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CAPACITY MECHANISMS IN THE EU: NATIONALIZING ENERGY SECURITY?

Jekaterina Grigorjeva | *research fellow at the Jacques Delors Institut – Berlin*

SUMMARY

Since the introduction of the first liberalization directive, the European electricity market has been undergoing a process of continuous transformation which has put the electricity systems of the Member States under condition of permanent shock. The incompatibility of the still persisting functioning principles of the electricity markets with the changed market reality have resulted in serious market failures which negatively affect investment climate and therefore pose a risk towards energy security in the EU.

„EUROPEANS HAD TO RETHINK THEIR APPROACH TOWARDS SECURITY OF SUPPLY FROM THE EUROPEAN PERSPECTIVE"

Being a sensitive issue which tends to be politicized very easily, the risk of deteriorating energy security has been addressed by the Member States mainly on the national level with the capacity mechanisms being one of the widespread solutions. The inconsistent approach by the Member States did not trigger any active response from the European Commission until recently, in light of the current geopolitical tensions, Europeans had to reconsider their energy dependency on non-EU suppliers and therefore rethink their approach towards security of supply from the European perspective. Despite its tremendous relevance the European Energy Union Package might represent a too slow response in this regard, as the national initiatives have been already unilaterally set in motion.

In order to answer the question whether capacity mechanisms represent a cure of the energy-only market or an impediment towards the IEM integration, this policy paper draws attention towards the potential impacts of the national interventions on the European level and comes to the following conclusions:

- Only compatible capacity mechanism designs with explicit participation models will allow for an effective 'co-existence' of the national capacity mechanisms and the European internal energy market.
- European Energy Union is about optimization of resources and infrastructure on the European level. The realization of the need of co-operation in addressing the current problems is still missing among the Member States.
- Protection of the old national equilibrium will not solve the issues faced by the Member States but only postpone the progress towards a more sustainable European energy sector.

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INTRODUCTION: SECURITY OF SUPPLY AS A GROWING CONCERN IN THE EU

On 25 February 2015, the European Commission presented its Energy Union Package which illustrated a vision for the future of the European energy sector – "an integrated continent-wide energy system where energy flows freely across the border". Despite the fact that the idea of a European energy union is anything but new, it has received particular attention under the Juncker's Commission as geopolitical tensions made Europeans reconsider their energy-dependency on non-EU suppliers. However, besides the overreliance on energy imports it is the functionality of the existing electricity market design which is putting at risk energy security in many Member States. On both dimensions the Commission wants to address energy security in Europe by setting in motion the creation of a European energy union.

> "IT IS THE FUNCTIONALITY OF THE EXISTING ELECTRICITY MARKET DESIGN WHICH IS PUTTING AT RISK ENERGY SECURITY"

Being ambitious in its objectives Commission's reaction might be coming too late. The risk of deteriorating energy security due to the decreasing functionality of the electricity market design has been recognized by the Member States long ago. The lack of a common European framework on security of electricity supply has allowed them addressing this problem with national initiatives disregarding the benefits of the internal energy market and provisions of Article 194 of the TFEU which clearly states that security of supply is also an EU competence. Therefore, while the authorities of the Member States express their general commitment towards the objectives of the internal market completion, they implement national strategies when it comes to such sensitive issues as domestic security of supply. In particular, there has been much debate about capacity remuneration mechanisms. Although they represent just one out of several ways of enhancing the existing electricity market, they have attracted more attention than alternative solutions and have already been put into practice in several Member States. The unilateral implementation of the capacity mechanisms on the national level represents a considerable risk towards further integration of the internal energy market by supporting incumbents and protecting the old paradigm in the energy system.

The objective of this Policy paper is to illustrate how national decisions, in particular the implementation of capacity mechanisms, can obstruct the benefits of the European internal energy market and even represent an obstacle towards its completion. First, this Policy paper will outline some general functioning principles of the existing electricity market in order to later define in the following section the prevailing market failures which distort the economically efficient functioning of the energy system. It will then particularly focus on the capacity mechanism as a means to correct these market failures outlining possible opportunities and risks associated with this instrument. In the last part of the Policy paper some alternative solutions of improving the existing electricity market design will be briefly discussed. The main message of this Policy paper is that in some cases capacity mechanisms could potentially improve the functionality of the existing electricity market design, but only if implemented in coordinated manner across the EU. In particular, a consistent approach to cross-border participation is crucial if the benefits of the internal energy market are to be realized in the future.

1. How does the electricity market operate?

The existence of the prevailing market failures which cause national interventions in the electricity market can be only explained, if the functioning principles, under which the system is assumed to operate flawlessly, are understood. There are certain characteristics and regulatory constraints that are specific to the energy sector only and which differentiate the electricity market from other market-based solutions. The following section will outline some of the crucial functioning principles of the electricity market.

1.1. Electricity trading

The electricity market, also known as the energy-only-market (EOM), compensates market actors only for the energy provided. The generation capacity under the EOM conditions does not represent a separate product and is not being explicitly rewarded. The electricity is traded either on the energy exchange (EEX in Leipzig and EPEX SPOT in Paris) or through direct supply contracts with electricity producers known as over the counter (OTC) transactions.

"CROSS-BORDER ELECTRICITY TRADING INCREASES THE LIQUIDITY OF THE ENERGY SYSTEM"

The market coupling[1] process has allowed the EU to bring electricity trading to the European level. The launch of market coupling in Central West Europe (Benelux, France, Germany) in 2010 was a first major step towards harmonization of the European electricity market, followed by the introduction of price coupling in North Western Europe (Central West Europe, Great Britain, the Nordics, the Baltics) in 2014[2]. These market integration initiatives have enabled intensification of cross-border trade between the Member States. According to the EU electricity market analysis by the European Commission[3], in 2014 both cross-border flow of electricity and traded volume of power on the EU markets have not only been growing, but they have also outnumbered the increase in electricity consumption. These positive developments have been possible because cross-border electricity trading increases the liquidity of the energy system as it allows for demand and supply synchronization across a larger geographical area.

Nevertheless, the synchronization process is limited by the technical characteristics of the European electricity market. The physical flow of electricity between the countries occurs through cross-border interconnectors which are currently not sufficiently given in Europe. Their availability and capacity puts a constraint on cross-border trade, as only a certain amount of electricity can be transmitted from a surplus country to its neighbour which experiences a scarcity situation.

1.2. Price formation

The theoretical model of the EOM assumes that the market actors operate under conditions of perfect competition. The electricity price should be determined through the market equilibrium between demand and supply, with no restrictions in form of subsidies, price caps, or other regulatory interventions. Free price formation is thus crucial for the functionality of the electricity market as it not only serves as a signal for both suppliers and consumers to adjust their production and consumption patterns, but it also allows for refinancing opportunities for peak units as it objectively reflects the real price of electricity in scarcity situations.

However, things look differently in the real life, and conditions of perfect competition are hardly to be found in any electricity markets. Firstly, extreme peak prices are often politically unacceptable as it is difficult to

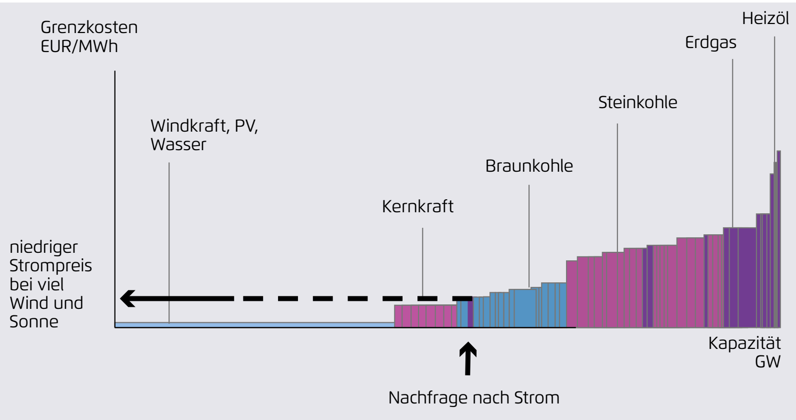
1. Market coupling allows directing flows of electricity to the country where prices are highest (Source: ENTSO-E).
2. EPEX SPOT, "Market Coupling", 2015.
3. European Commission, DG Energy, *Quarterly Report on European Electricity Markets*, 2015.

communicate their occurrence to the public. In order to avoid public concerns regulators set price caps that keep the price from rising beyond a certain point. Secondly, due to ambitious environmental provisions and targets for the expansion of the renewable energy sector the renewables have yet to be fully integrated into the European electricity market[4]. Therefore, in reality the electricity markets are far from being free from government intervention, and despite the fact that the price is formed through the equilibrium of supply and demand on the energy exchange, it does not objectively reflect the real market situation.

The electricity trading on the energy exchange underlies the merit-order-principle. The merit order means that the bids made by the electricity providers will determine the order in which they enter into electricity trading. Generation facilities with the lowest marginal costs (and so the lowest bid) will consequently be the first ones in line to meet demand[5]. The number of facilities involved in trading will increase up to the point where electricity demand is fully satisfied. The final exchange price is hence equal to the marginal costs of the most expensive power plant in use (marginal power plant).

Based on the unit marginal costs, the cheapest electricity comes from solar and wind, followed by hydropower, nuclear, lignite, and coal. The most expensive electricity is generated by gas power plants, which as a result are only dispatched during the peak load hours. Conversely, renewable energy sources enjoy a favourable position with marginal costs equal to zero. Even without a priority grid access, which was granted to the renewable energy providers in many European countries, their entry into the trading is technically guaranteed by the merit-order-principle as illustrated in Graph 1.

GRAPH 1 ► Logic behind the merit-order-principle



Key

Niedriger Strompreis bei viel Wind und Sonne = low electricity price due to large amount of wind and sun

Grenzkosten = marginal costs

Windkraft, PV, Wasser = renewables

Kernkraft = nuclear

Braunkohle = lignite

Steinkohle = hard coal

Erdgas = gas

Heizöl = oil fuel

Kapazität = capacity

Nachfrage nach Strom = electricity demand

Source: own illustration based on Agora Energiewende, *12 Thesen zur Energiewende*, November 2012.

1.3. Physical equilibrium

The demand-supply trading equilibrium on the energy exchange does not imply the physical equilibrium of the energy system. The electricity trading represents only the commercial side of the entire system which requires coordination and physical balancing in order to secure reliable energy supply and system security.

The transmission system operators (TSOs) are responsible for this physical equilibrium. The TSOs are entities operating independently from the other electricity market players. They provide grid access to generating companies, traders, suppliers and distributors, and guarantee safe operation and maintenance of the system[6]. If planned electricity consumption, i.e. the market result, is not equal to the actual demand, the TSOs ensure the grid stability through provision of balancing capacity which offsets unforeseen deviations caused

4. Priority grid access and different types of green subsidies are still being implemented across the EU.
5. Czakainski, Lamprecht, Rosen, Energiehandel und Energiemärkte: Eine Einführung, Essen: etv Energieverlag, 2011.
6. ENTSO-E, "ENTSO-E Member Companies", March 2015.

by unexpected weather conditions, technical deficiencies of the power plants, or short-term changes in electricity demand.

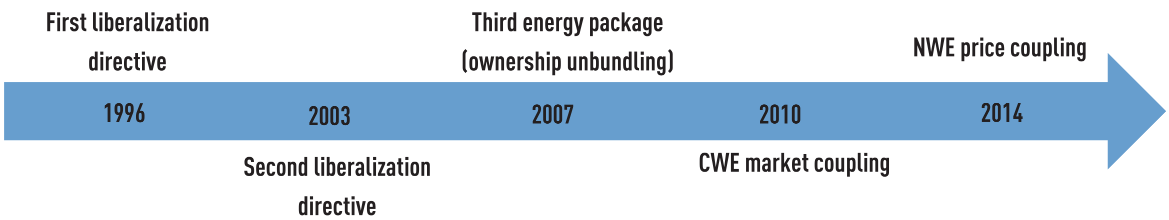
> „CONVENTIONAL POWER PLANTS ARE STILL INDISPENSABLE IN ENSURING SYSTEM RELIABILITY"

In context of the European electricity market TSO's are faced with a challenging task. While the share of renewable energy in the energy mix is steadily growing, tasks such as provision of balancing capacity or controlling power cannot be fulfilled by the renewable energy facilities due to the existing technical constraints (with the exception of some pilot projects). Therefore, while general demand for conventional energy is decreasing, conventional power plants are still indispensable in ensuring system reliability, making the ability to cost-efficiently implement conventional energy central to the functionality of the electricity market. Despite the fact that the interconnectivity of the European electricity market provides an opportunity for a more efficient use of conventional resources on the European level, the European TSO's are not allowed to coordinate the cross-border electricity flows to optimize common resources leaving the potential of the internal energy market untapped.

2. What are the failures of the electricity market?

With the adoption of the first liberalization directive for electricity in 1996 the European energy system has entered a period of a still ongoing transformation. The liberalization of the European energy markets accompanied by a growing share of renewables resulted in increased competition in the energy sector, leading to lower wholesale energy prices and decreased profit margins for the suppliers. At the same time, the market coupling initiatives have been bringing the European electricity markets together, expanding the opportunities for electricity cross-border trade in Europe. Graph 2 illustrates a timeline of some of the most crucial developments in the process of the described transformation.

GRAPH 2 ► Electricity market liberalization process



Source: own illustration based on the information provided on the EU Commission and EEX official websites.

The interaction of these developments created a new system set-up, which seems to be no longer compatible with the electricity market as we know it[7]. There is an increased concern among the European policy makers that the existing market design fails to deliver on crucial policy objectives such as security of supply. The following section will examine some of the widely discussed electricity market flaws and look into the causes behind them.

2.1. Negative prices and inefficient price signalling

Electricity prices, as any other prices in the open market, serve as important signals which reflect market condition and provide guidance for consumer and supplier behaviour. For example, if prices fall, electricity

7. For more information please see Sami Andoura and Jean-Arnold Vinois, Foreword by Jacques Delors, „From the European Energy Community to the Energy Union – A new Policy Proposal", *Studies & Reports No. 107*, Jacques Delors Institute, January 2015.

generators are expected to reduce their output. Yet, in case of the electricity market quick adjustments are not always possible due to the rigidity of the existing energy system. On the one hand it is caused by the technical inflexibility of power generators that very often cannot be shut down and restated in a quick and cost-efficient manner, as well as by implicit and explicit subsidies which eliminate incentives for a demand-oriented production. At the same time, despite the interconnectivity of the European electricity market the system as a whole lacks liquidity as very often overcapacities generated in one country cannot be transmitted to a country which is experiencing a scarcity situation.

In context of the electricity trading the rigidity of supply implies that output will not always be reduced even if prices fall below zero[8]. Since 2008 negative prices have become increasingly common on the European energy exchange. For instance, in France during the weekend of 15-16 June 2013 the spot prices fell down to -€200/MWh[9]. Graph 3 illustrates another example – development of the negative prices in Germany on 11 May 2014.

GRAPH 3 ► 11.05.2014 negative prices in Germany

Source: Craig, M., "German Power Prices Negative over Weekend", Energiewende Blog, May 2014.

> "THERE IS CERTAINLY AN INEFFICIENT ALLOCATION OF RESOURCES"

In practical terms, negative prices imply that consumers are getting paid by producers for consuming electricity, which certainly indicates uneconomical, even wasteful production, and inefficient allocation of resources. Besides the lack of liquidity across the European electricity market mentioned above, it is the still not accomplished market integration of the renewable energy which creates distortions. As long as different types of subsidies benefiting renewable energy persist, producers will remain unwilling to react and adjust production patterns when necessary because their profits are detached from the real market situation. In other words, current conditions do not provide renewable energy producers with sufficient incentives to invest in storage facilities which would enable more flexible production of renewable energy. Taking into account the steadily rising share of volatile renewable energy in the European energy mix, flexibility of the energy system becomes crucial.

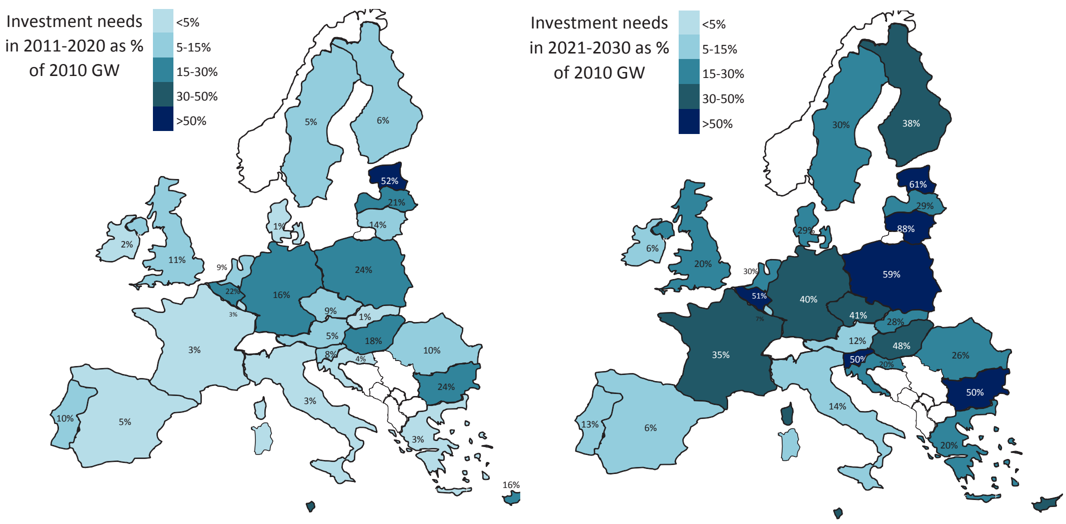
Therefore we can conclude that electricity price distortions do not represent a structural flaw of the existing design per se but rather a result of on the one hand regulatory interventions, which despite its negative impacts were certainly required in order to strengthen the position of renewables in the market. On the other hand, it is a reflection of the unwillingness of the Member States to improve energy co-operations. Intensified cross-border flows would prevent renewables from destroying their own price and allow for a more economically efficient allocation of resources across the borders.

8. Negative prices were first introduced in 2008 on the German/Austrian Day-Ahead and 2007 in the German Intraday market. In 2010, they were also introduced on the French Day-Ahead and Intraday markets (EPEX SPOT, Negative prices Q&A, 2015).
9. Benedettini S., Stagnaro C., Energypost, "The case for allowing negative electricity prices", May 2014.

2.2. Lack of investment incentives

In light of the ageing infrastructure in Europe, the envisaged nuclear phase out in Germany as well as the environmental requirements which will lead to closure of some old coal-fired power plants across the EU, timely investments become crucial for future system reliability. Considering the investment requirements illustrated in Graph 4, the inability of the electricity market to timely generate investment incentives represents a risk for the security of supply in Europe not only in the long-run, but already in the years to come. It has been widely argued by various interest groups that the energy-only markets have lost this ability.

GRAPH 4 ► Investment requirements short and long-term



Source: Study for DG Energy, *Capacity mechanisms in individual markets within the IEM.*

> "THE REASON FOR THE ADVERSE IMPACT OF LOW WHOLESALE PRICES LIES IN THE NATURE OF THE IMPERFECT COMPETITION IN THE ENERGY SECTOR"

Both low wholesale prices and rare dispatchment times of conventional power plants *(see merit-order-effect on page 5)*, in particular the gas power plants[10], contributed to the growing investor uncertainty and even speculations about the closure of some modern gas power plants[11]. Therefore, low wholesale prices and overcapacities in the short-run might not provide for the right investment indicators in the long-run, resulting in deteriorating energy security as generation capacity gets scarce over time. The reason for the adverse impact of low wholesale prices lies in the nature of the imperfect competition in the energy sector. Usually it is dominated by a few strategic firms who provide for some degree of market power and hence act strategically. Because these "strategic firms"[12] chose profit maximizing investment levels, more competitive spot market prices will usually lead to a decrease in their investment levels[13].

Consequently, if prices remain low investments in peak load units such as gas power plants become unattractive for profit-seeking investors, as spot and day-ahead prices do not reflect future investment needs but only the current market condition. Therefore, moving away from a centralized system dominated by a few market players towards a more competitive and decentralized set up revealed serious imperfections of the existing market design, in particular the electricity trading. This is mainly the reason why capacity remuneration

10. Despite their negative environmental impact coal power plants are still widely used due to the low production cost resulting in cheap electricity. Coal units do not experience any difficulties in generating profit as they enter the trading before gas power plants.
11. Tagesschau, "Betreiber wollen Irsching abschalten", 30.03.2015
12. Definition used by Grimm, V., Zoettl G., "Investment Incentives and Electricity Spot Market Competition", *Journal of Economics and Management Strategy*, Volume 22, Number 4, 832–851, Winter 2013.
13. For more information please see *ibid.*

mechanisms have recently received so much attention in the public debate and have been favoured by utilities, as they offer their participants remuneration for the mere availability of generation capacity and thus create a stable investment climate. Opinions on whether the intervention of such kind is really required differ among the experts in the energy field. Yet, if the objective is to avoid additional regulatory interventions and continue relying on the market forces, the electricity market design is in need of an urgent adjustment which would reflect the still ongoing transformation of the energy system.

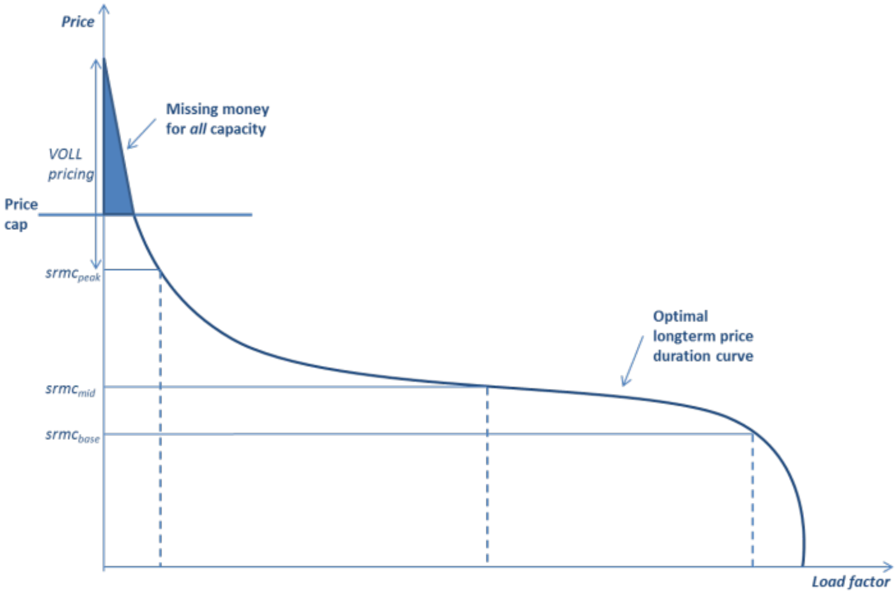
2.3. Missing money problem

Due to the centrality of electricity supply to the various spheres of life, both on private as well as national level, energy scarcity is strongly undesirable. Given that the energy sector is not perfectly competitive, electricity market actors become subjects to regulatory scrutiny as they provide for power to control supply during scarcity situations. Regulatory responses aimed at mitigating the abuse of such powerful market position usually come in form of (implicit or explicit) price caps.

> "ERRORS IN CHOICE OF THE PRICE CAP CAN HAVE DETRIMENTAL CONSEQUENCES ON INVESTMENT AND AVERAGE PRICES"

However, it comes to serious difficulties when the appropriate level of a price cap has to be defined. Studies have shown that errors in choice of the price cap can have detrimental consequences on investment and average prices[14]. This specifically applies for peaking units, or in other words power plants that come last into trading under the merit-order principle, as they earn most of their revenues in periods of high prices. If the price cap is set too low, or there are some other interventions or exogenous influences on the price formation which do not allow for the emergence of peak prices, the peaking units do not make enough profit to cover their costs. The phenomenon known as the missing money problem is illustrated in Graph 5.

GRAPH 5 ► Missing Money Problem



Source: Study for DG Energy, Capacity mechanisms in individual markets within the IEM.

The easiest solution to this problem might seem to leave the markets alone and allow for free price formation. However, as already mentioned before, the electricity market is not perfectly competitive. This makes it extremely difficult for regulatory authorities to differentiate between the peak prices which occur due to

14. Roques, F.A., Savva N.S., "Price Cap Regulation and Investment Incentives under Demand Uncertainty", Judge Business School, University of Cambridge. 2006.

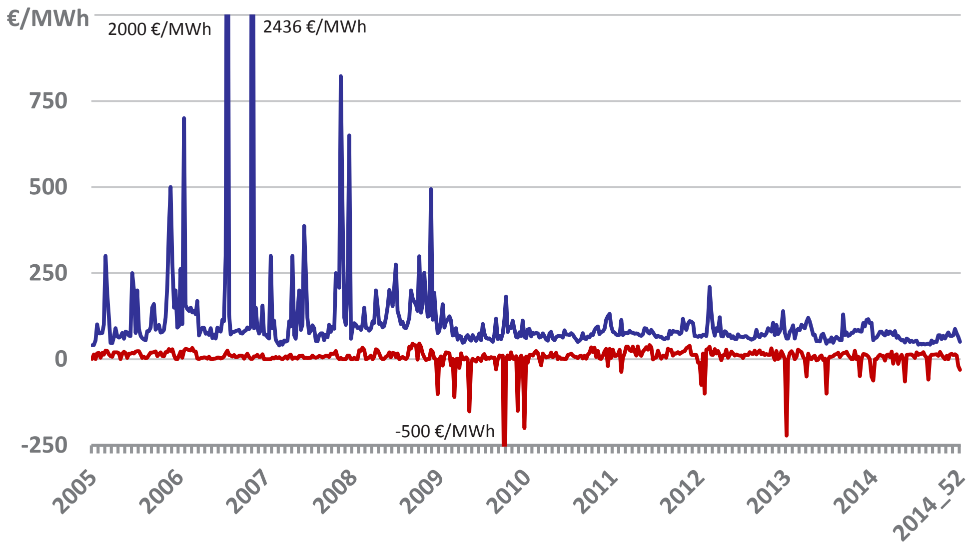
real shortage situations from the actual market power abuse. The fact that extreme price peaks are politically unacceptable contributes to a tendency among authorities to implement some kind of regulation. Therefore, the existing electricity market design provides for a trade-off between fair competition and profit-making opportunities for the peak load units.

> „THE PEAK PRICES HAVE BECOME A RARITY SINCE 2009"

Graph 6 demonstrates development of the day-ahead prices in the German market zone from 2001 till 2014. The peak prices have become a rarity since 2009, eliminating profit opportunities for the peak load units, which despite the increased share of the renewable energy in German energy mix remain relevant for the system reliability. Yet, it can be clearly seen in graph 6 that the prices were far from peaks and often entered the negative range in the given period, meaning that the energy system did not face any scarcity situations. Therefore, it seems that the inability of the German conventional energy providers to generate profits is unrelated to price caps. It rather looks like they are missing the profits they used to make before the energy system transformation was set in motion.

Certainly the free price formation is vital for the flawless functioning of the electricity market, but the claims about the missing money should be carefully examined when they are made by the incumbent industry.

GRAPH 6 ► **Weekly day-ahead maximum and minimum prices**



Source: Johannes Mayer, Fraunhofer ISE; Data: EPEX-SPOT / EEX.

3. Options for improving the electricity market design

The growing perception of a deteriorating level of security of supply resulting from the market distortions outlined in the previous section made Member States implement energy policies aimed at stimulating investment and improving energy security, with capacity mechanisms being one of the solutions. As energy security is still perceived as a highly sensitive national issue, these initiatives have been marked by a national character, resulting in an uncoordinated approach among EU Member States.

The following section will present some of the options for the improvement of the existing electricity market design focusing on the capacity mechanisms. The objective is not only to look at the functionality of these instruments on the national level, but evaluate their impact on the internal energy market (IEM).

3.1. Capacity mechanisms

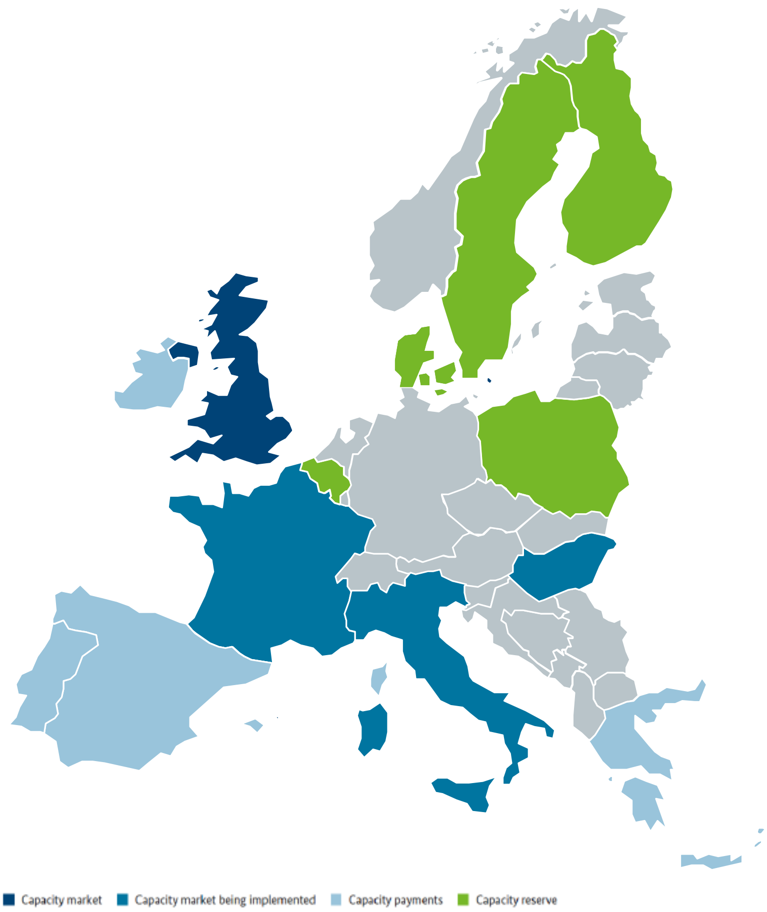
> „THE REMUNERATION OF CAPACITY SHOULD PROVIDE A STIMULUS FOR INVESTMENTS"

In the existing energy-only market, the provision of generation capacity is considered to be an externality as users benefit from the available as well as from the investments in new capacity, while energy providers cannot explicitly charge for it[15]. This makes the long-term security of supply dependent on the ability of the electricity market to create adequate investment incentives, which, as outlined in the section on electricity market flaws, are currently insufficient. Capacity mechanisms tackle this issue by providing explicit compensation for the mere availability of capacity in addition to revenues obtained in the energy-only market[16]. The remuneration of capacity should provide a stimulus for investments, as by substituting profits that could otherwise be made during the periods of peak prices, it allows peaking units to recover their costs. Hence a capacity mechanism creates a stable investment climate.

Despite the fact that capacity mechanisms represent a relatively new instrument, to date a large number of the EU members have already implemented a certain type of a capacity remuneration policy or are considering doing so as illustrated in Graph 7.[17] However, there is neither a standard design of the capacity mechanisms nor a common trading platform for the capacity as a product in Europe. The functioning principles of the capacity mechanisms already implemented or proposed by the member states differ considerably from one country to another, as they are designed on a case-by-case scenario in order to achieve the best fit to the local requirements of a particular national electricity market. The variety of approaches makes the classification of the capacity mechanisms rather complicated.

15. For more information see Cepeda, M., Finon, D., "Generation Capacity Adequacy in interdependent Electricity Markets", Energy Policy 39, 3128-3143, June 2011
16. Dr. Tennbakk, B. (ed.), *Capacity Mechanisms in Individual Markets within the IEM*, Study prepared for DG Energy, June 2013.
17. ACER, Capacity Remuneration Mechanisms and the Internal Market for Electricity, July 2013.

GRAPH 7 ► Status of capacity mechanisms in Europe in 2014



Source: BMWi

> "A LARGE NUMBER OF THE EU MEMBERS HAVE ALREADY IMPLEMENTED A CERTAIN TYPE OF A CAPACITY REMUNERATION POLICY OR ARE CONSIDERING DOING SO"

In general, capacity mechanisms can be divided into Capacity Payments, Strategic Reserve, and Capacity Markets.[18] The former two are relatively simple instruments which entail either fixed compensation for the providers (price-based solution), or fixed long-term contracting of reserve capacity (volume-based solution). Both Capacity Payments and Strategic Reserves do not imply the creation of a separate market besides the energy-only market, but rather provide an additional instrument within the existing market environment. In contrast to this, the implementation of a Capacity Market requires creation of a new market, where capacity as a product is traded in form of certificates that become an integral part of competition. The price of certificates should thereof solve as an indicator of scarcity on the capacity market. Depending on whether the capacity adequacy level is determined centrally by an official authority or freely by the market forces, capacity markets can either be centralized or decentralized.

If compared with Capacity Payments and Strategic Reserves, Capacity Markets probably represent the most complex instrument. To date only the UK has a functioning capacity market within the EU. In September 2014 France has confirmed its decision to implement a capacity market by 2016[19]. There is also an ongoing controversial debate in Germany, whether a capacity market is required for a long-term provision of security of supply, especially in light of the nuclear phase out in 2022. While German conventional energy industry is favouring implementation of a decentralized electricity market[20], the Federal Ministry for Economic Affairs

18. Classification proposed by ACER. Note that some studies use different classification.
19. RTE, *French Capacity Market. Report Accompanying the Draft Rules*, April 2014.
20. BDEW, *Design of a Decentralised Capacity Market. Position Paper*, September 2013.

and Energy in its recent discussion paper (Green Book) expresses a highly sceptical view towards capacity adequacy policies and pledges for electricity market reforms and a possible implementation of a Strategic Reserve instead (Electricity Market 2.0)[21].

3.1.1. What are the potential failures of the capacity mechanisms?

As capacity mechanisms have been implemented only recently, little empirical evidence exists on their functioning flaws and potential failures. For that reason the discussion about their possible negative effects is still a very theoretical one and is often merely based on speculations.

Yet it is quite straightforward and agreed among experts that the remuneration of capacity may impose additional costs on consumers. Despite the fact that, depending on the design of the capacity mechanism, the cost recovery process may considerably differ, it is most likely that the final costs will be paid by the retail customers. Advocates of the capacity mechanisms argue that the increased costs can be justified by the absence of peak prices and therefore increased political acceptability of the price formation on the energy exchange.

Further failures of the capacity mechanisms can be caused by design and implementation problems. Probably most important, is the precise estimation of the required capacity level. Considerable deviations between future forecasts and the current electricity demand—and therefore capacity requirements—can result in distortions of the electricity price formation.[22] This is a particularly serious concern in designs where capacity level is determined centrally (e.g. Capacity Payments, Capacity Reserves, Centralized Capacity Market). In this context a decentralized capacity market represents the most effective mechanism as it calls for the least regulatory intervention.

„NO COMMON APPROACH TO CAPACITY ADEQUACY ASSESSMENT EXISTS IN THE EU"

In general, demand forecasting is a challenging process as future electricity consumption will depend on many exogenous factors such as economic growth, technological progress, or speed of implementation of energy efficiency measures[23]. However, even more crucial is that no common approach to capacity adequacy assessment exists in the EU, as each Member State is free to make its own national projections. The same assessments carried out on the European level would probably lead to very different results as it would take into account the impacts of cross-border trade and the interdependency between the adjacent energy markets.

Finally, by favouring incumbent producers capacity mechanisms could serve as an obstacle to innovation, and under certain circumstances even disincentivise some investments, which seems to come in contradiction to the rationale behind the introduction of this instrument. For example, if electricity providers receive fixed capacity payments for the existing capacity, they might postpone its decommissioning and delay investments in new facilities, thus preventing technological advancement (e.g. investments in flexibility) and negatively affecting security of supply in the long-run. In general terms, a decentralized approach (e.g. Capacity Market) will have a higher potential of creating the right investment incentives in comparison to the centralized solutions (e.g. Capacity Reserve).

It is worth emphasizing that, as long as implementation of the capacity mechanisms remains a national issue, the potential failures of this new instrument cannot be generalized. At the same time, the interaction of different designs and provisions for foreign participation across the EU will have a strong impact on the IEM, as it affects cross-border trading. This last point requires particular attention and thus will be discussed separately.

21. Federal Ministry for Economic Affairs and Energy, An Electricity Market for Germany's Energy Transition, (Green Paper), October 2014.
22. Meray N., Meulman, L., CIEP, Capacity Mechanisms in Northwest Europe. Between a Rock and a Hard Place?, November 2012.
23. Ibid

3.1.2. Foreign participation and impacts on the internal energy market

> "THE COMMISSION DENOTES THE FULLY INTEGRATED INTERNAL ENERGY MARKET (IEM) AS THE KEY DRIVER OF THE ENERGY SECURITY IN THE EU"

In the Energy Union Package, the Commission denotes the fully integrated internal energy market (IEM) as the key driver of the energy security in the EU. It emphasizes that Member States have to be assured that in situations of tight supply they can rely on their neighbours, and that capacity mechanisms should only be implemented if the security of supply cannot be guaranteed on the regional, not just on the national level[24]. ENTSO-E also stresses the contribution of the IEM to the security of supply which results from two mechanisms – market coupling and TSO cooperation[25]. National capacity adequacy policies which do not take into account foreign participation and interdependence of the Member States could undermine the effectiveness of these crucial mechanisms.

Foreign participation can be either explicit or implicit. Implicit participation means, that it will be acknowledged by the national authorities that the capacity level required in a closed market will be higher than in an interconnected market. Explicit participation implies that foreign generators can take part in domestic capacity auctions or acquire capacity certificates (depending on the design), and directly contribute to meeting the required generation adequacy standards. Therefore in the latter option no artificial barriers to cross-border trade are created. Considering the interconnectivity of the European electricity market it seems obvious that only the explicit form of foreign participation can be seen as compatible with the IEM target model[26]. However, due to technical and regulatory hurdles it is associated with various implementation difficulties[27]. RTE, a French TSO, claims that the French capacity market, which should start operating in 2016, will be compatible with an explicit participation of foreign capacities, subject to many open questions, one of them being the compatibility of capacity mechanisms in the neighbouring countries[28]. As a first step only implicit recognition of foreign participation will be implemented.

Because of European market coupling, national capacity mechanisms will have spillover effects on the electricity markets of the neighbouring countries. It is however contentious what type of spillovers – positive or negative – these will be. For instance, according to the Green Paper of the German Federal Ministry for Economic Affairs and Energy (BMWi) published in October 2014, Germany sees a potential benefit for own consumers from the introduction of the capacity market in France. In this paper they claim that "the introduction of a capacity market [in France] will probably provide incentives for additional capacity in France. This capacity contributes to security of supply in Germany. Power plant capacity in Germany can drop to the same extent as additional French power plant capacity is available for the electricity market in Germany through the cross-border interconnectors available."[29] The asymmetric implementation of the capacity mechanisms in Germany and France could potentially result in redistribution effects, as German citizens would be benefiting from the improved generation adequacy, whose costs would be carried by French consumers.

However, some experts also argue that in the long-run countries without a capacity mechanism (in this example Germany) will not be able to 'free-ride' on the adequacy policies of the neighbouring markets, but on the contrary will face a deteriorating investment climate and growing system reliability problems, especially in the long-run[30]. This is because investors will be attracted by a market with a capacity mechanism, as it provides for a more predictable investment climate. Consequently, such scenario would lead to investment concentration in countries with a capacity policy in place, undermining the effectiveness of these investments. This is due to the wrong locational signals, as markets with capacity markets will be attracting investors with

24. European Commission , DG Energy, *Energy Union Package*, February 2015.
25. ENTSO-E, *Cross-border Participation to Capacity Mechanisms*, February 2015.
26. The target model for the European electricity market is the vision shared across all stakeholders on the future market design. The implementation of the target models in gas and electricity is equivalent to the completion of the IEM (Definition used by ENTSO-E).
27. For more information please see ENTSO-E, *ibid* and RTE, *French Capacity Market, op. cit.*
28. RTE, *French Capacity Market*, *op. cit.*
29. *Discussion Paper of the Federal Ministry for Economic Affairs and Energy*, *op. cit.*
30. *Generation Capacity Adequacy in interdependent Electricity Markets*, *op. cit.*

a secure return detached from the actual market conditions. Such a scenario would imply moving away from free-market competition towards greater protectionism, regulation and nationalization of the energy strategies in the EU.

3.2. Alternative solutions

3.2.1. Further development of the existing power trading

Because the electricity market failures are closely related to price signalling and trading processes some experts see the solution to the existing problematic in further development of the electricity trading system. Different approaches exist since the focus can be either put on the short-term trading products or on the long-term forward contracts.

In its recent Working Paper on Energy Turnaround Products EEX emphasizes the importance of short-term products in increasing the efficiency of the electricity market[31]. Because the volatility of the renewable energy production makes accurate forecasting extremely difficult, the target electricity volumes often deviate from the actual volumes calling for a need of 'last minute' adjustments. Since December 2011, EPEX SPOT has offered trading on a fifteen-minute basis which has already considerably increased the efficiency of power trading. Further expansion of the spot product spectrum would increase system flexibility, thus eliminating the occurrence of negative prices.

The introduction of short-term electricity trading products does not imply major energy system alterations and can be therefore carried out with relatively little regulatory intervention. Furthermore, they carry no risk for the IEM integration. However, while the short-term products do improve price signalling, they are unlikely to resolve the missing money problem and improve investment climate. According to some experts, these last two problems can be addressed by the introduction of a forward electricity market[32]. Currently, the electricity trading occurs on the Day-Ahead and Intraday markets only. Future risks can be only hedged with the help of financial trading products[33] on the Power Derivatives Market. Introduction of a forward market would allow trading energy products[34] (for example in form of a call option) certified by a regulatory authority of producing a particular level of energy in the future[35].

> "FORWARD CONTRACTS ELIMINATE THE NEED FOR PRICE CAPS AS PEAK LOADS ARE EFFECTIVELY HEDGED"

The functioning principles of forward electricity markets are similar to those of capacity mechanisms. Firstly, forward contracts eliminate the need for price caps as peak loads are effectively hedged. This also means that suppliers have no incentives to exercise market power, and therefore the regulatory dilemma gets resolved, as the peak prices are locked in. Furthermore, forward contracts could potentially improve investment climate by eliminating uncertainty about future returns. However, in contrast to capacity mechanisms, forward markets represent a pure market solution which can be introduced directly on the European level via the already existing European electricity trading platforms. A European forward electricity market would not only imply further intensification of cross-border trade, but it would provide a common instrument for addressing security of supply on the European level reducing the need for coordination between the Member States and preventing national policies from 'overruling' the IEM integration priorities. Nevertheless, the difficulties of foreign participation mentioned before with regards to the capacity mechanisms will also represent a challenge in forward markets. Management of simultaneous scarcity situations or the issue of transmission lines' reservation can be only

31. For more information on power trading innovation products please see EEX Working Paper on Energy Turnaround Products.
32. Lawrence, M. A., Cramton, P., "Using forward markets to improve electricity market design", Utilities Policy 18, 195 – 200, 2010.
33. This products are not backed by a physical resource.
34. Backed by a physical resource (MGW/h).
35. Ibid

addressed through active TSO cooperation and will require joint regulatory provisions and common technical standards on the European level.

3.2.2. Expansion of the trans-European electricity network

One of the striking features of the ongoing energy system transformation are the generation overcapacities, whose existence seems paradoxical given the pressing issue of energy security. The previously mentioned lack of liquidity of the European energy system *(see negative prices p. 7)* represents an obstacle towards the economically efficient allocation of resources cross-border. At the same time, concentration of overcapacities in some countries creates wrong investment signals in the short-run, incorrectly reflecting true future investment needs. Expanding the electricity network and allowing the electricity to flow more freely between the countries would allow solving this problem in a way corresponding the vision of the European energy union[36].

An expansion of the electricity network does not only imply enhancement of transmission lines, but also investment in cross-border interconnectors, as their capacity puts a physical constraint on the cross-border flows. Currently the IEM is still characterized by an insufficient level of interconnections, not allowing EU markets with overcapacities to match those with scarcer resources[37]. The need for network expansion has been realized by the EU Commission, which has drawn up a list of 248 projects of common interest, with the majority of projects involving gas and electricity transmission lines. The importance of energy interconnectors has been also emphasized by the Commission in its recent Energy Package communication on how to achieve an electricity interconnection of 10% in all Member States by 2020[38].

„THE SUCCESS AND IMPLEMENTATION SPEED OF THESE EU INITIATIVES WILL DEPEND ON WILLINGNESS AND MOTIVATION OF THE MEMBER STATES"

The success and implementation speed of these EU initiatives will depend on willingness and motivation of the Member States to look at the current problems from the European perspective and step back from renationalisation of their energy policies. The expansion of the trans-European electricity infrastructure does not represent a quick fix which will pay off in the short-term and quickly solve pressing issues on the national level. It is rather a strong commitment and acknowledgement that addressing the energy security on the European level represents the only sustainable solution in the long-run.

3.2.3. Electricity market 2.0[39]

In its recent discussion paper (Green Book) the German Federal Ministry for Economic Affairs and Energy (BMWi) presented an alternative solution to a capacity market – Electricity Market 2.0. Under the electricity market 2.0 an optimised electricity market with "credible legal framework that investors can rely on" is understood. The optimisation measures include strengthening of the market signals, expanding and optimising the power grid, intensifying European co-operation, as well as delivering on climate protection goals.

Whereas the optimisation measures do not claim anything much new, there is a certain feature to the electricity market 2.0 which distinguishes it from the market as we know it, which is the acceptance of peak prices. BMWi claims that under the 2.0 model "there should not be any restrictions to the occurrence of peak prices" and they should neither be "ruled out nor mitigated by the prohibition of abusive practices under anti-trust law". Free price formation should solve the missing money problem and create investment incentives and refinancing opportunities even for peak load power plants. At the same time, the resulting price volatility should incentivise system flexibility.

While the proposal may sound appealing in theory as it touches upon one of the crucial functioning principles of the electricity market, the German energy industry remains sceptical towards it due to the political

36. For more information on this issue also see Offenberg, P., "Taking Stock of German Energy Policy in European Context", Policy Paper No. 116, Jacques Delors Institut – Berlin, August 2014.
37. "From the European Energy Community to the Energy Union", *op. cit.*
38. European Commission, DG Energy, *Energy Union Package. Achieving 10% electricity interconnection target*, February 2015.
39. *Proposal by the German Federal Ministry for Economic Affairs and Energy presented in its Green Paper (2014), op. cit.*

uncertainty associated with the promise to keep the price formation free from regulatory intervention[40]. It is disputable whether the electricity market 2.0 would generate enough investor confidence, taking into consideration the radical course turnarounds which have been pursued in the German energy sector in the recent years. This might explain why BMWi is considering implementing a Strategic Reserve in addition to the electricity market 2.0, implicitly admitting that the electricity market reforms alone might be not enough to address current issues.

„MEMBER STATES ARE NOT LOOKING FOR THE SOLUTIONS ON THE EUROPEAN LEVEL"

Taking into account the interconnectivity of the European electricity market, the optimisation of the market design on the national level might be beneficial in many ways, but it will certainly not be enough to address the issue of energy security if not accompanied with European infrastructure projects and further intensification of cross-border trade. Therefore, it seems surprising that while acknowledging the fact that the mere adjustments of the market design seem insufficient, Member States are not looking for the solutions on the European level, but rather search for answers in national initiatives benefiting incumbents and protecting the old energy paradigm. Implementation of a Strategic Reserve in Germany and a Capacity Market in France would mean co-existence of different capacity mechanisms in two neighbouring countries, whose common effort might have been more beneficial for the completion of IEM.

40. The energy intensive industry on the contrary favours the implementation of the electricity market 2.0 as it fears additional costs created by a possible introduction of a capacity market.

CONCLUSION

„A EUROPEAN ENERGY UNION IS ABOUT OPTIMIZATION OF RESOURCES AND INFRASTRUCTURE ON THE EUROPEAN LEVEL"

This Policy paper showed that the European energy sector is faced with serious challenges. While trying to solve the pressing issues unilaterally, Member States have been bypassing and disregarding the benefits of the internal energy market integration by implementing national energy strategies aimed at protecting the status quo. In their report "From the European Energy Community to the Energy Union"[41] Sami Andoura and Jean-Arnold Vinois state that a European Energy Union is about optimization of resources and infrastructure on the European level. It is exactly the realization of this need of co-operation and addressing the problems from the European perspective which is still missing among the Member States.

Yet, by communicating its Energy Union Package in February 2015 the Commission might be responding too late as national initiatives have been already set in motion. The political sensitivity of the national energy security is very high, and the perceived risk of blackouts solves as a solid justification for the national interventions. In this context capacity mechanisms represent a quick fix, as even a mere announcement of the future implementation can increase investor confidence and mitigate public concerns. Nevertheless, on the European level the uncoordinated approach towards capacity policies is detrimental for the successful completion of the internal energy market, leading to a greater harm on a larger scale in the long-term. Only compatible capacity mechanism designs with explicit participation models will allow for an effective 'co-existence' of the national capacity mechanisms and the European internal energy market. Unfortunately, looking at the current developments in the Member States no signs of harmonization and coordination of national efforts can be observed.

Recognizing that the existing electricity markets in Europe are in need of adjustment this Policy paper drew attention towards the potential impacts of national interventions and showed that often the direction of these adjustments might be wrongly chosen if the causes of the persistent electricity market flaws are not understood. In fact, the observed market distortions arise from the incompatibility of the old market design with the new developments. Protecting the old national equilibrium without realizing the fact that the answers lie in the European co-operation will not solve the issues faced by the Member States but only postpone the progress towards a more sustainable European energy sector. This is why pan-European initiatives such as the expansion of the European electricity network should be given particular attention by all Member States, as the efforts which laid down the base of the existing structures of the European energy system should not be overrun by the national strategies. Security of supply is a European issue, and it cannot be addressed effectively unless this fact has been fully acknowledged by the Member States.

41. Sami Andoura and Jean-Arnold Vinois, Foreword by Jacques Delors, „From the European Energy Community to the Energy Union – A new Policy Proposal", *Studies & Reports No. 107*, Jacques Delors Institute, January 2015.

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Hertie School of Governance

Pariser Platz 6, D – 10117 Berlin
19 rue de Milan, F – 75009 Paris
office@delorsinstitut.de
www.delorsinstitut.de