

Blados, Charēs; Chatzinikolaou, Dimos; Kapaltzoglou, Foteini

Article

Energy market liberalisation in Greece : structures, policy and prospects

International Journal of Energy Economics and Policy

Provided in Cooperation with:

International Journal of Energy Economics and Policy (IJEEP)

Reference: Blados, Charēs/Chatzinikolaou, Dimos et. al. (2021). Energy market liberalisation in Greece : structures, policy and prospects. In: International Journal of Energy Economics and Policy 11 (2), S. 115 - 126.
<https://www.econjournals.com/index.php/ijEEP/article/download/10804/5712>.
doi:10.32479/ijEEP.10804.

This Version is available at:

<http://hdl.handle.net/11159/8178>

Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics
Düsternbrooker Weg 120
24105 Kiel (Germany)
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)
<https://www.zbw.eu/>

Standard-Nutzungsbedingungen:

Dieses Dokument darf zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden. Sie dürfen dieses Dokument nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen. Sofern für das Dokument eine Open-Content-Lizenz verwendet wurde, so gelten abweichend von diesen Nutzungsbedingungen die in der Lizenz gewährten Nutzungsrechte. Alle auf diesem Vorblatt angegebenen Informationen einschließlich der Rechteinformationen (z.B. Nennung einer Creative Commons Lizenz) wurden automatisch generiert und müssen durch Nutzer:innen vor einer Nachnutzung sorgfältig überprüft werden. Die Lizenzangaben stammen aus Publikationsmetadaten und können Fehler oder Ungenauigkeiten enthalten.

Terms of use:

This document may be saved and copied for your personal and scholarly purposes. You are not to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public. If the document is made available under a Creative Commons Licence you may exercise further usage rights as specified in the licence. All information provided on this publication cover sheet, including copyright details (e.g. indication of a Creative Commons licence), was automatically generated and must be carefully reviewed by users prior to reuse. The licence information is derived from publication metadata and may contain errors or inaccuracies.



<https://savearchive.zbw.eu/termsOfUse>



Energy Market Liberalisation in Greece: Structures, Policy and Prospects

Charis Vlado¹, Dimos Chatzinikolaou², Foteini Kapaltzoglou^{3*}

¹Department of Economics, Democritus University of Thrace, Komotini, Greece, and School of Business, University of Nicosia, Nicosia, Cyprus, ²Department of Economics, Democritus University of Thrace, Komotini, Greece, ³Department of International and European Studies, School of Law, Democritus University of Thrace, Komotini, Greece. *Email: kapaltzoglou@gmail.com

Received: 22 September 2020

Accepted: 28 December 2020

DOI: <https://doi.org/10.32479/ijee.10804>

ABSTRACT

The ongoing regulatory transformation towards a single European electricity market started several years ago. The rationale of this transformation is that the liberalisation of monopolistic energy structures should lead to the building of sustainable and flexible energy ecosystems, through an energy policy that sets goals in line with the requirements of our epoch, such as sustainable development, energy security, and the promotion of renewable energy sources. In this context, the liberalisation of the electricity market in Greece is explored, which is a complicated case in terms of development as it has only recently begun to exit from a long-term socio-economic crisis and strict adjustment programs. The concepts of energy market liberalisation, energy ecosystems, and energy policy are presented and compared to the main directions of the EU institutional environment and the evolution of the political and institutional framework of Greece. In Greece, an attempt has been made in recent years to liberalise the electricity market, which is hindered for a long time by socio-economic forces favoured by the monopolistic system of the market. This liberalisation process is also an opportunity for the country to move towards enhancing the structures that can lead to faster and more sustainable development and to maintain the pace of “coupling” with the most developed energy economies of Europe.

Keywords: Energy Market Liberalisation, Electricity Market Liberalisation, Energy Business Ecosystem, Energy Policy, EU Energy Packages, Greek Energy System

JEL Classifications: Q40, Q43, Q49

1. INTRODUCTION

While electricity markets used to be too “monopolistic,” they have undergone a liberalising reformation over the last two decades, in many places worldwide. In this context, alternative competition standards have been exploited, aiming at transforming the electricity supply industry from a regulated monopoly to increased competition (Hunt and Shuttleworth, 1996). In the late 1990s, the EU adopted measures to develop a more competitive, customer-centred, flexible, and non-discriminatory, European energy market.

Liberalisation was considered an essential step because it allows for competition in the production and distribution of electricity

(Pepermans, 2018). As claimed by the European Parliament (2020), the EU’s internal energy market liberalisation could be reached by implementing access to markets, transparency and bylaw, consumer protection, interconnection, and security of supply. The EU member states are expected to be “fully” merged through the process of uniform restructuring of energy markets and the integration with the requirements of a single European proposed model. Today, although a European “wide market” is reached, many hindering powers and obstacles still exist (Glachant and Ruester, 2014).

In this paper, The case of Greece is examined, which is a complicated case in developmental terms, as it has only recently

begun to exit a long and multifaceted crisis (Vlados et al., 2018). Being a country in the European south and with deficit budgets for many years (unlike the wealthy European north), Greece depended disproportionately heavily on European financial liquidity mechanisms (Andreou et al., 2017). Today, especially after the pandemic crisis of COVID-19, Greece is called upon to progressively transform its production model, focusing on innovation, digital transformation, and renewable energy sources (European Council, 2020). The problem for Greece compared to other, more developed European countries lies in the fact that it underperforms in terms of overall competitiveness, compared to the more advanced European states (Annoni and Dijkstra, 2019).

To this end, the rapid and significant development of the energy sector is one of the priorities of the current Greek government, as it can deliver increasing returns, being in line with the existing and ever-evolving European energy policy framework (Minister for the Environment and Energy, 2020). An analysis of the aspect of liberalisation of the Greek energy market could show how a medium-range country in terms of competitiveness proceeds to harmonise its internal legal framework and what this brings to the real economy. More specifically, the main issues addressed are as follows:

1. What are the principal socio-economic forces holding back or promoting the liberalisation of the electricity market in Greece?
2. What are the opportunities and threats from this liberalisation?
3. What medium to long-term forecasts can be done about this attempted change in the regulatory framework of the energy market in Greece?

The findings will help to answer the question of whether the liberalisation of this market in Greece is an ongoing process, with various socio-economic benefits. It will also provide an opportunity to understand whether the effort to improve the structures of the energy market in Greece could contribute to strengthening the competitiveness of the overall domestic production.

The paper is divided next into five sections. In section 2, a literature review of the energy market liberalisation is investigated, analysing the concept and the specific features. In section 3, the more advanced and sophisticated idea of energy ecosystems is explored by also presenting actual contemporary objectives of energy policy. In section 4, an overview of the EU legislative framework and the “European Energy Packages” is provided. In section 5, the steps taken by Greece to implement the respective European legislation are overviewed, together with the current situation of the Greek electricity system and the primary directions of national energy policy. In section 6, the conclusions of the research are extracted.

2. THE CONCEPT OF ENERGY MARKET LIBERALISATION

As for the question of what liberalising a market means, there are various approaches. Related to liberalisation are the concepts of deregulation and privatisation, which are mostly “legal programs”

instead of legal notions; they are policies of opening markets and abandoning monopolies (Green, 2006; Shin and Managia, 2017). In other words, liberalisation refers to the process by which a state removes restrictions and national monopolies to improve efficiency and enable new enterprises to operate in the relevant market. Overall, the process of liberalising the energy market concerns the reshaping of the applicable state regulations and the implementation of new rules aimed at controlling the behaviour of firms. The main types of state regulation at this level are the following (Kounetas et al., 2011):

- Economic arrangements that affect prices, entry barriers to the market, and exit conditions or service standards in the energy sector.
- And social arrangements, which aim to treat external effects diffused in several sectors, such as the pollution of the natural environment¹.

In the direction of the European Commission (1998), liberalisation encourages healthy competition, which leads to increased production levels and a reduction in energy prices, although the state should cover services of general economic interest. Through liberalisation, closed markets open to competition, barriers on access are removed, and the state’s restrictions on competition are eliminated. A typical example of the EU’s adherence to the competition requirements is the unbundling in the energy sector, meaning the separation of energy production and supply from the operation of its transmission networks (European Commission, 2015). The state monopoly of the electricity market, which is characterised nowadays by restructuring, privatisation, and deregulation is a primary field of liberalisation for the developed countries (Chen et al., 2018).

This liberalisation focuses on the creation of a less monopolistic market, which offers various choices to consumers (Bahçe and Taymaz, 2008). The re-regulation is a result and a necessary complement to market liberalisation and consists of an essential change in the relevant sector. However, this process introduces challenges and risks. A legal framework needs always to safeguard the transition from integrated regulation and administrative prices to competition and market prices because the efforts to minimise cost could fail to provide valuable products and services sustainably (Hammond and Spence, 2016). From the perspective of energy economics, the uninterrupted supply of electricity to all consumers is essential on the demand side, while, on the supply side, storing and transporting the product electricity always bears significant costs (Bhattacharyya, 2011). In other words, liberalisation should first be carried out in fields where the benefits prevail the losses

¹ The traditional monopolistic model of energy supply was very successful during the post-war phase of the development of world capitalism, with the prevalence of the consensus of Bretton Woods and the Keynesian model of the state-investor (public investments) and regulator in the economic process (entrepreneurial state) (Vlados, 2019). However, with the gradual advent and evolutionary emergence of globalisation from 1980 onwards and the consequent re-organisation mainly of the western national socio-economic systems, the need for expansion and development of competition became uncontested (Boyer and Saillard, 2001). In this context, the most competitive socio-economic systems gained clear precedence in the race for innovation and in hosting structures that allow the growth of global value chains (Lundvall, 1992).

and then in areas where the positive socio-economic outcome can be expected (Nicolli and Vona, 2019).

Liberalisation, which can be interpreted as the removal of barriers to competition, is related to deregulation, which implies the reduction and the lack of regulation (Aune et al., 2008). However, it must be noted that there is no complete deregulation or “self-regulation” of any market (Gond et al., 2011). The liberalisation of a market entails restructuring, which gives significant opportunities for competition between the stakeholders and key actors of a particular socio-economic system. Altogether, the following conditions can be distinguished as essential for the liberalisation of a today’s energy market to occur: gradual or radical abolition of monopolies through privatisation; re-organisation of a specific energy system; removal of state’s restrictions on competition; an essential and active role of benefited consumers.

3. ENERGY BUSSINES ECOSYSTEMS AND ENERGY POLICY

In the newly emerging business conception, the energy sector is nowadays analysed as a collection of distributed energy ecosystems, which include collaborative mechanisms, arising from different business models (Hellström et al., 2015). In this approach, energy companies should now be perceived as “integrated energy service companies,” where their product is at the centre of an energy ecosystem, including all actors directly or indirectly related to it (Kangas et al., 2018). Towards the integrated energy service company, the forces of the state, the initiatives of firms, and the regulatory institutions are developing and co-evolving in multiform and ever-mutating ecosystemic terms (Vlados and Chatzinikolaou, 2020).

Therefore, in terms of energy adequacy and security of supply, it is doubtful whether the current monopolistic energy schemes have sufficient response mechanisms. Especially in recent decades, where besides liberalisation efforts there has been a turn towards environmental security, sustainability, and climate change, the transition from monopolies to open competition is even more challenging (Cerović et al., 2014). Even though many countries have made a move in favour of renewable energy sources, the goals of sustainable development do not seem to be sufficiently achieved by the current energy and environmental policies pursued in the developed states (Kerr et al., 2019). In this context, an electricity market liberalisation will have a positive effect on renewable energy sources, as the small-scale energy production will be increased (Alsaedi et al., 2020).

Adding to this challenging process of liberalisation in the energy industry, the automated methods and systems today allow consumers to be involved in the production actively, rather than consume only energy as a product (Vihalemm and Keller, 2016). From this perspective, the most significant strategic direction for new companies entering the electricity industry, but also for the incumbent, is the flexibility and the focus on the demand side (Lampropoulos et al., 2018). The liberalisation of the electricity market can benefit the customers, the operators of the

grid, the energy suppliers themselves, and generally, the society (Kubli et al., 2018). Especially after the turmoil and global crisis of 2008, some authors notice a radical shift in the older business growth model of electricity providers, giving focus to the fact that the stock values of most large utilities in Europe have collapsed, with the profitability and existence of these well-established companies being at risk (Specht and Madlener, 2019).

This new approach to the development model of electricity providers belongs to an analysis that perceives the energy sector as an ever-evolving business ecosystem. The business ecosystem concept refers to the biological metaphor that deals with the socio-economic actors as co-evolving organisations that move gradually from a random collection of parts to structured communities (Moore, 1993). In other words, this business ecosystem conceptualisation is about a business network whose actors interact dynamically, and the survival potential (competitiveness, in economic terms) of the one depends on the respective dynamic of the other (Iansiti and Levien, 2004).

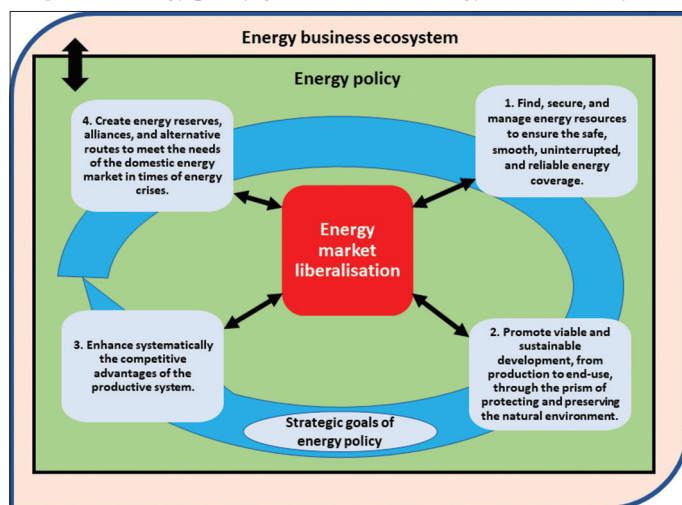
The structure of rules, the forms of regulation and the legal constraints, as well as the available potential in terms of capital, expertise, and expected markets, are crucial to how each business ecosystem develops. The structure and dynamics of energy business ecosystems are vital respectively for the hosting production system since they determine the availability, safe supply, and price of energy, which is a significant input for all sectors of a local and national production system.

In this sense, the process of an energy market liberalisation must be understood by giving convincing answers to the following questions:

- How and to what extent does the attempted energy market liberalisation contribute to strengthening the structures of energy supply?
- How and to what extent does the attempted energy market liberalisation lead to a sustainable and more environmentally friendly framework for the distribution and use of energy (demand)?
- Most importantly, how and to what extent does the attempted energy market liberalisation lead to a new competitive balance that increases the system’s capacity to respond to energy crisis conditions and to maintain and enhance energy security?

All the above questions concerning the liberalisation of an energy market can only be effectively addressed under the framework of an integrated energy policy of any nation or coalition of nations and communities. In practice, energy policy sets and serves four practical objectives (Figure 1):

1. The first and leading objective of energy policy is to find, secure, and manage energy resources in such a way as to ensure the safe, smooth, uninterrupted, and reliable coverage of the country’s energy needs in all localities, and providing the best possible conditions for citizens
2. The second objective is the viable and sustainable development of the energy sector, in all its forms, from production to end-use, through the prism of protecting and preserving the environment.

Figure 1: Energy policy goals within the energy business ecosystem

3. The third objective is to systematically enhance the competitive advantages of the productive grid that hosts the energy business ecosystem.
4. The fourth objective is to create energy reserves, alliances, and alternative routes to meet the needs of the domestic energy market in times of energy crises and to protect consumers through the implementation of mechanisms for the normalisation of exogenous, extraordinarily destabilising phenomena and trends.

The different objectives of energy policy, being always in a continuous dialectical relationship of co-determination and co-evolution, constitute the response given by energy policy to the structure and dynamics of the energy business ecosystem. Political ideology always plays a vital role in the promotion and implementation of these interdependent and systematically defined objectives of energy policy (Cadoret and Padovano, 2016). Policy makers must nowadays seek, with greater analytical clarity and completeness, a relatively balanced and secure liberalisation of the energy market, especially now when the fourth industrial revolution alters all the economic relationships and the modus operandi of society. The next section attempts to explore how the liberalisation of the electricity market in Europe has been announced and implemented from a political and legal point of view.

4. THE EU FRAMEWORK OF ENERGY MARKET LIBERALISATION

In their traditional perspective, energy markets have been appraised as being legally-free from any dynamics of competition since their specific technical and economic characteristics made them be considered as natural monopolies. According to the economic theory of natural monopolistic procedures, because of the existence of significant economies of scale in these markets, competition cannot be developed (Polemis, 2014). The preservation of adequate energy supply has been a matter of particular concern, so that it was common practice, both in the US and Europe, to delegate this task to vertically integrated companies (von Danwitz, 2006).

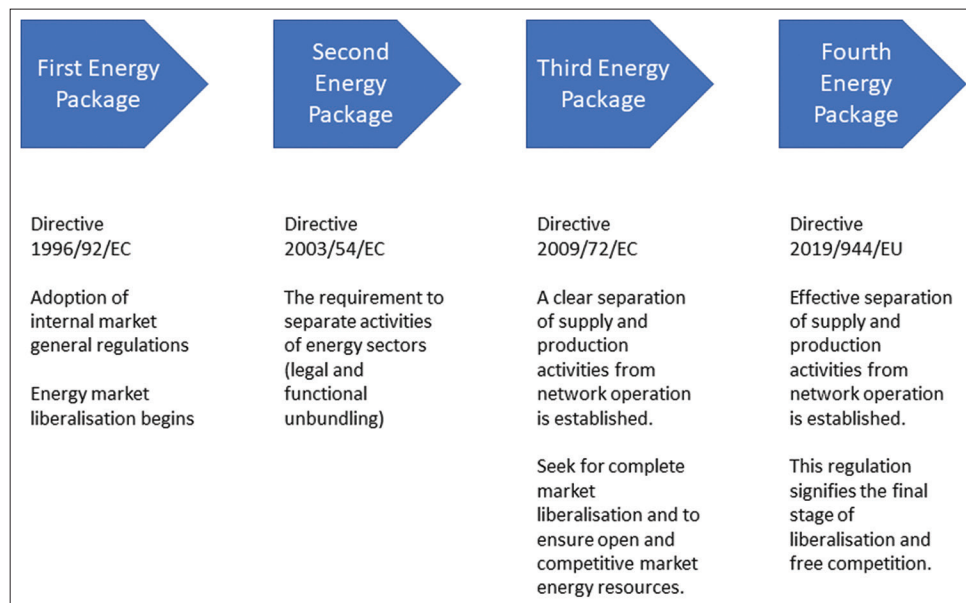
The issue of energy market liberalisation was raised in the Maastricht Treaty in 1992. Since the late 1990s, the EU attempted to liberalise, inter alia, the electricity market, which until then was dominated by old national monopolies (Galanis, 2012). The new electricity market situation that was created in the EU had legal, economic, and social consequences. The transition from cartels operating in the energy sector in the form of integrated enterprises to competition was not easy. Between the EU member states, as it is argued, obstacles to achieving a transparent, functional, and secure competitive internal market are also related to the issues of network access, pricing of infrastructure services, interoperability of networks, and the different stages of market liberalisation (Panagos, 2011).

However, the European institutional and regulatory framework in the energy sector has many aspects and includes several regulations, covering different sub-sectors and sub-markets. It is composed of commitments, which derive from rules in the context of the single market (the EU “Energy Packages”) and state legislation. For the internal electricity market to be completed, especially the EU member states are required to “compromise” and to liberalise their energy systems, with different political and social attitudes pursued (Radulovic et al., 2011).

In Europe, the transition towards liberalisation is gradual and goes through four main phases (Figure 2). The first in 1996, the second in 2003, the third in 2009, and the fourth in 2019, known as the four “Energy Packages:”

1. The first step towards the consolidation of a single, more efficient, European energy market started in 1996. The first electricity directive 96/92/EC introduced the process of liberalisation of the electricity markets of the member states and created the conditions towards the completion of the internal electricity market.
2. Directive 2003/54/EC replaced the first of 1996, and the regulation 1223/2003 was enacted. The new measures tried to develop unbundled tariffs concerning network access. In this way, the electricity market in the EU abandoned the principles of intervention and entered the stage of liberalisation and free competition.
3. The third energy package includes the directive 2009/72/EC and the regulations 713/2009/EC and 714/2009/EC. It is argued that this set of provisions is the cornerstone for the completion of the electricity market, which paved the way for its further liberalisation.
4. In 2019, a set of documents (also known as the “Winter Package”) was enacted, with the directive 2019/944/EU, the electricity regulation 2019/943/EU, the risk-preparedness regulation 2019/941/EU, and the Agency for the Cooperation of Energy Regulators (ACER) regulation 2019/942/EU. With the adoption of the fourth energy package, the EU electricity market decisively entered the stage of liberalisation, and the single European energy market was linked to the operation of an Energy Exchange, based on the standards of similar bodies already operating in many EU countries.

Besides these framework conditions, a policy analyst at the European Policy Centre has written that the EU member states

Figure 2: EU energy packages

Source: Based on Filippopoulou (2019).

do not have a unified policy on energy security (Hedberg, 2015). Instead, they are characterised by different national mini-markets and, thus, do not have a coherent internal energy market (Dudin et al., 2017). In this context, the restructuring of the energy market continues nowadays (Correljé, 2016). Pursuing the completion of the single energy market, the European Commission has been promoting a target model for electricity markets. This model is based on the principles of “energy-only regional markets” and “market coupling” (Hawker et al., 2017; Glachant, 2016). The first means the organisation on a zonal basis, where the revenues of generators depend on the price of each marginal unit of supplied energy. The latter corresponds to a way of connecting zonal day-ahead markets into a virtual market, so the lowest-priced bids can be accepted up to the point where congestion limits further trade (Keay, 2013). In other words, market coupling signifies the intention of the EU to form an interconnected European market for electricity by linking control and market areas and harmonizing different electricity exchanges system and reducing price differences (Synodinos, 2014).

Based on these broad principles, the target model sets out the minimum requirements that national socio-economic energy systems shall meet to facilitate border-free trading across Europe and lead to the coupling of EU markets. For this transitional stage of market liberalisation, the European legislator has taken steps to foster the internal electricity market, which must pursue three complementary objectives: security of supply, sustainable environmental action, and amplification of competition. To this end, it is understood that the goals and general directions of energy policy are formed at a European level and specialised in corresponding strategic directions at a national level. In the next section, the case of Greece’s electricity market liberalisation is examined based on the legislative framework set by the European Union, and the facts and objectives of energy policy.

5. THE CASE OF GREECE: THE ELECTRICITY MARKET LIBERALISATION

Concerning the harmonisation of the Greek legal and socio-economic system to this European practice, a steady progression is apparent (Tarnanidou, 2016). The first package was incorporated with the law 2773/1999 and the second with the amendment 3426/2005. For the third package, law 4001/2011 was passed, which is further specified and supplemented by rules adopted by the legislative power, included in the “regulations” and “codes” of the Greek energy market (Iliadou, 2012). As such, the law 4425/2016 introduced the European target model in Greece, and the law 4512/2018 the new market model to be regulated by the Hellenic Energy Exchange SA (HEnEx), established on June 18, 2018. The operating characteristics of the new energy markets were defined in detail, being divided into a day-ahead market, an intra-day market, a balancing market, and an energy derivatives market (Kampouris, 2019).

The new structure of the electricity market is expected to transform the Greek energy system since the rules of the daily market must change for a transition to the target model (Papadionysiou, 2019). Technical restrictions must be lifted on both the transmission system and the energy-producing units (Directorate-General for Energy, 2016). Bidding also changes as the intra-day market allows participants to adjust their positions to prevent and minimize deviations from the quantities sold and bought in real-time. A balancing market is also a prerequisite in today’s electricity market systems, including bids for increase or decrease of power from the production units, as well as load declarations for increase or decrease of the load to achieve a real-time balancing of the system. This market controls production and manages demand to distribute the energy load, in economic terms, in the distributed units of the system, having as a point

of reference the insertion program of the production units from the preceding day-ahead and intra-day market. Concerning the energy derivatives market, this is responsible for buying and selling financial derivatives besides physical products so that the participants can hedge the risk that is always present in such transactions.

In line with the target model and following the set of documents of the fourth package, law 4643/2019 was enacted, which introduced provisions concerning, *inter alia*, the restructuring of the Greek energy market. The foremost harmonisation step with the European legislation is expected to begin with HEnEx, at the end of 2020. The wholesale electricity market will be transferred to HEnEx, which will be responsible for the entire organisation and control of the system, where the participation of producers, suppliers, and traders will be allowed in the new auction platforms (Filippopoulou, 2019). The expected results can be summarised as follows (IENE, 2019):

- Energy transactions will be taken out of state control, and the participants will be able to diversify their variable costs and pricing policy.
- The Greek market will be coupled with other European markets, strengthening competition and transparency.
- The energy costs will be reduced, providing better prices for the consumers.
- The security of energy supply will be enhanced since there will be diversification of energy sources in the energy mix.
- The participation in renewable energy sources will be increased, and new energy trading products will be offered, which will comply with the requirements of the target model.

In this context, the achievement of these objectives depends on the speed and degree of success with which a systematic and balanced process of liberalisation of the energy market in Greece will take place. The energy transition in Greece appears to have been delayed due to the long-term socio-economic crisis and because of various political and ideological restraints that prevailed in previous years (Vlados et al., 2019).

As mentioned in the election pledges of the current ruling party (Mitsotakis, 2017), the country needs a whole new energy and policy strategy, based on four key priorities: ensuring the country's energy efficiency and supply; reducing energy costs so that they are affordable for households and firms and competitive compared to other neighbouring states; protecting the environment by fulfilling the country's international obligations; attracting investment from the private sector to grow the energy market, create jobs and stimulating development. As one of the party's press releases was stating in the run-up to the elections (New Democracy, 2017), the party's energy policy must balance between liberalising the energy market, providing the country with adequate energy supply, and adapting to climate change.

These commitments seem to have been put on track by the current governmental program. More specifically, the government aims to transform the country's energy system by diversifying the energy mix, reducing the use of lignite ("de-lignification"), and shifting to clean energy. This transition is built on the following seven policy

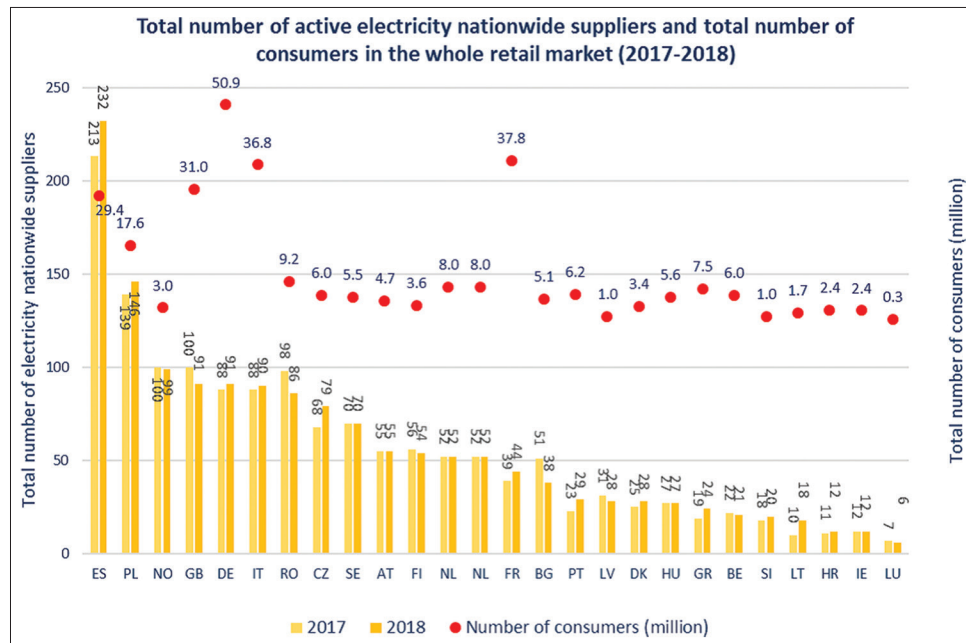
pillars (Secretariat for Strategic Planning and Communication of the New Democracy party, 2020):

1. The first step is activating the integrated new electricity market, which is compatible with the EU-approved target model. The goal is to achieve the lowest price in the wholesale energy market through the coupling of markets.
2. The second step is more significant penetration of renewable energy sources. The aim is for the renewables to be the country's primary source of electricity by 2030.
3. Third, achieving energy transition through de-lignification, a project of national importance.
4. Fourth, proceeding with further energy saving. The plan is the energy renovation of 60,000 household buildings each year until 2030/
5. Fifth, implementing the already-legislated new institutional framework of electromobility for public transports, environmentally sustainable development, and entrepreneurship.
6. The sixth step is adhering to international energy projects, with the construction of the TAP and IGB gas pipelines, and the new liquefied natural gas terminal of Alexandroupoli (Deniozos et al., 2019).
7. The last step is to accelerate the electrical interconnections, domestic and Balkan, which will contribute to energy security, sufficiency, increased competition, and cheaper energy prices.

In most European countries, where the process of energy market liberalisation started earlier than in Greece, an increase in trading volume in the electricity industry has been recorded, because new producers gained access to the transmission and distribution system (Amoiralis and Andriosopoulos, 2017). This competition between energy suppliers helped with the reduction of electricity prices since consumers now have more options to choose (Mourtzikou, 2018).

The Council of European Energy Regulators (CEER, 2019) prepares and publishes reports annually, recording, among other things, the main features of the functioning of the national electricity markets (Figure 3). The countries with most suppliers are Spain and Poland, with 232 and 146 suppliers respectively. If suppliers by country are reduced to the number of consumers, the countries with the highest percentage are Norway, Latvia, and Slovenia, and with the lowest are Spain and France (obviously due to their largest populations). Concerning the case of Greece, the shares of the state-owned and for years the primary carrier and producer Public Power Corporation SA (PPC) record a steady decline.

The share percentage of PPC in July 2020 was 67.74%, while in January of the same year it was 71.44%. According to the Energy Exchange Group (2020) reports on the shares of suppliers, the rate of July 2020 is the lowest recorded for the PPC in the supply of electricity (Appendix 1 and 2). Meanwhile, an increase was recorded in all the leading alternative providers between the January and July 2020 period, while PPC remained the primary supplier in the wholesale and retail penetration of electricity. However, based on the number of shares, the market share of PPC is continuously decreasing (falling by 3.37% points between January and July 2020), while the number of alternative suppliers

Figure 3: Number of electricity suppliers per country in 2017 and 2018, and the number of electricity consumers in respective states

Source: CEER (2019)

increases. For the first time, the alternative provider Mytilineos (Protergia) managed to achieve in January the rate of 5.62%, recording a significant increase in the coming months, reaching at 6.71% in July 2020.

These data show that new producers are active in the Greek electricity market, even though they are still small-scale stakeholders. PPC continues to hold a dominant position by having a broad customer base, the vital infrastructure that it continues to control, and the commercial reputation created from the decades-long monopolistic presence. The high cost of investments required by the energy industry and their uncertain depreciation, discourage competitors from entering the industry. Barriers to entry, combined with the lack of liquidity in wholesale electricity markets, and the limited interconnection capacity also contribute to this situation. In terms of market design, the minimum size for supply is the most apparent potential barrier for small companies to participate. Other obstacles include time-consuming licensing procedures, the difficulty of networking, and the high-tax laws in Greece (Energy Committee of the Academy of Athens, 2017).

The Greek electricity market, both wholesale and retail, is now in complete transformation. Despite the long-term establishment of PPC, having the exclusivity in the production, transmission, distribution, and supply of electricity to final consumers, today private producers increase their capacity continually. Moreover, soon the four new markets are expected to start, through the newly established HEnEx, through which electricity will pass successively before reaching consumers.

The activity of new companies in the energy sector will contribute to economic growth, as large funds have been invested in the market, creating job opportunities and a more developed economy. These evolutions seem to contribute to the protection of the environment and the reduction of carbon dioxide emissions, as

they cause a progressive shift to renewable energy sources and related innovative technologies (Tsikogias, 2014).

However, this process of liberalisation can carry severe systemic risks. The adverse side effects of liberalisation are often neglected due to the attractive advantages it offers (Ang and McKibbin, 2007). The emblematic embezzlement cases of “Energia Power Trading” and “Hellas Power” electricity companies are examples of these adverse effects arising from the liberalisation in Greece. In 2012, an alternative power supplier Energia – Hellas Power was found to have stolen from the state (Danias et al., 2013; Farantouris, 2015). The illegal amount taken totals some 83 million euros, including charges for not paying the relevant consumption tax to the authorities, property taxes, and extracting around 200 million Euros to foreign banks. Several executives of the above companies were found guilty of stealing state money. Cases of fraud as this can have a deterrent effect in the use of alternative electricity suppliers. Concerning the Greek energy system, the final customers became suspicious towards new suppliers, getting back their confidence towards the historically-established provider of PPC (Liappis, 2018).

Overall, Greece is gradually implementing the central components of the relevant Community framework. The electricity market liberalisation has been accompanied by the development of competition in the fields of production and supply, like in other EU countries. Therefore, it is understood that, in recent years, there has been in Greece a maturation at the institutional, organisational, and political level towards faster liberalisation.

6. CONCLUSIONS AND DISCUSSION

The main objective of this study was to examine the regulatory transformation process of the electricity market liberalisation in

Greece. Within this framework, the EU legislation and the specific features of the Greek energy system were analysed, together with the implications and prospects of the liberalisation in a broader European institutional framework. It was pointed out that the evolution of the Greek national energy policy since the beginning of the 21st century has gone through a restructuring process. Based on available stats and the development of the relevant EU legal framework, it was noted that the liberalisation of electricity markets is increasing, at least in the most developed economies. However, an internal European marketplace for electricity has not been realised yet, while the EU is still facing significant challenges.

Greece has already started the legislative steps to abolish the dominant position of PPC, which exploits the production of electricity from lignite and thus hampering competition. The operation of the market, which theoretically is formally liberalised, is far from being relatively competitive, as it shows a high degree of concentration in terms of supply and significant barriers to the access and operation of private enterprises. With the implementation of the target model and the functioning of HEnEx, the further interconnection with the different networks of the EU member states seems possible. Despite the current COVID-19 crisis, Greece is making considerable efforts to be an associated member of the pan-European price matching market and to lead to the faster digital transformation of the energy market.

Concerning the socio-economic forces influencing the liberalisation of the specific market of electricity, the deriving opportunities and threats, and the forecasts that can be made for the near future, the following conclusions can be drawn:

1. To a large extent, the primary socio-economic forces that have so far restrained the processes of sound and efficient liberalisation of the energy market have been the forces that were benefited from the monopoly structure of the market. Corporatist and established interests prevailing within the state energy provider and specific political powers that appeared unable to bear the political costs to accelerate the process of harmonization of Greek legislation with the European are such hindering powers.
2. The attempted market liberalisation process in Greece seems to create several new opportunities, especially in the direction of reducing prices and promoting energy transition to more environmentally friendly forms of energy. Of course, there are also potential threats to this effort, especially in terms of maintaining energy security, as the attempted transition must consider, among other things, the past failed attempts.
3. In the medium to long term, the attempted change in the regulatory framework of the energy market seems imperative as, in its absence, the gap of the energy market in Greece would widen compared to the more advanced operating standards of other energy markets in the European Union.

Overall, it is noted that the attempted liberalisation in Greece increases the opportunities for strengthening the supply structures, even though a particularly strong interest for new investments from international private electricity producers that could be activated in Greece is not observed until this day. At the same time, the current energy policy exercised by this effort to liberalise the

energy market in Greece seems to be now sufficiently aware of issues of sustainable and more environmentally friendly energy use. Finally, the attempted change of the regulatory framework of the energy market in Greece shows that, under certain conditions, the capabilities of the national energy production system in dealing with various forms of energy crisis could be enhanced in the medium term, improving the relative energy autonomy of the country and further strengthening the dimensions of its energy security.

ACKNOWLEDGMENTS

We would like to express our gratitude to Dr. Andreas Andrikopoulos, Associate Professor at the Department of Business Administration of the University of the Aegean, who provided useful comments.

REFERENCES

- Alsaedi, Y., Tularam, G.A., Wong, V. (2020), Impact of solar and wind prices on the integrated global electricity spot and options markets: A time series analysis. *International Journal of Energy Economics and Policy*, 10(2), 337-353.
- Amoiralis, E.I., Andriosopoulos, K. (2017), Challenges for a compliance officer in the liberalised EU energy market: A case study on the Greek gas transmission system operator. *Energy Policy*, 110(C), 117-125.
- Andreou, A., Andrikopoulos, A., Nastopoulos, C. (2017), Debt markets, financial crises, and public finance in the Eurozone: Action, structure, and experience in Greece. In: Economou, F., Gavrilidis, K., Gregoriou, G.N., Kallinterakis, V., editors. *Handbook of Investors' Behavior during Financial Crises*. Ch. 1. London, UK: Academic Press. p3-28.
- Ang, J.B., McKibbin, W.J. (2007), Financial liberalisation, financial sector development and growth: Evidence from Malaysia. *Journal of Development Economics*, 84(1), 215-233.
- Annoni, P., Dijkstra, L. (2019), *The EU Regional Competitiveness Index 2019*. Luxembourg: Publications Office of the European Union.
- Aune, F.R., Golombek, R., Kittelsen, S.A., Rosendahl, K.E. (2008), *Liberalizing European Energy Markets: An Economic Analysis*. Cheltenham: Edward Elgar.
- Bahçe, S., Taymaz, E. (2008), The impact of electricity market liberalisation in Turkey: "Free consumer" and distributional monopoly cases. *Energy Economics*, 30(4), 1603-1624.
- Bhattacharyya, S.C. (2011), *Energy Economics: Concepts, Issues, Markets and Governance*. London: Springer.
- Boyer, R., Saillard, Y. (2001), *Regulation Theory: The State of the Art*. London, New York: Routledge.
- Cadoret, I., Padovano, F. (2016), The political drivers of renewable energies policies. *Energy Economics*, 56, 261-269.
- CEER. (2019), *Monitoring Report on the Performance of European Retail Markets in 2018*. Brussels, Belgium: CEER. Available from: <https://www.ceer.eu/documents/104400/-/-/5c492f87-c88f-6c78-5852-43f1f13c89e4>.
- Cerović, L., Maradin, D., Čegar, S. (2014), From the restructuring of the power sector to diversification of renewable energy sources: Preconditions for efficient and sustainable electricity market. *International Journal of Energy Economics and Policy*, 4(4), 599-609.
- Chen, T., Alsafasfeh, Q., Pourbabak, H., Su, W. (2018), The next-generation US retail electricity market with customers and prosumers-a bibliographical survey. *Energies*, 11(1), 8.
- Correljé, A. (2016), *The European natural gas market*. Current Sustainable

- Renewable Energy Reports, 3, 28-34.
- Danias, N., Swales, J.K., McGregor, P. (2013), The Greek electricity market reforms: Political and regulatory considerations. *Energy Policy*, 62, 1040-1047.
- Denizos, N., Vlados, C., Chatzinikolaou, D. (2019), Energy economy in the era of new globalization: The case of the Balkans and Greece. *International Journal of Economics and Management Studies*, 6(9), 10-19.
- Directorate-General for Energy. (2016), Overview of European Electricity Markets (METIS Technical Note No. T4). Brussels: European Commission.
- Dudin, M.N., Frolova, E.E., Sidorenko, V.N., Pogrebinskaya, E.A., Nikishina, I.V. (2017), Energy policy of the European Union: Challenges and possible development paths. *International Journal of Energy Economics and Policy*, 7(3), 294-299.
- Energy Committee of the Academy of Athens. (2017), Energy Prospects of Greece in 2030 Facing the Horizon of 2050. Available from: <http://www.academyofathens.gr/el/announcements/press-releases/20171121>.
- Energy Exchange Group. (2020), Monthly Wholesale and Retail Penetration and Market Share Report. Available from: <http://www.enexgroup.gr/en/markets/market-analysis/monthly-report>.
- European Commission. (1998), Resolution on the Commission Communication: Energy for the Future: Renewable Sources of Energy-White Paper for a Community Strategy and Action Plan, COM No. 97 0599 C4-0047/98.
- European Commission. (2015), A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, COM.
- European Council. (2020), Special meeting of the European Council, Conclusions. Brussels: European Council.
- European Parliament. (2020), Fact Sheets on the European Union: Internal Energy Market, Matteo, Ciucci. Available from: <https://www.europarl.europa.eu/factsheets/en/sheet/45/internal-energy-market>.
- Farantouris, N. (2015), Liquidity problems of the Greek energy market and state aids. *European State Aid Law Quarterly*, 14(4), 503-509.
- Filippopoulou, O. (2019), The Application of EU Target Model in Greece, Regulatory Authority for Energy. Greece: 84th International Fair of Thessaloniki.
- Galanis, T. (2012), Free competition and anti-competitive practices in the energy sector). In: Farantouris, N., editor. *Energy-Law, Policy and Economics*. Athens: Nomiki Bibliothiki. p115-151.
- Glachant, J.M. (2016), The Long March Towards an EU Power Target Model (1.0) and the Journey Towards a 2030 Target Model (2.0). Florence, Italy: European University Institute, Florence School of Regulation.
- Glachant, J.M., Rueter, R. (2014), The EU internal electricity market: Done Forever? *Utilities Policy*, 31, 221-228.
- Gond, J.P., Kang, N., Moon, J. (2011), The government of self-regulation: On the comparative dynamics of corporate social responsibility. *Economy and Society*, 40(4), 640-671.
- Green, R. (2006), Electricity liberalisation in Europe-how competitive will it be? *Energy Policy*, 34(16), 2532-2541.
- Hammond, E., Spence, D.B. (2016), The regulatory contract in the marketplace. *Vanderbilt Law Review*, 69(1), 141-216.
- Hawker, G., Bell, K., Gill, S. (2017), Electricity security in the European Union-the conflict between national capacity mechanisms and the single market. *Energy Research and Social Science*, 24, 51-58.
- Hedberg, A. (2015), Europe's Energy Security-is the Energy Union the Answer? Brussels, Belgium: European Policy Centre.
- Hellström, M., Tsvetkova, A., Gustafsson, M., Wikström, K. (2015), Collaboration mechanisms for business models in distributed energy ecosystems. *Journal of Cleaner Production*, 102, 226-236.
- Hunt, S., Shuttleworth, G. (1996), *Competition and Choice in Electricity*. Chichester, UK: John Wiley & Sons Publications.
- Iansiti, M., Levien, R. (2004), *The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability*. Boston, MA: Harvard Business School Press.
- IENE. (2019), Greece's Energy Sector, Annual Report 2019 of the IENE (Institute of Energy for South-East Europe). Available from: <https://www.iene.gr/articlefiles/costis-stambolis-ellinikos-energeiakos-tomeas-etisia-ekthesi-2019.pdf>.
- Iliadou, A. (2012), Energy Market Liberalisation under European and National Law. In: Farantouris, N., editors. *Energy-Law, Policy and Economics*. Athens: Nomiki Bibliothiki. p17-32.
- Kampouris, I. (2019), An Overview of the Greek Balancing Market. Regulatory Authority for Energy. Greece: 84th International Fair of Thessaloniki.
- Kangas, H.L., Lazarevic, D., Kivimaa, P. (2018), Technical skills, disinterest and non-functional regulation: Barriers to building energy efficiency in Finland viewed by energy service companies. *Energy Policy*, 114, 63-76.
- Keay, M. (2013), The EU "target model" for Electricity Markets: Fit for Purpose? (Oxford Energy Comment). Oxford, UK: Oxford Institute for Energy Studies.
- Kerr, N., Gillard, R., Middlemiss, L. (2019), Politics, problematisation, and policy: A comparative analysis of energy poverty in England, Ireland and France. *Energy and Buildings*, 194, 191-200.
- Kounetas, K., Skuras, D., Tsekouras, K. (2011), Promoting energy efficiency policies over the information barrier. *Information Economics and Policy*, 23(1), 72-84.
- Kubli, M., Loock, M., Wüstenhagen, R. (2018), The flexible prosumer: Measuring the willingness to co-create distributed flexibility. *Energy Policy*, 114, 540-548.
- Lampropoulos, I., van den Broek, M., van der Hoofd, E., Hommes, K., van Sark, W. (2018), A system perspective to the deployment of flexibility through aggregator companies in the Netherlands. *Energy Policy*, 118, 534-551.
- Liappis, D.C. (2018), *Electricity and Contract Law: From the Monopoly to the Unbundling and the Energy Exchange, with the New Regulations of Law No. 4512/2018*. Athens: Sakkoulas Publications.
- Lundvall, B.Å. (1992), *National Innovation Systems: Towards a Theory of Innovation and Interactive Learning*. London: Pinter Publishers.
- Minister for the Environment and Energy. (2020), Draft Law Energy Market Liberalisation, Modernisation of the Public Power Corporation, Privatisation of the Public Gas Company, and Support of Renewable Energy Sources, Public Online Consultation. Available from: <http://www.opengov.gr/minenv/?p=10101>.
- Mitsotakis, K. (2017), President of the New Democracy Party, at an Event on the Party's Energy Policy. Athens: New Democracy Party Headquarters. Available from: <https://www.nd.gr/nea/eisigisi-toy-proedroy-tis-neas-dimokratias-k-kyriakoy-mitsotaki-se-ekdilosi-gia-tin-energeiaki>.
- Moore, J. (1993), Predators and prey: A new ecology of competition. *Harvard Business Review*, 71(3), 75-86.
- Mourtzikou, A. (2018), The Implementation of the Electricity Target Model in Greece, Regulatory Authority for Energy. Greece: 83th International Fair of Thessaloniki.
- New Democracy. (2017), Energy Policy Proposal by the New Democracy Party-Press Release. Athens: New Democracy Party Headquarters. Available from: <https://www.nd.gr/deltia-tipou/i-protasi-tis-neas-dimokratias-gia-tin-energeiaki-politiki>.
- Nicolli, F., Vona, F. (2019), Energy market liberalization and renewable energy policies in OECD countries. *Energy Policy*, 128, 853-867.
- Panagos, T. (2011), *The Separation of Enterprises Operating in the Energy Sector*. Athens: Sakkoulas Publications.

- Papadionysiou, E. (2019), Electricity Derivatives, Day-Ahead and Intra-Day Markets Operation under Target Model. Regulatory Authority for Energy. Greece: 84th International Fair of Thessaloniki.
- Pepermans, G. (2018), European energy market liberalization: Experiences and challenges. *International Journal of Economic Policy Studies*, 13(1), 3-26.
- Polemis, M.L. (2014), Competition in the relevant electricity markets in Greece: Utopia or reality? In: Farantouris, N., editors. *Energy-Networks and Infrastructure*. Athens: Nomiki Bibliothiki. p157-182.
- Radulovic, D., Skok, S., Kirincic, V. (2011), Energy efficiency public lighting management in the cities. *Energy*, 36(4), 1908-1915.
- Secretariat for Strategic Planning and Communication of the New Democracy party. (2020), 6+1 Steps for the Energy Transition of Greece. Athens: New Democracy Party Briefing Report.
- Shin, K.J., Managia, S. (2017), Liberalisation of a retail electricity market: Consumer satisfaction and household switching behavior in Japan. *Energy Policy*, 110, 675-685.
- Specht, J.M., Madlener, R. (2019), Energy supplier 2.0: A conceptual business model for energy suppliers aggregating flexible distributed assets and policy issues raised. *Energy Policy*, 135, 110911.
- Synodinos, C. (2014), Energy networks and infrastructure: Recent legal developments. In: Farantouris, N., editors. *Energy-Networks and Infrastructure*. Athens: Nomiki Bibliothiki. p203-224.
- Tarnanidou, C. (2016), Contemporary Energy Markets: Institutional Framework and Greek Perspective. Athens: Nomiki Bibliothiki.
- Tsikogias, A. (2014), Environment and energy: The road to alternative energy sources amid crisis in the EU and the role of smart grids. In: Farantouris, N., editors. *Energy-Networks and Infrastructure*. Athens: Nomiki Bibliothiki. p369-386.
- Vihalemm, T., Keller, M. (2016), Consumers, citizens or citizen-consumers? Domestic users in the process of Estonian electricity market liberalization. *Energy Research and Social Science*, 13, 38-48.
- Vlados, C. (2019), The phases of the postwar evolution of capitalism: The transition from the current crisis into a new worldwide developmental trajectory. *Perspectives on Global Development and Technology*, 18(4), 457-488.
- Vlados, C., Chatzinikolaou, D. (2020), Advancements on helix theory and the strategy-technology-management approach: Towards a new synthesis. *International Journal of Management Concepts and Philosophy*, 13(2), 136-152.
- Vlados, C., Chatzinikolaou, D., Demertzis, M. (2019), Development, competitiveness and institutional modernisation: Towards a new approach to the Greek crisis. *International Journal of Competitiveness*, 1(4), 293-318.
- Vlados, C., Deniozos, N., Chatzinikolaou, D., Demertzis, M. (2018), Conceptual misunderstandings in the structuration of anti-crisis economic policy: Lessons from the Greek case. *Journal of Governance and Public Policy*, 5(3), 283-322.
- von Danwitz, T. (2006), Regulation and liberalization of the European electricity market-a German view. *Energy Law Journal*, 27(2), 423-450.

APPENDIXES

Appendix 1: Suppliers market shares (%) per voltage level (HV-MV-LV) in the interconnected system based on their load declaration in Day-Ahead Scheduling (DAS) for January 2020. The Public Power Corporation-PPC (“ΑΕΗ”, in Greek) is the primary supplier

Supplier	Year	Month	HV(MW/h)	Monthly Quantities			Monthly Share		
				MV(MW/h)	LV(MW/h)	DAS-Consumption (MW/h)	HV-Share (%)	MV-Share (%)	DAS-Consumption (%)
ΔΕΗ	2020	1	466.858	549.746	2,393,020	3,409,625	97.15	53.72	73.21
ΔΕΗ ΙΙΚΥ	2020	1			27.315	27.315			0.84
ΜΥΤΙΛΙΝΕΟΣ	2020	1	900	124.726	142.591	268.217	0.19	12.19	4.36
ΗΡΩΝ	2020	1		94.533	153.055	247.588		9.24	4.68
ΕΛΠΕΔΙΣΟΝ	2020	1	11.939	68.721	141.008	221.668	2.48	6.72	4.31
WATT and VOLT	2020	1		20.206	105.625	125.831		1.97	3.23
NRG	2020	1		52.812	55.241	108.052		5.16	1.69
VOLTERRA	2020	1	13	38.655	44.892	83.56	0.00	3.78	1.37
ΑΕΠΙΟ ΑΤΤΙΚΗΣ	2020	1		20.4	36.682	57.082		1.99	1.12
VOLTON	2020	1		1.537	47.469	49.007		0.15	1.45
ZENIO	2020	1		9.805	36.364	46.169		0.96	1.11
EATA	2020	1		21.027	20.539	41.566		2.05	0.63
KEN	2020	1		3.326	36.308	39.634		0.32	1.11
ΟΤΕ ΑΚΙΝΗΤΑ	2020	1		184	19.543	19.726		0.02	0.60
BIENER	2020	1		8.384	244	8.628		0.82	0.01
PETROGAZSA	2020	1		4.844	92	4.936		0.47	0.10
GRE. EN.	2020	1		102	4.458	4.56		0.01	0.14
INTERBETON	2020	1		2.107	83	2.189		0.21	0.00
ELINOIL	2020	1		490	1.636	2.126		0.05	0.05
ECON. GROWTH	2020	1		972	880	1.852		0.09	0.03
EUNICE	2020	1		319	796	1.116		0.03	0.02
SOLAR ENERGY	2020	1		13	973	986		0.00	0.03
KORINTHOS POWER	2020	1	567			567	0.12		0.01
ΑΙΓΙΝΙΤΙΚΗ ΜΕΛΙΤΗΣ	2020	1	264			264	0.05		0.01
VIOLAR	2020	1		179	5	184		0.02	0.00
ENEL GREEN POWER	2020	1		169		169		0.02	0.00
K. MAPKOY	2020	1		86		86		0.01	0.00
Totals			480.541	1,023,342	3,268,818	4,772,701	100.00	100.00	100.00

Source: Energy exchange group (2020)

Appendix 2: Suppliers market shares (%) per voltage level (HV-MV-LV) in the interconnected system based on their load declaration in Day-Ahead Scheduling (DAS) for July 2020. The Public Power Corporation-PPC (“ΔΕΗ”, in Greek) is the primary supplier

Supplier	Year	Month	HV(MWh)	Monthly quantities				Monthly share		
				MV(MWh)	LV(MWh)	DAS-Consumption (MWh)	HV-Share (%)	MV-Share (%)	LV-Share (%)	DAS-Consumption (%)
ΔΕΗ	2020	7	644.591	343.828	2,274.422	3,262.842	97.50	34.22	72.18	67.74
ΔΕΗ ΠΚΥ	2020	7			33.997	33.997			1.08	0.71
MYTILINEOS	2020	7	680	176.915	145.772	323.367	0.10	17.61	4.63	6.71
HPQN	2020	7		134.125	163.475	297.6		13.35	5.19	6.18
ELPEDISON	2020	7	9.591	89.245	133.688	232.524	1.45	8.88	4.24	4.83
NRG	2020	7		82.067	66.58	148.647		8.17	2.11	3.09
WATT and VOLT	2020	7		22.711	102.146	124.857		2.26	3.24	2.59
VOLTERRA	2020	7	12	63.35	37.446	100.808	0.00	6.30	1.19	2.09
ΑΕΠΟ ΑΤΤΙΚΗΣ	2020	7		32.062	31.352	63.414		3.19	0.99	1.32
ZENIO	2020	7		12.514	41.733	54.247		1.25	1.32	1.13
VOLTON	2020	7		2.869	44.804	47.674		0.29	1.42	0.99
EATA	2020	7		15.343	21.228	36.571		1.53	0.67	0.76
KEN	2020	7		3.09	28.864	31.954		0.31	0.92	0.66
BIENER	2020	7		10.513	234	10.747		1.05	0.01	0.22
HPQN ΠΚΥ	2020	7			6.652	6.652			0.21	0.14
PETROGAZSA	2020	7		5.951	426	6.377		0.59	0.01	0.13
OTE AKINHTA	2020	7		192	6.013	6.205		0.02	0.19	0.13
ELINOIL	2020	7		3.263	2.879	6.142		0.32	0.09	0.13
EUNICE	2020	7		2.827	1.804	4.631		0.28	0.06	0.10
ΑΙΓΙΤΙΚΗ	2020	7	4.56			4.56	0.69			0.09
ΜΕΤΑΛΟΠΟΛΗΣ										
INTERBETON	2020	7		2.447	81	2.528		0.24	0.00	0.05
GRE. EN.	2020	7		48	2.405	2.453		0.00	0.08	0.05
SOLARENERGY	2020	7		724	1.153	1.877		0.07	0.04	0.04
ΑΙΓΙΤΙΚΗ ΜΕΛΙΤΗΣ	2020	7	1.344			1.344	0.20			0.03
MYTILINEOS ΠΚΥ	2020	7			1.284	1.284			0.04	0.03
ELPEDISON ΠΚΥ	2020	7			1.087	1.087			0.03	0.02
NRG ΠΚΥ	2020	7			939	939			0.03	0.02
ΔΕΗ ΙΤΚ	2020	7		195	528	723		0.02	0.02	0.02
KORINTHOS POWER	2020	7	322			322	0.05			0.01
VIOLAR	2020	7		242	7	249		0.02	0.00	0.01
K.MAPKOY	2020	7		238		238		0.02		0.00
ENEL GREEN POWER	2020	7		131		131		0.01		0.00
Totals:			661.1	1,004,893	3,150,998	4,816,991	100.00	100.00	100.00	100.00

Source: Energy Exchange Group (2020)