriving the load factor time series from climate model data.</p> <p>Beyond the extension of PECD, also a more accurate analysis of uncertainties caused by different hydro conditions is important. After consultation with expert stakeholders inflow data can contribute to an improved adequacy assessment.</p>
Pekka Vile	Fortum Oyj	<p>The load management range and the demand side contribution to price-dependent hourly response and to the provision of the control reserves can be considered as resources of flexibility.</p>	<p>Power demand can provide both dynamic market-based flexibility reacting to hourly market prices, and system reserves through contracted load management by the TSOs. Industrial companies and other big electricity users can directly optimise their power purchase based on spot market prices. With hourly metering for all consumers now installed or being implemented in many countries, all consumers can choose hourly pricing options and react to market prices either individually or through contracted services provided by electricity retailers.</p>	<p>An increased geographical granularity is essential to enable modelling at different levels including local market simulations. It should be also pointed out that a Pan-EU and regional assessment needs to adopt some kinds of simplification in the modelisation approach in order to create a model able to catch all the key aspects of each and all the different areas under investigation, while a national methodology can take into account in a much more detailed way the national legal and regulatory framework, obviously losing its applicability to other countries. Hence, in line with the recommendation of the ECG subgroup on adequacy, ENTSO-E believes that national methodologies should be maintained and eventually improved by the relative owners/stakeholders.</p>
Zdenek Danielovsky	CZ Ministry of Industry and Trade	<p>Transparency does not mean total freedom of TSOs and ENTSO-E to deviate from the official policies and investment decisions of governments in the ENTSO-E reports.</p>	<p>Transparency does not mean total freedom of TSOs and ENTSO-E to deviate from the official policies and investment decisions of governments in the ENTSO-E reports.</p>	<p>TSOs and ENTSO-E consider important to be able to build scenarios which could deviate from the expected time frame to achieve political goals. TSO develop scenarios to assess the system adequacy as well as to optimally design the necessary transmission infrastructure for the future. ENTSO-E aims to be transparent on the scenario building process, assumptions and logic behind the definition of scenarios.</p>
Paulo Lopes	Eurelectric		<p>The methodology for short and long-term reports should include the definition of Loss of Load Expectation.</p>	<p>The development of a model able to capture all the key features of the Pan-EU and regional power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary. Main indicators will be assessed in order to quantify the system adequacy and the need for flexibility, e.g. expectancy LOLE, the loss of load probability LOLP, and the effective load carrying capability ELCC, etc.</p>
Jasmina PIERRE	EdF	<p>The analysis of a special scenario under severe conditions however can be performed until the probabilistic approach is implemented.</p>	<p>EDF understood from both workshops and the consultation document that the move to a probabilistic approach was strongly demanded by stakeholders and that ENTSO-E considered it a necessary improvement to the methodology. In order to be consistent, it should therefore appear as a target throughout the whole document.</p>	<p>We thank the stakeholder for this comment. The text has been adapted accordingly.</p>

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Pekka Vile	Fortum Oyj	– The adequacy analysis will be performed with an hourly resolution. – The need for contracted balancing reserves for the operational hour should be informed.	Hourly resolution does not give the need for balancing reserves which must thus be analysed and informed separately.	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of <u>Demand Side Management (DSM)</u> , hydro inflows, pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the <u>demand sector</u> . The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with <u>increased transparency from all parties</u> .
Zdenek Danielovsky	CZ Ministry of Industry and Trade		It is necessary to clarify what exactly the “DSM programs” means (e.g. program electromobility implementation).	The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of Demand Side Management (DSM), hydro inflows, pump storage power plants and modeling of reserves. An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the demand sector.
Paulo Lopes	Eurelectric		Indicators such as CO2, although important, are not relevant for generation adequacy assessments.	The development of a model able to capture all the key features of the Pan-EU and regional power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary. Main indicators will be assessed in order to quantify the system adequacy and the need for flexibility, e.g. expectancy LOLE, the loss of load probability LOLP, and the effective load carrying capability ELCC, etc.
Jasmina PIERRE	EdF	Some values could be built centrally to ensure consistency (e.g. RES capacity factors until the probabilistic simulation is implemented).	With a proper simulation, RES capacity factors are not inputs but outputs of the simulation. If capacity factors have to be used in intermediate steps, they must not be the same across all Europe but be dependant on the different local weather regimes, the installed capacity (capacity factor decreases with installed capacity) and correlation with other hazards (probability of covariance in pan-regional RES output at times of system stress of smallest generation margins over demand).	A gradual evolution of the Pan-European Climate Database (PECD) is foreseen both in terms of years covered and scope of data. At present, PECD time series include solar PV load factors, wind load factors and temperature data for the period 2000-2011/2012-2013. In addition to the country level data, also regional time series are available for a few countries. An increased geographical granularity is essential to enable modelling at different levels including local market simulations. The ongoing technology evolutions like changes in wind turbine height, storm control facilities, blade pitching, the development of deep offshore floating turbines, PV tilt angles, CSP, etc.. have a fundamental impact on the characteristics of future generation equipment. These changes are to be reflected by the assumptions made on the composition of generation equipment when deriving the load factor time series from climate model data. Beyond the extension of PECD, also a more accurate analysis of uncertainties caused by different hydro conditions is important. After consultation with expert stakeholders inflow data can contribute to an improved adequacy assessment.
Pekka Vile	Fortum Oyj	– While it is not ENTSO-E’s mandate to further harmonise national approaches, the future adequacy assessments should be done based on a regional and European approach based on a common methodology.	All national adequacy assessments should be based on a large enough market area, preferably using a European-wide modelling. Even if national criteria would be used, the cross-border contributions to adequacy need to be always taken into account.	The goal of the ongoing process is to improve the ENTSO-E Pan-EU and regional adequacy assessment methodology toward a target methodology which will cope with each and all the new requirements set by the recent evolution of the European electrical system, while this process does not aim to set rules for the national assessments. It should be also pointed out that a Pan-EU and regional assessment needs to adopt some kinds of simplification in the modelisation approach in order to create a model able to catch all the key aspects of each and all the different areas under investigation, while a national methodology can take into account in a much more detailed way the national legal and regulatory framework, obviously losing its applicability to other countries. Hence, in line with the recommendation of the ECG subgroup on adequacy, ENTSOE believes that national methodologies should be maintained and eventually improved by the relative owners/stakeholders.
Zdenek Danielovsky	CZ Ministry of Industry and Trade		With regard to discussions on the need for a new model of the electricity market it is appropriate to define the term "the Internal Electricity Market (IEM) target model". Mentioned new market model is yet still current concept market coupling short-term markets together with the calculation of cross-border capacities by "Flow based" method.	The Target Model is the 'state-of-the-art' definition for the European Internal Energy Market (IEM). The Target Model provides a blueprint and roadmap for closer market integration by setting out clear proposals for the coordination and harmonisation of Europe’s electricity markets. This requires in particular that in cooperation with ACER, national regulators and transmission systems operators’ step up their work on market coupling and guidelines on network codes applicable across European networks.
Paulo Lopes	Eurelectric		EURELECTRIC believes that these multi-area adequacy assessments should actually become an integral part of the local national perspective and not only a complement.	It should be also pointed out that a Pan-EU and regional assessment needs to adopt some kinds of simplification in the modelisation approach in order to create a model able to catch all the key aspects of each and all the different areas under investigation, while a national methodology can take into account in a much more detailed way the national legal and regulatory framework, obviously losing its applicability to other countries. Hence, in line with the recommendation of the ECG subgroup on adequacy, ENTSOE believes that national methodologies should be maintained and eventually improved by the relative owners/stakeholders.
Jasmina PIERRE	EdF	The final methodology should be widely accepted by stakeholders. Adequacy assessments must include physical indicators related to system needs and resources availability. In addition, indicators such as estimated CO2 emission, RES curtailment, system cost, marginal technology, need to be continuously developed, though not directly related to adequacy issues.	Adequacy assessments rely on a physical analysis of system needs and resources availability. Though not directly related to targeted issue, additional indicators (such as CO2 and system costs) are required for stakeholders to measure the economical and environmental feasibility of studied scenarios.	The development of a model able to capture all the key features of the Pan-EU and regional power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary. Main indicators will be assessed in order to quantify the system adequacy and the need for flexibility, e.g. expectancy LOLE, the loss of load probability LOLP, and the effective load carrying capability ELCC, etc... Other indicators as CO2 will also be assessed indeed.

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Pekka Vile	Fortum Oyj	Hence, the level of reliability of the Pan-EU electricity system will be assessed throughout a chronological hourly simulation of the whole interconnected system in which, for every time point (hour), an optimization procedure will try to cover the estimated load demand (taking account of demand response) of each area using the generation capacity available both inside the area and in the other areas, according to their merit order and properly taking into account the constraints on the interconnections.	Industrial companies and other big electricity users can directly optimise their power purchase based on spot market prices. With hourly metering for all consumers now installed or being implemented in many countries, all consumers can choose hourly pricing options and react to market prices either individually or through contracted services provided by electricity retailers.	The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation <u>with increased transparency from all parties</u> . The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of <u>Demand Side Management (DSM)</u> , hydro inflows, pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the demand sector
Zdenek Danielovsky	CZ Ministry of Industry and Trade		It is necessary to clarify the relation of “interconnected areas” to “control areas” and “control blocks”.	Interconnected areas' can be a country, a bidding zone or even a grid point. For each type of analysis (short term, medium term and long term) the appropriated market node or interconnected area will be considered. The issue of 'control blocks' or 'control zones' is related with balancing arrangements of each member state which are specific for national adequacy assessments, since take into account in a much more detailed way the national legal and regulatory framework.
Paulo Lopes	Eurelectric		ENTSO-E should rather focus on the core purpose of adequacy assessments, which is power system adequacy itself, and leave indicators such as “estimated marginal technology, CO2 emissions and RES curtailments” for other studies by other entities.	The development of a model able to capture all the key features of the Pan-EU and regional power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary. Main indicators will be assessed in order to quantify the system adequacy and the need for flexibility, e.g. expectancy LOLE, the loss of load probability LOLP, and the effective load carrying capability ELCC, etc... Other indicators as CO2 emissions might be also assessed but not as the main ones for the adequacy assessment.
Jasmina PIERRE	EdF	Generation Data: referred to each technology [...] – Non-Usable Capacity and reason for non-usability	The reason should be specified since it can be of importance for the different reports. For instance, a mothballed plant can be considered non-usable for the seasonal outlook reports, however its status for the mid-term reports would be worth discussing.	The goal is to extend the level of detail, so the information of mothballed units, must run constraints will be defined for the different types of units within a given technology to increase the knowledge about flexibility of the system. Focus is on harmonization of categories between the Seasonal Outlooks and SOAF reports. However, we agree with the stakeholder that the usage of the data might vary between short term and medium term assessments. Indeed you need to model differently unplanned outages and maintenance and mothballed units differently in both cases. Power plants of all fuel types can be subjected to must-run conditions as well as provide flexibility to the system, both due to technical or economic reasons. Furthermore the must run level of a plant can differ throughout the year due to heat supply for instance. The TSOs are assessing the level of must run generation based on technical and economic characteristics of the power system. For this evaluation TSOs are consulting power plant operators on their own constraints. The information about must – run constraints will be detailed in order to increase the awareness about the need for flexibility in the system.
Zdenek Danielovsky	CZ Ministry of Industry and Trade		At the mention of a simplified grid model, it should be pointed out that an acceptable degree of simplification is different for a simple arrangement of interconnected networks and other (i.e. less simplified model) for highly meshed networks, such as those in our region (CZ, SK, PL, DE, HU, AT).	We thank the stakeholder for this comment. Grid reduction procedures will be performed in such a way that will consider and capture the specificities and grid topology of each region properly.
Paulo Lopes	Eurelectric		It should not be the role of ENTSO-E to produce price forecasts. However, ENTSO-E should use these outputs of its modelling to conduct economic viability checks that evaluate whether providers that contribute to system adequacy have the correct economic conditions to do so. Such checks could derive at least into a sensitivity analysis of adequacy.	The purpose of the ENTSO-E target adequacy methodology under construction is the development of a sound methodology which will allow to perform regular pan European and regional diagnosis of the evolving European power system with respect to adequacy risks. Considering any modelling implies simplifications, ENTSO-E adequacy target modelling is to focus on the hourly power balance modelling. Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted. Finally whenever there is no official communication of decommissioning, it is considered that the units will be available for security of supply reasons.

Name	Company	Proposed	Comment	ENTSO-E Answer
Jasmina PIERRE	EdF		<p>This point should be more precisely explicated.</p> <p>ENTSO-E should provide more details about economical background. The assessment should be based on what has already proved reliable locally in recent years, and not on an optimistic forecast.</p>	<p>The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with increased transparency from all parties. The purpose of the ENTSO-E target adequacy methodology under construction is the development of a sound methodology which will allow to perform regular pan European and regional diagnosis of the evolving European power system with respect to adequacy risks. Considering any modelling implies simplifications, ENTSO-E adequacy target modelling is to focus on the hourly power balance modelling. Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted. Finally whenever there is no official communication of decommissioning, it is considered that the units will be available for security of supply reasons.</p>
Zdenek Danielovsky	CZ Ministry of Industry and Trade		<p>This assumption is not valid in the CCE region (Continental Central East) and therefore in this case it is absolutely necessary to model both variations by bidding zones and at the national level.</p>	<p>We agree. The text has been updated accordingly It is assumed that the most significant network constraints are / will be reflected in the Bidding Zone definition.</p>
Paul Mott	EdF	<p>As a consequence, it is important to clearly distinguish between the studies for long term network development plan and for mid-term adequacy forecast, which differ in goals and horizons, while ensuring common methodologies so that local adequacy assessments, which are sure to still be necessary, are locally-accurate/appropriate, yet globally-comparable.</p>	<p>THIS SUBMISSION IS FOR EDF ENERGY BY PAUL MOTT Press attention is paid to system (generation) adequacy reports, and with new investment in generation required, this interest will grow. The equivalent national reports - in GB's case, the winter/summer Outlook reports, and the future energy scenarios - will remain key to local assessments, and it is important that ENTSO-E's assessment is well thought through and locally-accurate in its view. Looked at the other way around, the local adequacy assessments need to be undertaken to a comparable method and formulation across the EU, using comparable treatment of the difficult question of what capacity factor to use for RES at time of minimum system generation margin (albeit, the actual factors will inevitably differ by member state, according to local wind and solar disposition/relevant weather patterns). Where ENTSO-E's regional assessment detects a potential issue in a country, then a national assessment is likely to be needed, which might be able to use a still more accurate data/method, to further identify the issue. ENTSO-E's assessment should have growing significance as there are attempts over time, to ensure compatible capacity auctions that deliver the intended results.</p>	<p>The goal of the ongoing process is to improve the ENTSO-E Pan-EU and regional adequacy assessment methodology toward a target methodology which will cope with each and all the new requirements set by the recent evolution of the European electrical system, while this process does not aim to set rules for the national assessments.</p> <p>It should be also pointed out that a Pan-EU and regional assessment needs to adopt some kinds of simplification in the modelisation approach in order to create a model able to catch all the key aspects of each and all the different areas under investigation, while a national methodology can take into account in a much more detailed way the national legal and regulatory framework, obviously losing its applicability to other countries. Hence, in line with the recommendation of the ECG subgroup on adequacy, ENTSOE believes that national methodologies should be maintained and eventually improved by the relative owners/stakeholders.</p> <p>One of the main objectives is to be able to inform about the 'need for flexibility' in the system. The focus is on need for physical sources of flexibility at the operation time. Flexibility in the adequacy assessments is based on weather-dependent effects related to load variation, generation patterns of wind and solar power plants with a one-hour resolution and the consideration of the resources of flexibility. The existing Pan-European Climate Database (PECD) will be used for the adequacy assessments.</p>
Jasmina PIERRE	EdF	<p>The input and output data will be made publicly available, except data which ACER confirms is confidential or sensitive.</p>	<p>ACER should decide which output data should be considered confidential or sensitive. All other output data should, "by default", be made publicly available.</p>	<p>The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with increased transparency from all parties. ENTSO-E must fulfil obligations of Reg. 714/2009, and contribute to the overall European/national debates on adequacy concerns and should respect national legislation and confidentiality agreements between TSOs and national stakeholders. As indicated in the target methodology document . "....However, confidence in the results and confidentiality issues might require some data to be publicly released in an aggregated manner...." .</p>
Zdenek Danielovsky	CZ Ministry of Industry and Trade		<p>In order to properly take into account the probabilistic behaviour of the forced outages, the future adequacy methodology will be based on a Monte Carlo simulation approach.</p>	<p>The development of a model able to capture all the key features of the Pan-EU power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary. In this context, ENTSO-E is aware of the differences between sequential and non-sequential simulation approaches. ENTSO-E is also aware that the choice of the approach will affect in a significative manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the modeling approach (montercarlo methods, stochastic dynamic programming methods, global mixed integer methods, etc..) will be further investigated in the next steps of the methodology improvement process and the final methodology details will be properly consulted.</p>
Paul Mott	EdF	<p>The goal is to measure potential lack of flexible generation in the expected power system operation. For this reason it is all the more important to improve the adequacy method using probabilistic assessment methods to identify how often the system is not balanced or when availability of ancillary services might be affected. These changes are mostly caused by the actual hour-on-hour evolution of the climate situation and also by forecast errors in the planning processes.</p>	<p>The question of how to determine interconnector flows at times of system stress - whether of peak demand, or of other times due to the increasing significance of when peak RES generation occurs - is particularly vexing. A probabilistic method may be beneficial for assessing both capacity and flexibility adequacies. We would not suggest developing a very precise method that would take into account every constraint - this, as an aim, would probably be over-optimistic, as it may not be practically achievable.</p>	<p>Having in mind that considering historical data as an input to modelling is always an option, ENTSO-E ambition is to be able to explore the ongoing and future evolutions of the power system such as an increasing renewable generation, the enforcement of the Industrial Emission Directive, changes in the national and European energy policies, network development, market design, etc. Therefore, it is of the utmost importance for ENTSO-E that its pan European adequacy methodology is able to accommodate different forecast scenarios and not replicating the past only.</p>

Name	Company	Proposed	Comment	ENTSO-E Answer
Jasmina PIERRE	EdF	To do so, we need a centralised methodology based on tools used for TYNDP to model the contribution of cross-border exchanges to adequacy. Such 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.	EDF considers pragmatic and transparent solutions need to be pursued by ENTSO-E to implement an enhanced methodology for future TYNDP and system adequacy reports. This paragraph should be more explicit about the target "methodologies" . Cross-border contributions are best assessed through a regional simulation of plants using a zonal model (we understand that this is what is also called "market-model" in this consultation document). In that sense, the wording "harmonized methodology" is not fully relevant and should only apply to the methods regarding the selection/creation of input data. That analysis in it-self should be a single simulation performed centrally (which, of course, does not mean a "copper plate" simulation but a zonal one based on existing bidding-zones configuration) "Regional Investment Plans" refer to different tools used for the European-wide Ten-Year Network Development Plan (TYNDP) Package. The single simulation performed centrally supporting adequacy reports could rely on similar tools and methodologies than the ones used for TYNDP. In particular, multi-area adequacy and market simulator (ANTARES) providing outcome of random events whose possible combinations form a set of scenarios (climatic conditions, forced outages) could adequately be considered.	The development of a model able to capture all the key features of the Pan-EU power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary. In this context, ENTSO-E is aware of the differences between sequential and non-sequential simulation approaches. ENTSO-E is also aware that the choice of the approach will affect in a significative manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the modeling approach (montercarlo method, stochastic dynamic programming, global mixed integer method, etc..) and the available tools for market simulations will be further investigated in the next steps of the methodology improvement process and the final methodology details will be properly consulted. ENTSO-E will optimize the synergies between market modeling within TYNDP and for adequacy assessments when possible, also keeping in mind that the focus of grid infrastructure development and adequacy assessment are slightly different.
Zdenek Danielovsky	CZ Ministry of Industry and Trade		Also in this article a statistical evaluation of individual cross-border interconnectors in terms of their availability (outages) and changes in their available capacity is proposed. We require that the resulting model is tested in parallel with the valid data of the real operation for long enough time period.	The development of a model able to capture all the key features of the Pan-EU power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary. In this context, ENTSO-E is aware of the differences between sequential and non-sequential simulation approaches. ENTSO-E is also aware that the choice of the approach will affect in a significative manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the modeling approach (montercarlo methods, stochastic dynamic programming methods, global mixed integer methods, etc..) and the available tools for market simulations will be further investigated in the next steps of the methodology improvement process and the final methodology details will be properly consulted. ENTSO-E will optimize the synergies between market modeling in TYNDP and Adequacy Assessment, when possible, also keeping in mind that the focus of infrastructure development and adequacy assessments are slightly different.
Paul Mott	EdF	Therefore, the assessment of flexibility and the addressing of balancing issues are of key importance for improvement of the method for carrying out the adequacy assessment, in order to measure potential lack of flexible generation.	Clarification: adequacy assesment should refer to quantitative studies. Local system operators are at risk of using different cost-benefit analyses and indicators in their local adequacy assessments, which is why the common method will help.	see answer to Mrs. Jasmina PIERRE - EDF above
Jasmina PIERRE	EdF		EDF considers both options though reasonable. If properly implemented, option 1 should be preferred since it allows considering that outage planning might progressively change as installed renewable capacity increase. Besides, such impact analysis on ATC values should be extended to others sources of uncertainties, including renewable generation pattern. EDF considers such analysis might appears over-complex to implement.	We thank the stakeholder for her constructive comment, in line with the target methodology and roadmap documents consulted. In page 10. of the target methodology it is mentioned "In the future, when the Flow Based (FB) approach will be much more widespread and its application will be consolidated on a broader geographical area, a possible evolution of the methodology toward this approach could be foreseen"
Zdenek Danielovsky	CZ Ministry of Industry and Trade	– The areas in the analysis should be in line with the Bidding Zones configuration and also with national borders.	Common assumption that bidding zones are covered by state borders or they are smaller is not valid in the CCE region (Continental Central East) and therefore it is absolutely necessary to make analysis by bidding zones and at the national level too.	It is assumed that the most significant network constraints are / will be reflected in the Bidding Zone definition. We have updated the text accordingly.
Paul Mott	EdF	The demand side contribution to the provision of system margin adequacy at time of system stress, will vary by member state/area, but should be fully considered. In GB, this has so far taken the form of about 2 GW of industrial and commercial demand side management at time of expected peak system demand, as this allows those users to avoid transmission use of system charges.	In future it is hoped that wider active "demand-side response" will develop, potentially making demand a despatchable (or, self-despatching against consumer time of day price) resource - but the assessment should be based on what has already proved reliable locally in recent years, and not on an optimistic forecast	see answer to Mrs. Jasmina PIERRE - EDF above

Name	Company	Proposed	Comment	ENTSO-E Answer
Jasmina PIERRE	EdF		The sequential simulation should be preferred to the non-sequential one. This type of approach should also be used for plants outages.	The development of a model able to capture all the key features of the Pan-EU power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary. In this context, ENTSO-E is aware of the differences between sequential and non-sequential simulation approaches. ENTSO-E is also aware that the choice of the approach will affect in a significant manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the modeling approach (montecarlo methods, stochastic dynamic programming methods, global mixed integer methods, etc..) and the available tools for market simulations will be further investigated in the next steps of the methodology improvement process and the final methodology details will be properly consulted. ENTSO-E will definitely optimized the synergies between market modeling in TYNDP and adequacy assessment when possible, also keeping in mind that the focus of infrastructure development and adequacy assessments are slightly different.
Zdenek Danielovsky	CZ Ministry of Industry and Trade	The ENTSO-E methodology will be a probabilistic approach and enable the evaluation of stochastic effects (e.g. severe weather conditions, their duration etc.). However, the transition of the methodology should be a gradual step by step approach. One of the results of the probabilistic solution should be identification of other risky situations, not only caused by severe climatic conditions.	It is necessary to focus also on other risky situations than situations caused by severe climatic conditions.	A gradual evolution of the Pan-European Climate Database (PECD) is foreseen both in terms of years covered and scope of data. At present, PECD time series include solar PV load factors, wind load factors and temperature data for the period 2000-2011/2012-2013. In addition to the country level data, also regional time series are available for a few countries. An increased geographical granularity is essential to enable modelling at different levels including local market simulations. The ongoing technology evolutions like changes in wind turbine height, storm control facilities, blade pitching, the development of deep offshore floating turbines, PV tilt angles, CSP technology, etc... have a fundamental impact on the characteristics of future generation equipment. These changes are to be reflected by the assumptions made on the composition of generation equipment when deriving the load factor time series from climate model data. Beyond the extension of PECD, also a more accurate analysis of uncertainties caused by different hydro conditions is important. After consultation with expert stakeholders inflow data can contribute to an improved adequacy assessment. Finally risk due to severe climatic situations will be accounted by consideration of statistically relevant and climatically correlated ensembles of time series for RES, inflow and load including low and high RES infeeds, dry and wet years of inflow and high and low demand.
Paul Mott	EdF	- Generation : Thermal and nuclear power plants and RES Thermal power plants [...] In addition to larger units, the potential flexibility of smaller-scale generation (modelled usually as an aggregated production) could be examined and assessed.- Modelling RES generation should take into account the volatility and co-variance of their related inputs/outputs, and their potential flexibility provided to the system.	The treatment of RES generation in the short and long term adequacy assessments, should take into account the volatility of their related outputs both within each member state, and their co-variance across the EU. For example, anticyclonic weather systems across the EU are typically larger, and longer-lasting, than cyclonic weather systems across the EU - these can be coincident with a widespread wind lull, at times of elevated demand due to markedly cold, or markedly hot, weather, according to season. Drier-than-average (low hydro output) years for one member state may co-incide dry years also, for others. Note : there is active consideration in GB at present, of the possible provision of reserve, fast frequency response, and "intertrip" services from some RES generation.	see answer to Mrs. Jasmina PIERRE - EDF above
Zdenek Danielovsky	CZ Ministry of Industry and Trade		The document refers in multiple places to models that do not yet exist. Model specification must be elaborated, as well as their use at national, regional and European level.	The development of a model able to capture all the key features of the Pan-EU and regional power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary. In this context, ENTSO-E is aware of the differences between sequential and non-sequential simulation approaches. ENTSO-E is also aware that the choice of the approach will affect in a significant manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the two approaches will be further investigated in the next steps of the methodology improvement process, with focus on engagement of stakeholders through expert workshops and continuous consultations towards the final methodology.

Name	Company	Proposed	Comment	ENTSO-E Answer
Paul Mott	EdF	<ul style="list-style-type: none"> - ENTSO-E will report on expected needs for flexibility as part of its adequacy forecast. - The adequacy analysis will be performed with an hourly resolution. - The Pan European Climate Database (PECD) will be used in modelling the volatility of load, wind, hydro and solar generation and their co-variance. - All potential resources should be modelled, including potential flexibility from demand response and RES curtailment, grounded in recent real data. 	The modelling of the load and RES generation should take into account the volatility of their related outputs - but also the value to the system of their potential for output flexibility	see answer to Mrs. Jasmina PIERRE - EDF above
Sarah KEAY-BRIGHT	The Regulatory Assistance Project		While improving harmonisation via increased transparency is a laudable aim, it lacks ambition. ENTSO-E is in a unique position to drive harmonisation though identifying best practice amongst TSOs within Europe and elsewhere, and proposing rules for resource adequacy assessment based on that best practice.	<p>The goal of the ongoing process is to improve the ENTSO-E Pan-EU and regional adequacy assessment methodology toward a target methodology which will cope with each and all the new requirements set by the recent evolution of the European electrical system, while this process does not aim to set rules for the national assessments.</p> <p>It should be also pointed out that a Pan-EU and regional assessment needs to adopt some kinds of simplification in the modelisation approach in order to create a model able to catch all the key aspects of each and all the different areas under investigation, while a national methodology can take into account in a much more detailed way the national legal and regulatory framework, obviously losing its applicability to other countries. Hence, in line with the recommendation of the ECG subgroup on adequacy, ENTSOE believes that national methodologies should be maintained and eventually improved by the relative owners/stakeholders.</p>
Paul Mott	EdF	Some values could be built centrally to ensure consistency, and TSOs will have the opportunity to validate and modify these values.	If capacity factors have to be used, rather than falling out of a probabilistic assessment of RES output, then local weather regimes should be taken account of; the realistic probability of co-variance in pan-regional RES output, per technology, at times of system stress (of smallest generation margins over demand), also needs to be allowed for.	see answer to Mrs. Jasmina PIERRE - EDF above
Sarah KEAY-BRIGHT	The Regulatory Assistance Project		The development of an appropriate market model to model cross-border exchanges is a valid approach. However, an alternative approach would be to rely on historic data on interconnector flows during stress events. While historic data may not fully take into account the relative recent introduction of market coupling, over time it will. It is also important to note that interconnection contribution during stress events is what is really important, not just average conditions. Interconnector contribution will be driven increasingly by price differentials, which will be highest during stress events.	Having in mind that considering historical data as an input to modelling is always an option, ENTSO-E ambition is to be able to explore the ongoing and future evolutions of the power system such as an increasing renewable generation, the enforcement of the Industrial Emission Directive, changes in the national and European energy policies, network development, market design, etc... Therefore, it is of the utmost importance for ENTSO-E that its pan European adequacy methodology is able to accommodate different forecast scenarios and not replicating the past only.

Name	Company	Proposed	Comment	ENTSO-E Answer
Paul Mott	EdF	Generation Data: referred to each technology [...] – Non-Usable Capacity and reason for non-usability, and timeframe, if known, for its possible return to service.	In Britain, it is currently considered of significance by some, that we have several GW of "mothballed" (not in operation, yet not closed) gas-fired CCGT power stations. The true status of this plant, and the timeframe in which it might be able to be brought back into operation in response to better market prices, is a matter of debate, yet is quite important to the short-term assessment of generation adequacy.	The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with increased transparency from all parties. The purpose of the ENTSO-E target adequacy methodology under construction is the development of a sound methodology which will allow to perform regular pan European and regional diagnosis of the evolving European power system with respect to adequacy risks. Considering any modelling implies simplifications, ENTSO-E adequacy target modelling is to focus on the hourly power balance modelling. Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted. Finally whenever there is no official communication of decommissioning, it is considered that the units will be available for security of supply reasons.
Paul Mott	EdF	The input and output data will be made publicly available, except data which ACER confirms is confidential or sensitive.	ACER should decide which output data should be considered confidential or sensitive. All other output data should "by default", be made publicly available.	see answer to Mrs. Jasmina PIERRE - EDF above
Sarah KEAY-BRIGHT	The Regulatory Assistance Project		It would also be useful if ENTSO-E could develop a standard methodology for assessing coincidence between the demand profiles of individual MS systems. This would also promote a harmonised approach to assessing interconnector contribution amongst MS.	The goal of the ongoing process is to improve the ENTSO-E Pan-EU and regional adequacy assessment methodology toward a target methodology which will cope with each and all the new requirements set by the recent evolution of the European electrical system, while this process does not aim to set rules for the national assessments. It should be also pointed out that a Pan-EU and regional assessment needs to adopt some kinds of simplification in the modelisation approach in order to create a model able to catch all the key aspects of each and all the different areas under investigation, while a national methodology can take into account in a much more detailed way the national legal and regulatory framework, obviously losing its applicability to other countries. Hence, in line with the recommendation of the ECG subgroup on adequacy, ENTSOE believes that national methodologies should be maintained and eventually improved by the relative owners/Stakeholders.
Melle Kruisdijk	Wärtsilä		We support ENTSO-E's view that the increasing share of renewable energy sources raises new challenges for electricity systems. The EU decarbonisation and renewables agenda will lead in particular to a much greater level of intermittent generation on the system (i.e. wind and solar). Increasing the amount of intermittent renewable generation causes unpredictable fluctuations and increasing ramping requirements in the rest of the generation fleet. As a result, increased operational flexibility from the generation fleet is required.	A gradual evolution of the Pan-European Climate Database (PECD) is foreseen both in terms of years covered and scope of data. At present, PECD time series include solar PV load factors, wind load factors and temperature data for the period 2000-2011/2012-2013. In addition to the country level data, also regional time series are available for a few countries. An increased geographical granularity is essential to enable modelling at different levels including local market simulations. The ongoing technology evolutions like changes in wind turbine height, storm control facilities, blade pitching, the development of deep offshore floating turbines, PV tilt angles, CSP technology, etc., have a fundamental impact on the characteristics of future generation equipment. These changes are to be reflected by the assumptions made on the composition of generation equipment when deriving the load factor time series from climate model data. Beyond the extension of PECD, also a more accurate analysis of uncertainties caused by different hydro conditions is important. After consultation with expert stakeholders inflow data can contribute to an improved adequacy assessment.
Sarah KEAY-BRIGHT	The Regulatory Assistance Project		It should be mentioned here that there will be a move to flow-based capacity allocation as soon as practical.	We thank the stakeholder for his constructive comments which are in line with the target methodology and roadmap documents consulted. In page 10. of the target methodology it is mentioned "In the future, when the Flow Based (FB) approach will be much more widespread and its application will be consolidated on a broader geographical area, a possible evolution of the methodology toward this approach could be foreseen".
Melle Kruisdijk	Wärtsilä		Wärtsilä is of the opinion that market based solutions can incentivize investments in flexibility. However, we agree with ENTSOE that current existing European market designs fail to deliver the necessary level of flexibility, both in the short and long term. New investments in flexible solutions are crucial to keep the European power system reliable, affordable and support the decarbonisation goals. To attract investments in flexible solutions, it is important that market designs signal the long term value of flexibility to potential investors. The European electricity market could signal the short term value of flexibility through its balancing arrangements, which should provide the basis for the long term value of flexibility. To achieve this however, it is necessary that today's existing market failures in these arrangements are corrected. We see the implementation of the European Network Code for Electricity Balancing, in line with the Framework Guideline published by ACER, as an important step forward in correction these failures and signalling the value of flexibility.	The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with increased transparency from all parties. The purpose of the ENTSO-E target adequacy methodology under construction is the development of a sound methodology which will allow to perform regular pan European and regional diagnosis of the evolving European power system with respect to adequacy risks. Considering any modelling implies simplifications, ENTSO-E adequacy target modelling is to focus on the hourly power balance modelling. Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted. Finally whenever there is no official communication of decommissioning, it is considered that the units will be available for security of supply reasons.

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Sarah KEAY-BRIGHT	The Regulatory Assistance Project		A more transparent and harmonized approach to what constitutes “adequacy” including a more harmonized approach to calculation of LOLE is needed (for instance, the UK’s treatment of over-generation and economic demand response as losses of load).	<p>The goal of the ongoing process is to improve the ENTSO-E Pan-EU and regional adequacy assessment methodology toward a target methodology which will cope with each and all the new requirements set by the recent evolution of the European electrical system, while this process does not aim to set rules for the national assessments.</p> <p>It should be also pointed out that a Pan-EU and regional assessment needs to adopt some kinds of simplification in the modelisation approach in order to create a model able to catch all the key aspects of each and all the different areas under investigation, while a national methodology can take into account in a much more detailed way the national legal and regulatory framework, obviously losing its applicability to other countries. Hence, in line with the recommendation of the ECG subgroup on adequacy, ENTSOE believes that national methodologies should be maintained and eventually improved by the relative owners/stakeholders.</p>
Melle Kruidijk	Wärtsilä		We support the goal to measure the available and required level of flexibility to have a transparent analysis and clear understanding of the potential lack of flexibility. We believe such information is of high importance for potential investors in flexibility and should therefore have a sufficient forward looking element so that such information can be taken into account for new investment decision.	<p>The ENTSO-E adequacy methodology considers that the large-scale exploitation of renewable energy sources of variable generation poses challenges for electricity system operation. In addition to sufficient levels of back-up capacity, additional resources of system flexibility will be needed in the future.</p> <p>Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system. Flexibility in the adequacy assessments is based on weather-dependent effects related to load variation, generation patterns of wind and solar power plants with a one-hour resolution and the consideration of the resources of flexibility. The existing Pan-European Climate Database (PECD) will be used for this adequacy assessments. Power plants of all fuel types can be subjected to must run conditions as well as provide flexibility to the system, both due to technical or economic reasons. Furthermore the must run level of a plant can differ throughout the year due to heat supply for instance. The TSOs are assessing the level of must run generation based on technical and economic characteristics of the power system . For this evaluation TSOs are consulting power plant operators on their own constraints.</p> <p>The goal is to extend the level of detail, so the information of must run constraints will be defined for the different types of units within a given technology to increase the knowledge about flexibility of the system.</p> <p>The information about must – run constrains will be detailed in order to increase the awareness about the flexibility of the system.</p>
Sarah KEAY-BRIGHT	The Regulatory Assistance Project		Governance: ACER/CEER, or alternative, should have a formal oversight role.	We have a close and constructive cooperation with ACER and we will continue this process. ACER already provides official opinions on the main deliverables published according to Regulation (EC) 714/2009.
Melle Kruidijk	Wärtsilä		Wärtsilä welcomes the proposed use of one-hour resolution in ENTSO-E’s assessment as a big improvement compared to the ‘static’ adequacy view used earlier. Wärtsilä has performed several studies for different power systems to analyse and understand the impact of intermittent RES, need for flexibility, and the power system cost savings that can be achieved with different levels of flexible capacity added to future power systems. In these studies, we’ve found that sub-hourly effects can have considerable impact, depending on the share of intermittent RES in the power system. This impact is not revealed with an hourly approach, as currently proposed by ENTSOE. We therefore recommend ENTSO-E to consider sub-hourly analysis. As a first step, this can be considered specifically for regions with high expected fluctuations in production, e.g. regions with high shares of installed renewable energy sources.	<p>The ENTSO-E adequacy methodology considers that the large-scale exploitation of renewable energy sources of variable generation poses challenges for electricity system operation. In addition to sufficient levels of back-up capacity, additional resources of system flexibility will be needed in the future.</p> <p>Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system. Flexibility in the adequacy assessments is based on weather-dependent effects related to load variation, generation patterns of wind and solar power plants with a one-hour resolution and the consideration of the resources of flexibility. The existing Pan-European Climate Database (PECD) will be used for this adequacy assessments. Power plants of all fuel types can be subjected to must run conditions as well as provide flexibility to the system, both due to technical or economic reasons. Furthermore the must run level of a plant can differ throughout the year due to heat supply for instance. The TSOs are assessing the level of must run generation based on technical and economic characteristics of the power system . For this evaluation TSOs are consulting power plant operators on their own constraints.</p> <p>The goal is to extend the level of detail, so the information of must run constraints will be defined for the different types of units within a given technology to increase the knowledge about flexibility of the system.</p> <p>The information about must – run constrains will be detailed in order to increase the awareness about the flexibility of the system.</p> <p>One of the main objectives is to be able to inform about the 'need for physical flexibility' in the system at the hour of operation.</p> <p>The purpose of the ENTSO-E target adequacy methodology under construction is the development of a sound methodology which will allow to perform regular pan European and regional diagnosis of the evolving European power system with respect to adequacy risks. Considering any modelling implies simplifications, ENTSO-E adequacy target modelling is to focus on the hourly power balance modelling. It should be also pointed out that a Pan-EU and regional assessment needs to adopt some kinds of simplification in the modelisation approach in order to create a model able to catch all the key aspects of each and all the different areas under investigation, while a national methodology can take into account in a much more detailed way the national legal and regulatory framework, obviously losing its applicability to other countries. Sub-hourly adequacy assessment belong to national adequacy assessments</p>
Chris Dent	Durham University		MC simulation a way of evaluating model outputs, indeed when dealing with complex stochastic models it is often the only available way of evaluating outputs. However when comparing the capabilities of different approaches We suggest that the focus should be on the underlying model structure assumptions, rather than on the approach used to evaluate outputs.	<p>The development of a model able to capture all the key features of the Pan-EU and regional power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary.</p> <p>In this context, ENTSO-E is aware of the differences between sequential and non-sequential simulation approaches.</p> <p>ENTSO-E is also aware that the choice of the approach will affect in a significant manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the two approaches will be further investigated in the next steps of the methodology improvement process, with focus on engagement of stakeholders through expert workshops and continuous consultations towards the final methodology.</p>
Melle Kruidijk	Wärtsilä		Different generation technologies have different ways of providing flexibility. Some generation technologies are able to start up from zero output and then increase their output ('ramp up') within a matter of seconds. Other technologies may take a number of hours to start up, but once they are generating above a stable level they can quickly flex their output up to meet the system needs (typical of large units such as combined cycle gas turbines (CCGTs), and large coal plants). These slower technologies typically provide the required system flexibility today. As a result, such plants need to run 'part-loaded' at their minimum stable export level (typically 50%-70% of capacity) in readiness for dispatch, which in turn add costs to the system in terms of fuel and carbon costs, wear and tear, and maintenance costs. It could also lead to lost renewables output, to the extent that part-loading the CCGTs leads to wind curtailment. Finally, part-loading these plant at their minimum stable export level means that there is less capacity available from these plants for flexibility purposes (i.e. only the upper half of the total name-plate capacity can be used). In the assessment of resources of flexibility, we believe all the parameters that determine the flexible capabilities should be taken into consideration.	

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Chris Dent	Durham University		In order to interpret modelling results robustly, it is necessary to consider carefully the relationship between the model and the real system it is intended to represent; this includes consideration of both model structure assumptions, and of quantity and relevance of data. This is even more significant in when deadlin with large scale models and datasets such as that for adequacy assessment in the interconnected European system. We are concerned that the proposed methodology does not include such an assessment, and implicitly makes a number of uncontrolled assumptions about the relationship between the model and the real system, and that it is thus unclear how real-world conclusions should be drawn. We strongly recommend that greater emphasis is placed on these statistical modelling issues in the final target methodology.	
Melle Kruisdijk	Wärtsilä		Wärtsilä believes that a scenario describing severe conditions is of high importance. Such scenario can describe a situation where a sudden loss of high in-feed of renewable energy is experienced due to the shut-down of wind capacity to protect generation equipment against high wind speeds. Such scenario would reveal the needed level of flexibility and clearly addresses security of supply challenges. Therefore, before deciding to omit such analysis because of a probabilistic approach, we believe it is important to understand and clarify that such approach would indeed cover such analysis, and inform stakeholders of the outcome.	
Chris Dent	Durham University		We suggest that the benefits of sequential over non-sequential modelling should be clarified. The present text states that "A non-sequential simulation process considers each time point as independent. Consequently, a nonsequential approach does not accurately model phenomena that involve correlations among different time points." It is however the case that in systems without substantial storage non-sequential calculations are entirely sufficient for calculating expected value risk indices such as LOLE. A sequential approach is however needed if any technology such as storage means that calculations for different time periods cannot be considered separately, or if there is a desire to explore the variability of possible outturns in a given year (which depends on serial correlations between periods). Most notably, calculation of an expected value index using a non-sequential calculation gives no indication at all of the possible variability of outturns.	
Melle Kruisdijk	Wärtsilä		Due to the increasing amount of RES on the power system, the remaining fleet of conventional thermal generation will see more start/stop cycles and ramping events. This will impact the lifetime consumption of such plant and therefore the maintenance inspection regime (as well as maintenance costs). As a first approach, using historical series to estimate future maintenance periods for thermal generation seems reasonable. However, as the amount of RES increases, the impact on operation and maintenance schedules of conventional generation should become clearer and should be taken into account.	

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Jasmina PIERRE	EdF		<p>ENTSO-E Consultation on target methodology for system adequacy assessment, seasonal outlook and SOAAF reports evolutions EDF response – General comments - 20 September 2014</p> <p>See attached file</p>	<p>We thank the stakeholder for his constructive comments which are in line with the scope of the target methodology and roadmap documents consulted. The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with increased transparency from all parties. The purpose of the ENTSO-E target adequacy methodology under construction is the development of a sound methodology which will allow to perform regular pan European and regional diagnosis of the evolving European power system with respect to adequacy risks. Considering any modelling implies simplifications, ENTSO-E adequacy target modelling is to focus on the hourly power balance modelling.</p> <p>Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted.</p> <p>ENTSO-E is also aware that the choice of the approach will affect in a significant manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the two approaches will be further investigated in the next steps of the methodology improvement process, with focus on engagement of stakeholders through expert workshops and continuous consultations towards the final methodology.</p>
andrea pompa	Edison	PDF file	PDF file	<p>We thank the stakeholder for his constructive comments which are in line with the scope of the target methodology and roadmap documents consulted. The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with increased transparency from all parties. The purpose of the ENTSO-E target adequacy methodology under construction is the development of a sound methodology which will allow to perform regular pan European and regional diagnosis of the evolving European power system with respect to adequacy risks. Considering any modelling implies simplifications, ENTSO-E adequacy target modelling is to focus on the hourly power balance modelling.</p> <p>Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted.</p> <p>ENTSO-E is also aware that the choice of the approach will affect in a significant manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the two approaches will be further investigated in the next steps of the methodology improvement process, with focus on engagement of stakeholders through expert workshops and continuous consultations towards the final methodology.</p>
Jasmina PIERRE	EdF	<p>As a consequence, it is important to clearly distinguish between the studies for long term network development plan and for mid-term adequacy forecast, which differ in goals and horizons, while ensuring common methodologies, so that local adequacy assessments, which are still necessary, are locally-accurate/appropriate, yet globally-comparable.</p>	<p>It is indeed important to keep the different studies distinct, in particular regarding the choice of specific point of focus or the way to develop scenarios. However, we do not believe that the means and tools used for the studies should differ. The target for all studies should be a common probabilistic simulation based on a market model with similar principles regarding the way to develop data sets so that local adequacy assessments, which are still necessary, are locally-accurate/appropriate, yet globally-comparable.</p> <p>Where ENTSO-E's regional assessment detects a potential issue in a country, then a national assessment is likely to be needed, which might be able to use a still more accurate data/method, to further identify the issue. ENTSO-E's assessment should have growing significance as there are attempts over time, to ensure consistent capacity mechanisms that deliver the intended results.</p>	<p>The goal of the ongoing process is to improve the ENTSO-E Pan-EU and regional adequacy assessment methodology toward a target methodology which will cope with each and all the new requirements set by the recent evolution of the European electrical system, while this process does not aim to set rules for the national assessments.</p> <p>It should be also pointed out that a Pan-EU and regional assessment needs to adopt some kinds of simplification in the modelisation approach in order to create a model able to catch all the key aspects of each and all the different areas under investigation, while a national methodology can take into account in a much more detailed way the national legal and regulatory framework, obviously losing its applicability to other countries. Hence, in line with the recommendation of the ECG subgroup on adequacy, ENTSO-E believes that national methodologies should be maintained and eventually improved by the relative owners/stakeholders.</p>
Paulo Lopes	Eurelectric		<p>EURELECTRIC welcomes the opportunity to respond to the consultation on the ENTSO-E target methodology for adequacy assessment as stakeholder involvement is key to achieve an improved methodology.</p>	<p>We thank the stakeholder for responding to the consultation.</p>
IEA Task 25	IEA	<p>Recommended practices report recommends use of ELCC/LOLP based calculation.</p> <ul style="list-style-type: none"> - COPT table based estimation from forced outages is difficult to apply to Europe wide multi-area problem but could be made as a benchmark for Europe wide area. - Sequential Monte Carlo may be appropriate method as long there is no clear analytical method available - Flexibility assessment should be made as a separate simulation 		<p>The development of a model able to capture all the key features of the Pan-EU power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary.</p> <p>In this context, ENTSO-E is aware of the differences between sequential and non-sequential simulation approaches.</p> <p>ENTSO-E is also aware that the choice of the approach will affect in a significant manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data.</p> <p>Hence, the selection between the modeling approach (montecarlo methods, stochastic dynamic programming methods, global mixed integer methods, etc..) and the available tools for market simulations will be further investigated in the next steps of the methodology improvement process and the final methodology details will be properly consulted.</p> <p>ENTSO-E will definitely optimized the synergies between market modeling in TYNDP and adequacy assessment when possible, also keeping in mind that the focus of infrastructure development and adequacy assessments are slightly different.</p>

Name	Company	Proposed	Comment	ENTSO-E Answer
IEA Task 25	IEA	Things to be taken into account for Capacity Adequacy: More accurate forced outage rates for generation plants is an important input. Net load should be studied from synchronous load/wind/PV data.		Power plants of all fuel types can be subjected to <u>must - run</u> conditions as well as provide flexibility to the system, both due to technical or economic reasons. Furthermore the must run level of a plant can differ throughout the year due to heat supply for instance. The TSOs are assessing the level of must run generation based on technical and economic characteristics of the power system . For this evaluation TSOs are consulting power plant operators on their own constraints. The goal is to extend the level of detail, so the information of must run constraints will be defined for the different types of units within a given technology to increase the knowledge about flexibility of the system.
IEA Task 25	IEA	It is very good that there will be attempt to estimate which power plants are actually available (mothballing etc.). Smart grid gives more control over involuntary load shedding, which decreases the cost impact of capacity deficiency. Should the methodology evolution consider cost-based approach at some point?		We thank the stakeholder for his constructive comments which are in line with the scope of the target methodology and roadmap documents consulted. The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with increased transparency from all parties. The purpose of the ENTSO-E target adequacy methodology under construction is the development of a sound methodology which will allow to perform regular pan European and regional diagnosis of the evolving European power system with respect to adequacy risks. Considering any modelling implies simplifications, ENTSO-E adequacy target modelling is to focus on the hourly power balance modelling. Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted. ENTSO-E is also aware that the choice of the approach will affect in a significant manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the two approaches will be further investigated in the next steps of the methodology improvement process, with focus on engagement of stakeholders through expert workshops and continuous consultations towards the final methodology.
IEA Task 25	IEA	PECD could be expanded from 11 years. Wind turbine height and CF evolution potentially important, as is PV tilt angles. Consideration of multi-year oscillations in climate (North Atlantic, El Nino,...)		We thank the stakeholder for his constructive comments which are in line with the scope of the target methodology and roadmap documents consulted. The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with increased transparency from all parties. The purpose of the ENTSO-E target adequacy methodology under construction is the development of a sound methodology which will allow to perform regular pan European and regional diagnosis of the evolving European power system with respect to adequacy risks. Considering any modelling implies simplifications, ENTSO-E adequacy target modelling is to focus on the hourly power balance modelling. Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted. ENTSO-E is also aware that the choice of the approach will affect in a significant manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the two approaches will be further investigated in the next steps of the methodology improvement process, with focus on engagement of stakeholders through expert workshops and continuous consultations towards the final methodology.
IEA Task 25	IEA	Other things to consider: Future changes in heat pumps and air conditioning? Consideration of droughts and water temperature (cooling problems)?		The contribution of market participants is very important to develop and apply appropriate models for adequacy assessment, especially in cases of <u>Demand Side Management (DSM)</u> , hydro inflows, pump storage power plants and <u>modeling of reserves</u> . An in-depth discussion with stakeholders on modelling principles, constraints resulting from technology, regulatory and market framework is planned in the form of continuous consultations and dedicated expert workshops. Focus is on the development of a sound methodology which will allow to perform a diagnosis of the power system with respect to adequacy risks. One of the main objectives is to be able to inform about the 'need for flexibility' in the system both from the generation and the <u>demand sector</u> . The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with <u>increased transparency from all parties</u> .
IEA Task 25	IEA	For for Flexibility assessment: Load duration curves would not capture flexibility needs, Maximum ramps could be used. Chronological simulations may be needed.		The development of a model able to capture all the key features of the Pan-EU power system is a main objective for ENTSO-E. In order to cope with this ambitious goal, ENTSO-E believes that a market-based stochastic model, with a proper representation of the zonal configuration of the geographical area under investigation, is necessary.
IEA Task 25	IEA	US is in the middle of similar process (NERC). They have working group work that is already finished that you may want to check at		In this context, ENTSO-E is aware of the differences between sequential and non-sequential simulation approaches.
IEA Task 25	IEA	North American Electric Reliability Corporation. Integrating Variable Generation Task Force on Probabilistic Methods Team. M. Milligan and M. O'Malley, leads. (2010). Special Report: Flexibility Requirements and Metrics for Variable Generation: Implications for System Planning Studies. Available at http://www.nerc.com/docs/pc/ivgtf/IVGTF_Task_1_4_Final.pdf		We thank the stakeholder for responding to the consultation and for informing ENTSO-E about the similar process in the USA.

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Marcel Cailliau	GDF Suez			<p>We thank the stakeholder for his constructive comments which are in line with the scope of the target methodology and roadmap documents consulted. The fundamental changes of power systems integrating high share of renewables require a multilateral cooperation with increased transparency from all parties. The purpose of the ENTSO-E target adequacy methodology under construction is the development of a sound methodology which will allow to perform regular pan European and regional diagnosis of the evolving European power system with respect to adequacy risks. Considering any modelling implies simplifications, ENTSO-E adequacy target modelling is to focus on the hourly power balance modelling.</p> <p>Although these studies will not encompass every potential issues of the future power system, ENTSO-E strongly believes that: i) This methodology will allow the development of a model able to capture all the key features and risks regarding adequacy for the Pan-EU power system. This is a main objective for ENTSO-E: ii) Together with other studies/activities performed by ENTSO-E, these analyses will help improving market design and network codes ultimately. In that sense, it is worth mentioning that ENTSO-E is aware of the impact of designing an optimal and economically feasible set of investments plans in generation portfolio. However this is outside of the scope of the methodology consulted.</p> <p>ENTSO-E is also aware that the choice of the approach will affect in a significantive manner the indicators which can be assessed through the simulation as well as the structure and the complexity of the input data. Hence, the selection between the two approaches will be further investigated in the next steps of the methodology improvement process, with focus on engagement of stakeholders through expert workshops and continuous consultations towards the final methodology.</p> <p>The goal of the ongoing process is to improve the ENTSO-E Pan-EU and regional adequacy assessment methodology toward a target methodology which will cope with each and all the new requirements set by the recent evolution of the European electrical system, while this process does not aim to set rules for the national assessments.</p> <p>It should be also pointed out that a Pan-EU and regional assessment needs to adopt some kinds of simplification in the modelisation approach in order to create a model able to catch all the key aspects of each and all the different areas under investigation, while a national methodology can take into account in a much more detailed way the national legal and regulatory framework, obviously losing its applicability to other countries. Hence, in line with the recommendation of the ECG subgroup on adequacy, ENTSOE believes that national methodologies should be maintained and eventually improved by the relative owners/stakeholders.</p> <p>Power plants of all fuel types can be subjected to must - run conditions as well as provide flexibility to the system, both due to technical or economic reasons. Furthermore the must run level of a plant can differ throughout the year due to heat supply for instance. The TSOs are assessing the level of must run generation based on technical and economic characteristics of the power system . For this evaluation TSOs are consulting power plant operators on their own constraints.</p> <p>The goal is to extend the level of detail, so the information of must run constraints will be defined for the different types of units within a given technology to increase the knowledge about flexibility of the system.</p>