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The European Union resource adequacy assessment as an instrument to support the development of renewable energy sources and the achievement of decarbonisation targets

Ocena wystarczalności zasobów Unii Europejskiej jako instrument wsparcia rozwoju odnawialnych źródeł energii i realizacji celów w zakresie dekarbonizacji

Abstract

Due to the growing mix of different types of dispersed generation, energy storage, energy efficiency and new promising technologies, in combination with traditional large scale fossil fuel electricity generation, ensuring reliability of electricity systems is increasingly challenging. The electricity demand is also in constant change because of the increased frequency of extreme weather events. In this regulatory environment, the European Union has proposed a single regulatory model to assess the security of the electricity system, in which a key role is played by long-term resource adequacy assessment. The aim of the article is to show this model, indicating what the policy implications are for the development of renewable energy sources and decarbonisation targets.

Keywords: European Union, resource adequacy, electricity market, decarbonisation

Streszczenie

W związku z rosnącym udziałem różnych rodzajów generacji rozproszonej, akumulatorów, efektywności energetycznej oraz nowych obiecujących technologii, w połączeniu z tradycyjnym wytwarzaniem energii elektrycznej z paliw kopalnych na dużą skalę, zapewnienie niezawodności systemów elektroenergetycznych staje się coraz większym wyzwaniem. Zapotrzebowanie na energię elektryczną również podlega ciągłym zmianom ze względu na zwiększoną częstotliwość występowania ekstremalnych zjawisk pogodowych. W tym środowisku regulacyjnym Unia Europejska zaproponowała jednolity model regulacyjny oceny bezpieczeństwa systemu elektroenergetycznego, w którym kluczową rolę odgrywa ocena długoterminowej wystarczalności zasobów. Celem artykułu jest przedstawienie tego modelu, wskazując jakie są jego implikacje z punktu widzenia tworzenia polityki regulacyjnej dla rozwoju odnawialnych źródeł energii i celów dekarbonizacji.

Słowa kluczowe: Unia Europejska, wystarczalność zasobów, rynek energii elektrycznej, dekarbonizacja

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Introduction

Electricity is a socially and economically sensitive commodity whose lack may cause social disruptions and affect political stability and economic development. Ensuring stable electricity supply is very often a matter of national interest, but achieving 100% security of electricity system can lead to unreasonable and excessive costs. The aim of regulators is to create an acceptable level of security at a socially acceptable price.

The European Union (EU) has developed its own regulatory model to ensure security of the electricity system, as it was noted that the methodologies employed by the Member States differ to a very large extent, especially while considering the role of renewable sources of energy and the role of interconnectors with other Member States.[1] Therefore, the new EU model consists of two regulatory models of assessment: the risk preparedness and the resource adequacy. Risk preparedness (operational security) is the ability of the electricity system to function, while preserving its integrity, and perform its functions despite the occurrence of sudden disturbances, such as short circuits or a sudden emergency shutdown of system components in the short or medium term. Resource adequacy is the long-term (10 years) system's ability to cover the aggregate capacity and energy demand of all consumers throughout the entire period under consideration, taking into account planned and unplanned outages of system components.

As the responsibility to determine the general structure of electricity supply is the Member States' right and obligation, they have freedom to set its own desired level of security of electricity supply. The UE facilitates the achievement of the above objectives through better alignment and coordination of joint actions, setting a commonly accepted standard. As part of this standard, the Methodology for the European resource adequacy assessment was adopted (The Agency for Cooperation of Energy Regulators decision 24/2020 of 2 October 2020), hereinafter "Methodology". Its analysis reveals key elements that may allow better ex ante analysis of the electricity system and thus better adaptation to changing market conditions.

Ensuring the reliability of electricity systems has been the subject of several scientific studies of mostly technical nature (Billinton & Allan, 1984; Mehrtash et al., 2012; Tina & Gagliano, 2011; Suchitra, et al., 2016; Mohammad Rozali et al., 2013). Historical publications showed the importance of large-scale generation sources which was quite natural in that market circumstances. The growing presence of renewable energy sources, energy storage, demand side response or energy efficiency require a change of regulatory approach, especially in a situation where decarbonisation objectives are of particular importance. Additionally, consumers have increasingly elected to self-source a portion of their energy supply which influences the model. Safety and stability of electricity supply may be also of varying importance to the consumers, as decarbonisation objectives and other environmental aims play an increasing role in their perception of the role of the electricity market (Billimoria & Poudineh, 2019; Simshauser & Tiernan, 2019; Riesz & Elliston, 2016; Simshauser, 2019).

The above conditions make it important to shape the model of resource adequacy in such a way that it flexibly adapts to changing market conditions and consumer preferences, considering technological progress. However, the transformation of the electricity system generates significant risks, resulting from inadequate coordination and adaptation of the changes introduced, which may generate significant risks as well as social and system costs.

The aim of this article is to describe the EU model, indicating what the policy implications are for the development of renewable energy sources. The article is divided into four parts. In the first one I will present the legal conditions for resource adequacy regulation within the EU. In the following four chapters I will describe the importance of four elements of this system, i.e. the market modelling scenarios, the regulation of capacity mechanisms, the role of economic assessment, and the importance of indices. The whole will then be summarised by indicating conclusions and policy implications.

Methodology

The considerations being the subject of the article belong to the dogmatic considerations of binding law. The aim of the considerations carried out is to answer the question what the policy implications of the applied policy are and what they are likely to mean for similar legal solutions in other jurisdictions. The basic research method used in the paper will be the formal-dogmatic method showing the provisions of EU law, doctrinal positions as well as case law in this area. I do not focus exclusively on the interpretation of norms based on specific interpretation procedures, but I refer to their values and objectives. In addition to the formal-dogmatic method, I will also apply the historical method, showing the broader context of the solutions proposed.

Legal basis of the EU resource adequacy assessment

The liberalisation of the EU electricity markets which started in the 1990s has led to a model based on competition between generation sources with different characteristics and cross-border exchange of electricity. Renewable energy sources have played a special role in the EU's energy transition since 2001. However, strong focus on their development has made it each time more difficult to finance large-scale generation capacity based on fossil fuels, irrespective of the fact that electricity production of verifiable predictability has been needed to give operational security and resource adequacy in this transitional period.[2] The capacity market has been the solution to this problem, given the level of stability and security of the electricity system (Petitet et al., 2017; De Vries & Heijen, 2008; Cramton et al., 2013; Joskow, 2008; Cramton & Stoft, 2008). The experience gained from the co-existence of capacity markets with the energy-only market led to changes in the EU legal acts in 2019 aimed at narrowing the use of instruments such as the capacity market to situations of absolute necessity, placing additional emphasis on building common preventive and operational mechanisms within the EU to ensure system security.

Chapter IV of the EU Regulation 2019/943[3] of 5 June 2019 on the internal market for electricity has created a long-term model to ensure the adequacy of the electricity system. Based on it the resource adequacy assessment is carried out at the EU level and supplemented by national assessments in the

Member States, but the EU assessment prevails. Additionally, the EU assessment is not the sum of assessments of individual Member States of the EU, but a uniform model of assessment which considers interactions between national markets and transborder electricity flows. This approach is better able to identify interconnections between Member States' electricity systems, including possible barriers.

According to Article 23(5) of this Regulation, the EU resource adequacy assessment must consider several factors. It encloses all the Member States. It is based on the appropriate central reference scenarios of projected demand and supply including an economic assessment of the likelihood of retirement, mothballing, new-build of generation assets and measures to reach energy efficiency and electricity interconnection targets and appropriate sensitivities on extreme weather events, hydrological conditions, wholesale prices, and carbon price developments. It contains separate scenarios reflecting the differing likelihoods of the occurrence of resource adequacy concerns with different types of capacity mechanisms. The EU resource adequacy assessment takes account of the contribution of all resources including existing and future possibilities for generation, energy storage, sectoral integration, demand response, import-export, and their contribution to flexible system operation. It encloses the possible impact of regulatory distortions resulting from the national legislation of the Member States or market failures as a part of the State aid process. It includes scenarios without existing or planned capacity mechanisms and with such mechanisms. It is based on a market model using the flow-based approach, using probabilistic calculations within the modelling tool covering the whole EU system. The analysis is based on two indices: EENS and LOLE. Considering the real network development, it identifies the sources of possible resource adequacy concerns (network or resource constraint). It ensures that the national characteristics of generation, demand flexibility and energy storage, the availability of primary resources and the level of interconnection are taken into consideration.

The Methodology for the European resource adequacy assessment of 2 October 2020 (ACER, 2020b) presents a model for resource adequacy assessment that details the above requirements. It creates a single Pan-European analytical tool based on the probabilistic method (Monte Carlo model), considering the data provided by the national transmission system operators (TSOs), delivered in a uniform way and aggregated by European Network of Transmission System Operators for Electricity (ENTSO-E), within which an adequacy assessment in 10-years' time horizon with an annual update is performed. This allows reflecting the actual state of development of the system, which is particularly important for renewable energy sources, flexibility of demand and supply, self-generation, energy storage, demand-side management, and energy efficiency, due to the shorter investment process and dynamic changes in the predictability of these technologies. Such an assessment is based on two basic scenarios of the possible development of the system with the possibility to create additional ones, if required. The scenarios of possible development of the electricity system consider the technical data of the system, assumed directions of its development, but also political expectations regarding the structure of fuel and energy use and economic analysis of the profitability of investment decisions, as the creation of the energy mix is still a domain (with some reservations) of national policies of the Member States which the EU model must take into account. The condition of the electricity system resulting from each of these scenarios will then be assessed given three indices (metrics): EENS, LOLE, and VOLL, being a common measure for assessing the adequacy of the electricity system.

The above shows a coherent model based on harmonised mechanisms for data collection and analysis and the creation of scenarios which analyse the adequacy of the system, considering, to a certain extent, the circumstances of individual Member States. This system takes into consideration the importance of different technologies within the electricity system. However, several issues play a crucial role for further development of renewable sources of energy. This is demonstrated when analysing the first report, published on 16 November 2021 on the adequacy of the EU electricity system, based on the Methodology (ENTSO-E, 2021).

It shows the importance of planning, coordination, and targeted intervention based on uniform rules when the EU electricity system faces an unprecedented transition toward decarbonisation. It shows in which elements of the system it faces adequacy challenges. This shows the particular importance of evaluation elements such as scenarios, the capacity market, economic evaluation as well as indices. The most important thing is to notice the role of increased renewable generation in combination with carbon pricing on the economics of thermal generation, putting the downward pressure on its capacity. This is particularly important in the Member States where cogeneration in these sources increases the available electricity capacity.

Market modelling scenarios

Predicting how the electricity system will behave on a given day or at a given hour over the next 10 years is difficult. The idea behind system adequacy is to predict it as reliably as possible. This is based on scenarios covering assumed electricity supply and demand in each year over the next 10 years covered, considering the existing and assumed state of the infrastructure and the market operating model.

The data used in the analysis, concerning demand, supply or the state of the infrastructure, will come from simulations carried out and policies published by the Member States. The main source of system data is national transmission system operators (TSOs). The way data are reported is harmonised and inaccuracies verified at EU level. Importantly, data from the Member States feed into the

EU-wide model where they are checked for completeness and consistency and consolidated for the modelling purpose. The second source of data is climate data, including temperature, irradiance, humidity, wind speeds, and their significance for electricity production from the sun, wind, and water. The creation of a uniform assessment model, based on the same range of data and methodologies for their verification, is a significant improvement. It allows better forecasting especially in terms of cross-border interactions. In addition, since the source data come from the Member States, this has the consequence of harmonising data collection methodologies, their aggregation, but also their use, including purposes other than the resource adequacy assessment model itself.

Based on such source data, annual scenarios of system operation for the next 10 years are created. According to Article 13(5) of Regulation 2019/943, there should be "central reference scenarios" and "separate scenarios (…) [with] capacity mechanisms". However, Article 3 of the Methodology limits the scenarios to two:

1) with capacity mechanisms already approved, i.e. including all the financial benefits for electricity producers and their obligations to those related to the capacity market;

2) without capacity market, i.e. not including the profits from the participation of generating units in the capacity market but understood as including already concluded contracts in the capacity market.

The above shows the still important role of capacity mechanisms in long-term modelling of the functioning of the EU electricity market (European Commission, 2016c, p. 8; THEMA Consulting Group, 2013, p. 16; González-Diaz, 2015).

These two basic scenarios may be supplemented by additional ones or the so-called "sensitivities with European relevance" which are based on other assumptions, including the elimination or reduction of the importance of capacity markets. They may be based on different assumptions related to input data and scenario uncertainties, i.e. different economic and policy trends relevant for resource adequacy, the impact of uncertainty in the deployment of grid investments, assessments of the robustness of the identified investments within the economic assessment, variations on fuel, wholesale prices and carbon prices, the consideration of extreme weather events and hydrological conditions, variations on cross-zonal capacities, the presence of indirect restrictions to wholesale price formation or variations with the capacity mechanism. In the first period a sensitivity analysis was conducted to assess the impact of an increased price of CO_2 or a decrease of the price cap on the capacity change in the system. It showed that several generation capacities based on lignite and hard coal can additionally be decommissioned due to these conditions (ENTSO-E, 2021, p. 37–39).

This provides an opportunity to analyse scenarios involving only renewable energy sources and the interaction between technologies based on distributed generation (including energy efficiency). Their application may allow answering the question of how the electricity system model should be built without a capacity market and without fossil fuel-based generation. The existence of the possibility to carry out such simulations based on unified reliable data may be an important element of support for these sources. It will make it possible to strengthen the argumentation towards a limited positive role of the capacity market in the long run or to indicate areas where such support may be needed, but clearly delimiting its limits.

However, the procedure which allows doing additional scenario or sensitivities analysis introduces significant restrictions. They require the approval of ENTSO-E and a public consultation in which the views of the Member States and "relevant stakeholders" shall be "duly taken into account". This can be a constraint on change and an additional difficulty for those seeking to argue for a faster elimination of fossil fuels from the EU energy mix.[4]

New parameters of the capacity mechanisms

In recent years, capacity mechanisms have been an important part of the EU electricity market (European Commission, 2016a; European Commission, 2016b; European Commission, 2014; European Commission, 2018).[5] They aimed to be a solution for securing investments in predictable generation capacities in the transitional period. There have been several ways to address this problem by complementing the energy-only market with other mechanisms such as scarcity pricing, forward capacity market, reliability options scheme or the insurer of last resort (Khalfallah, 2011; Billimoria & Poudineh, 2019). The proper shape of the model which guarantees availability of necessary capacity and its market price has been the real problem (Joskow & Tirole, 2007; Petitet et al., 2017; Kim & Kim, 2012). The experience gained in this area by the EU as well as the complaints lodged by stakeholders against the national capacity mechanisms accepted by the European Commission (Case T-793/14, Case T-167/19) have led to a change in the meaning of the capacity mechanisms.

Article 21 of Regulation 2019/943 introduces the capacity market mechanism as a necessary element to ensure long-term system stability. Its introduction requires additional justification on the part of the Member State concerned. It is treated as a "temporary" and "last resort" measure "to eliminate residual resource adequacy concerns" of duration no longer than 10 years with the possible phrase-out if new contracts are awarded in three consecutive years. The Member States are not eligible to introduce capacity mechanisms or award new contracts within the existing ones if the EU resource adequacy assessment has not identified a resource adequacy concern. Additionally, the strategic reserve as a measure which is less intrusive into the energy market has been given priority and only its insufficiency is the basis for other types of capacity mechanisms.

The capacity mechanism to be implemented must be non--discriminatory in relation to renewable energy sources, demand-side management, energy storage and other forms of system flexibility. The CO_2 emission limits have also been introduced for sources benefiting from capacity mechanism support (550 g of CO_2/kWh). The introduction of any capacity mechanism by a Member State is subject to the condition that the electricity resource adequacy assessment, prepared both at the national and the EU level, indicates that such a mechanism is necessary.

According to Article 25 of Regulation 2019/943, when applying capacity mechanisms the Member States shall have a reliability standard in place. A reliability standard shall indicate the necessary level of security of supply of the Member State in a transparent manner. It shall be based on the Methodology. The reliability standard shall be calculated using at least the VOLL and the cost of new entry over a given time frame and shall be expressed as EENS and LOLE. The aim of the reliability standard is to determine the amount of capacity to be in the capacity mechanisms.

The Methodology may be relevant for assessing the real impact of capacity markets on the long-term security of the electricity system in relation to the impact of renewable sources of energy. It may turn out that the perception of the positive impact of renewable energy sources or energy efficiency in this regard will increase, to the detriment of large generation sources that use fossil fuels and are supported by the capacity markets. Irrespective of the fact that the Member States have certain discretion in defining the parameters of the reliability standard which may theoretically set the desired reliability at such a level that it will demonstrate the need for capacity mechanisms to be in place, having the uniform model covering the whole EU may pose certain difficulties in this regard. It will benefit other sources of energy and other technologies giving them better level playing field.

This is evident in the first report assessing the adequacy of the EU system, where it is noted that the contribution of capacity mechanisms to ensuring system adequacy is still important as adequacy risks appear all around EU in a scenario without the capacity mechanisms. It however does not specify in which technologies or geographic locations within a region the capacity mechanisms should be included (ENTSO-E, 2021, p. 16–17).

The role of economic impact assessment

According to Article 20(1)–(2) of Regulation 2019/943, the purpose of Methodology is to identify resource adequacy concerns in the Member States, based on regulatory distortions or market failures. When addressing resource adequacy concerns, the Member States consider the development of renewable sources of energy, demand-side response, energy storage, electric vehicles, flexible demand and supply as well as the environmental impact of electricity sector.

Economic assessment analyses the economic determinants of the contribution of these technologies and generation sources to the security of the electricity system, recognising that economic justification is central to their decisions in this regard. It serves as a guideline for medium and long-term measures to increase resource adequacy and reduce uncertainty. An economic assessment is an important element of adequacy assessment as Article 23(5)(b) of Regulation 2019/943 requires its inclusion in all the reference scenarios.

Theoretical models for such assessment are increasingly complex due to the existence of a wider range of solutions within electricity systems (Bagen, 2005; Gross, et al., 2006; Küfeoglu & Lehtonen, 2015). The EU model is based on one of two methods: assessment of the economic viability of capacity resources or minimisation of overall system costs. The first one considers revenues and costs of each capacity resource in each year and treats it as a basis for decision of the capacity provider related to its activity in the market. The sum of such activities of all the stakeholders is the basis for scenarios related to available capacity. The second one simplifies it by combining all the costs within the market as entry and exit decisions as assessed together for all the capacity resources. The second option assumes that perfect competition between capacity resources exists and is the basis for their decisions.

The models consider the economic valuation of variables such as supply, demand, availability of generation, reservoir and storage, availability of interconnectors and additional conditions that may be relevant but whose impact can only be estimated. The use of economic valuation as part of a resource adequacy can significantly affect the reliability of the model as it allows to understand the costs, risks and trade-offs of different options to secure the electricity system. This allows typical market behaviour based on economic calculation to be modelled, showing its real impact. It determines more cost-effective solutions for the determined level of reliability of the system. The use of source data on system operation, as well as wholesale market data or weather and climate data, brings the model closer to adequacy. This provides an important impetus for better addressing the importance of renewable energy sources or energy efficiency in the model. It can better quantify the resource adequacy value of different types of technologies.

An important element of EU resource adequacy was the creation of a single economic evaluation mechanism. Its purpose was to seek to understand the economic forces impacting capacity in EU. The report showed how the availability of generation capacity changes when this factor is considered (ENTSO-E, 2021, p. 4–26). This can be an important factor in the development of EU policies to encourage the availability of capacities that meet decarbonisation objectives.

The relevance of indices

The resource adequacy is impacted by many random and non-controllable variables: unexpected outages of generation or transmission facilities, availability of primary resources, mainly in the case of intermittent RES, transmission capacity limits and availability, variability of the load, support (or lack of support) from neighbouring countries. This impact requires forecasting which is executed using a few methods (Tomasson & Soder, 2018; Singh & Kim, 1988). The EU chose the probabilistic approach based on the Monte Carlo method. Its outcome is data which can be presented using several indices. Such unified approach within each Member State and the whole EU allows for a comparable assessment of different scenarios and comparable results.

According to Article 23 of the Regulation 2019/943, at least two indices — EENS (Expected Energy Not Served) (ENTSO-E, 2017) and LOLE (Loss of Load Expectation) — will be used to assess the long-term system adequacy. Methodology adds one additional — VOLL (value of lost load) (ACER, 2020a).

EENS is the volume of electricity that will not be delivered to customers which shows depth and probability of deficits. This lack may come from the lack of power or interconnection, or the overloading of the network. This indice does not show the outcome to be achieved by planned management of supply (direct participation of the load in the dispatching market) and demand (like demand-side management).

LOLE is defined as the expected number of hours or days of uncovered demand which indicates the probability of generating units not to meet the required load demand. There are differences how many hours or days a year is a limit, like 10 h/y or 0.0274h/day. It does not show the severity of its occurrence as it assesses in the same way a blackout affecting the entire electricity system and minor load curtailments due to the impossibility of covering high peak loads. It can be calculated from the probabilistic approach.

VOLL is an estimation of the maximum electricity price that the customer is willing to pay to avoid outage (EUR/MWh). It shows how much the lack of electricity is worth to different consumers in terms of the social and economic valuation of electricity not supplied. The obstacle in the use of VOLL resides in difficulties of obtaining its proper value, which may vary by consumer, country or day and time, but the EU proposed a uniform methodology in this regard. In liberalised and efficient electricity markets, VOLL should be equal to the wholesale peak price of electricity, providing the basis for investment decisions in the electricity market.

The reliability of the electricity system is not perceived as the only aim from the social perspective. A certain level of risk in this area can be socially acceptable. However, other objectives, such as decarbonisation, are becoming increasingly important. The EU assessment of the adequacy of the electricity system in the long term naturally takes these issues into account. While it can be accepted that short-term reliability assessment (risk-preparedness) is more concerned with the technical aspects of the electricity system, the long-term assessment considers such variables. The EU regulation requires deeper inclusion of decarbonisation objectives in any EU policies. The practical aspect is to show the resource adequacy scenarios (central reference or additional ones) with CO_2 per MWh indice. This would give a clear picture of how carbonised the electricity system is, and therefore the direction in which long-term measures to ensure the adequacy of the electricity system should go, considering decarbonisation objectives.

Conclusions and policy implications

The Methodology proposes a certain model for assessing resource adequacy at the EU level, which considers the primary role of the sole Member States to address this issue. Historically, in the absence of such assessment and different approaches of the Member States assessing adequacy in their national electricity systems, unified rules proposed by the EU can give better understanding of the whole system, its internal implications as well as the value of trade-offs. The EU model is in line with the objectives and the EU internal electricity market, which means the development of more flexible and sustainable low carbon generation, more flexible demand, as well as decarbonisation of the electricity system, by enabling the integration of electricity from renewable energy sources and by providing incentives for energy efficiency. It seems to make the EU model prevail the one executed by the Member States creating checks and balances in this regard.

The main justification for supporting fossil fuel-based generation sources from capacity mechanisms was security, defined quite independently by each Member State. Creating a single standard based on scenarios, economic justification and indices could give a level playing field for different technologies and sources, benefiting above all renewables and demand management. The above, with additional restrictions on the use of new capacity mechanisms, may give new arguments to indicate the importance of technologies other than large fossil fuel-based generation.

The first ENTSO-E report showed how the adequacy of the EU electricity system is influenced by renewables, demand-side response and other technological solutions, together with carbon pricing in the 10-year perspective. It showed, based on a uniform methodology, how the system should be changed in the coming years. It gives an important contribution to the discussion on the direction and way of regulating the electricity market. The model is dynamic and the procedure for changing it is quite flexible, which, given the positive attitude towards energy transition based on renewable energy sources, may give an additional impetus towards their development.

Notes/Przypisy

[1] Council of European Energy Regulators (CEER) Report ref. C13-ESS-32-03 of 3rd March 2014: Assessment of electricity generation adequacy in European countries, p. 14.

[2] The missing money problem has been so far quite extensively analysed in the literature; see for example: Joskow & Tirole, 2007; Joskow, 2008; Cramton & Stoft, 2008; Fabra et al., 2011; Simshauser, 2019.

[3] Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (OJ L 158, 14.6.2019, p. 54–124).

[4] As a comparison, in the risk preparedness analysis (spot, short and medium-term disruptions of the electricity system), the EU has foreseen the preparation of at least 8 different scenarios indicating their parameters, see: Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC (OJ L 158, 14.6.2019, p. 1); The national Greece adequacy assessment consists of 12 scenarios based on different generation sources and consumption management patterns with decarbonisation objectives at stake, see: Simoglou et al., 2014.

[5] See also: case T-793/14, Tempus Energy Ltd and Tempus Energy Technology Ltd vs. European Commission, ECLI:EU:T:2018:790; case T-167/19 Tempus Energy Germany and T Energy Sweden vs. European Commission.

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