Streimikiene, D., Bruneckiene, J., Cibinskiene, A. (2013), "The Review of Electricity Market Liberalization Impacts on Electricity Prices", *Transformations in Business & Economics*, Vol. 12, No 3 (30), pp.40-60.

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BUSINESS & ECONOMICS

THE REVIEW OF ELECTRICITY MARKET LIBERALIZATION IMPACTS ON ELECTRICITY PRICES

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Received: April, 2012
1st *Revision*: January, 2013
2nd *Revision*: April, 2013
Accepted: October, 2013

ABSTRACT*. *The paper aims to analyse and generalize the results of empirical studies dealing with assessment of electricity market liberalization impacts. The main tasks of the paper: to review results of studies dealing with electricity market liberalization impacts and to develop framework for assessment of the impact of energy market liberalization in terms of achievement of the main EU energy policy goals consisting of the three main pillars: competiveness, environmental sustainability and security of energy supply. Analysis of electricity market liberalization impact on EU energy policy priorities indicated that countries ranked with high energy market liberalization indicators not necessarily have been ranked with high scores according indicator for the assessing EU energy policy goals.

KEYWORDS: electricity market liberalization, EU energy policy goals, competitiveness, environmental sustainability, security of energy supply.

JEL classification: Q4, Q5, O2, C5.

Introduction

The European Union (EU) has identified energy sector as one of its main policy priorities. Reliable and sustainable energy supplies at reasonable prices for businesses and consumers are crucial to the European economy. In the past, the energy industries have been organized as vertically integrated monopolies and mainly state owned. The growing ideological and political disaffection towards vertically integrated monopolies and the liberalization successes in other network industries have lead to liberalization initiatives in the energy industries. The oil sector has been liberalized the first one. The electricity sector was the next on agenda. Vertically integrated utilities have been vertically separated or unbundled and barriers to entry in generation and supply are being removed to create competition and to increase the competitiveness of the electricity industry Littlechild (2001), Newbery (2001). The first liberalisation directives in EU were adopted in 1996 (electricity) and 1998 (gas) and should be transposed into Member States' legal systems by 1998 (electricity) and 2000 (gas). The second EU liberalisation directives were adopted in 2003 and were to be transposed into national law by Member States by 2004, with some provisions entering into force only in 2007. The Third electricity directive adopted in 2009 confirms the trend initiated by the precedent 2003 Directive of setting general guidelines for the government of the sector and further strengthen consumer protection, innovation and makes an attempt to merge national systems into one European electricity markets. The three EU Directives discussed the following important issues: market opening, third party access and the system operator. The

Directive 96/92/EC introduced the concept of 'eligible consumers', having the legal capacity to contract volumes of electricity from any supplier. The Directive aimed at a slow, gradual and partial opening of the Member States' electricity markets so that more and more generators and consumers have the opportunity to freely negotiate the purchase and sales of electricity. With the new Directive 2003/54/EC replacing the first Directive the process is dramatically accelerated and all non-households customers are eligible from 1 July 2004 and all consumers will be eligible from 1 July 2007. The suppliers and generators need to be assured they will have access to the grid to settle negotiated electrical energy transactions for delivering electric energy Roggenkamp, Boisseleau (2005). Directive 2003/54/EC therefore introduces one regime, being regulate Third Pat Access (rTPA), and the requirement to appoint a regulator, who has to approve the tariffs, monitor congestion management and act as a dispute settlement authority Bergeman *et al.*, (1999). The second Directive 2003/54/EC can be characterized by shorter term deadlines and less freedom which should result in more convergence between Member States. The third energy liberalization package contains some commendable provisions on strengthening national regulators and on increased transparency in record keeping. However the package does little to enforce transparency in price formation or to break up regulated tariffs. Since the introduction of the first directive in 1998 opening EU energy markets to competition, the situation in energy sector has changed dramatically in member states. The coherence among three pillars around which EU energy policy is built – competitiveness, security of energy supply and environmental sustainability is necessary to achieve. Therefore it is important to assess the impact of electricity market liberalization on the competiveness, security of supply and sustainability. Such type of assessment would allow to track the progress achieved in energy market liberalization in specific country and to assess the impact of this progress achieved on the main pillars of EU energy policy.

The aim of the paper is to analyse and generalize the results of empirical studies dealing with assessment of energy market liberalization impacts. ***The main tasks to achieve the aim of the paper***: 1. to review results of studies dealing with electricity market liberalization impacts; 2. to develop framework for assessment of the impact of energy market liberalization in terms of achievement of the main EU energy policy goals; 3. to apply framework for assessment of electricity market liberalization impact on EU energy policy priorities.

1. The Review of Electricity Market Liberalization Impacts

There are several important studies conducted all over the world dealing with energy markets liberalization especially in electricity sector. One of the first studies aiming to develop models for assessing impact of regulatory regimes on electricity market environments and performances was conducted by Steiner (2000). He analyzed the effect of regulatory reforms on the retail price for large industrial customers as well as the ratio of industrial price to residential price, using panel data for 19 OECD countries for the period 1986-1996. Steiner found that regulatory reforms to introduce competition into the industry, including the creation of a wholesale spot market and the unbundling of electricity generation from transmission, generally induced a decline in the industrial price and an increase in the price differential between industrial customers and residential customers, indicating that industrial customers benefit more from the reform. These results support some policy recommendations currently made by the OECD. For example, in its policy recommendation of structural separation in the network industries, OECD judges that the results show signs of enhanced competition in the electricity supply industry from the unbundling of generation Gonenc *et al.* (2001). Although the analysis was carefully conducted as a first step in assessing the impact of the reforms, it has several shortcomings and needs to be improved before reaching a consensus as to the policy recommendation.

The Steiner applied regression analysis for assessing the linkages between electricity liberalization model and electricity prices for 19 countries (Steiner, 2000). He used as indicators of competitiveness: industrial electricity prices, the ratio of industrial to residential prices, utilization rates and reserve margins. In his study the author concluded that the unbundling of generation and transmission, the expansion of third party access (TPA) and introduction of electricity markets reduce industrial and-users prices. The Sterner model of the impact of liberalization on electricity prices:

$$p_e = \alpha + \beta R + \gamma NR + \varepsilon \qquad (1)$$

Here: p_e– the industrial electricity prices, R – regulatory variables; NR- non-regulatory variables; α, β and γ are vectors of coefficients that were estimated and ε – is residual term.

The main regulatory variables according Steiner (2000) are: unbundling of generation from transmission, Third party Access (TPA), Wholesale Pool, Ownership, Time to liberalization, time to privatization. The main independent non-regulatory variables: hydropower share, nuclear share and GDP. The two share variables reflect differences in generating technologies across economies, which affect the marginal costs and hence the price of generating electricity. Finally the inclusion of GDP adjusts for differences in the size of economies and is also an overall measure of national income (*Table 1*).

Table 1. The Steiner's model of assessing impact of electricity market liberalization on electricity prices

Variables	Measurements
Dependent variables	
Industrial electricity prices	Pre-tax industrial price (expressed in US PPP$)
Independent regulatory variables	
Unbundling of generation from transmission	Dummy variable (1=accounting separation or separate companies; 0=otherwise)
Third-party access	Dummy variable (1=regulated or negotiated third-party access; 0=otherwise)
Wholesale pool	Dummy variable (1=presence of wholesale electricity markets; 0=otherwise)
Ownership	Discrete variable (4=private ownership; 3=mostly private ownership; 2=mixed; 1=mostly public; 0=public)
Time to liberalization	Negative of the number of years to privatisation (ranges from 11 to 0)
Time to privatization	Negative of the number of years to privatisation (ranges from 11 to 0)
Independent non-regulatory environmental variables	
Hydro share	Share of electricity generated from hydropower sources
Nuclear share	Share of electricity generated from nuclear sources
Gross domestic product	Gross domestic product (expressed in USPPP$ billion)

Source: Steiner, 2000.

Three of the six regulatory coefficients: for separating generation from transmission, allowing TPA to the transmission grid, allowing the wholesale electricity market are led to lower electricity prices. The coefficients on the three remaining variables – private ownership, time to liberalization and time to privatization – are less intuitive. The regulatory variables in Steiner's model focus on the key economic regulation needed to establish competitive generation sector- vertical unbundling of the generation system from the transmission system, whether third parties can access the transmission system, and whether a wholesale market exists. Dummy variables are used to indicate 3 key economic regulations needed to establish a competitive generation sector.

The unbundling of generation from transmission variable takes on a value 1 if separate companies are involved in the generation and transmission sectors or if both sectors are managed by a single entity, but separate accounts are kept for each sector (accounting separation); otherwise it takes on a value of 0. The TPA variable takes on a value 1 if generators and eligible customers have a legal right to access the transmission grid on a certain specific terms and conditions (regulated TPA) or can negotiate the terms and conditions under which grid access can occur directly with the operator of the transmission grid (negotiated TPA); otherwise it takes on a value of 0. The wholesale market variable takes on a value of 1 if generators can voluntarily sell or are obliged to sell their electricity into a wholesale electricity market, otherwise it takes on a value of 0.

Additionally to the above three regulatory variables needed to establish a competitive generation sector, F. Steiner included 3 market structure variables in the model: ownership variables takes on different discrete values ranging from 0 to 4, depending on the mix of public and private ownership. The time to liberalization and time to privatization variables measure the negative number of years to liberalization and privatization respectively. Indicators of the time remaining to liberalization and privatization are included as a proxy for the impact of expectations of liberalization and privatization on prices. These indicators are forward looking as they assesses the effect of regulation on prices before liberalization or privatization, In Sterner model the time to liberalization is interpreted as being the time until the year in which key legislative changes are enacted, and time to privatization is deemed to be the time until the year in which the first sale of a public owned generators occurs.

The Sterner's model also includes 3 non-regulatory variables – the share of electricity generated from hydro; the share of electricity generated from nuclear and the GDP. The two share variables reflect differences in generating technologies across economies which affect the marginal costs and hence the price of generating electricity. Finally, the inclusion of GDP adjusts for differences in the size of economies and is also an overall measure of national income.

Table 2. Effects of regulation on electricity prices: random effects model

Variable	Estimated coefficient	Z-statistic	Value under the benchmark regime
Constant	0.0667	7.104	0.0667
Regulatory and industry variables			
Unbundling of generation from transmission	-0.0011	-0.659	Separate
Private ownership	0.0029	2.7	
Third-party access	-0.0027	-1.357	Third party access
Wholesale pool	-0.0052	-2.306	Yes
Time to liberalization	0.0008	2.814	
Time to privatization	0.0006	1.51	
Non-regulatory environmental variables			
Hydro share	-0.0341	-3.252	
Nuclear share	0.0023	0.132	
Gross domestic product	0	1.011	

Source: Steiner, 2000.

The results of Steiner's model are summarized in *Table 2*. The *Table 2* provides the impact of each economic regulation parameter on price. From these individual impacts it is possible to gauge the overall impact of economic regulation on price.

The indicators of regulation, industry structure, and performance were used to estimate equation (1) for the electricity supply industry. The model was estimated separately for industrial prices and for the ratio of industrial to residential prices. In the long run, liberalisation and privatisation may reduce electricity prices. On the other hand, the positive and significant coefficient on ownership suggests that private ownership is not necessarily correlated with increased competition. This indicator reflects the influence of historic private ownership in addition to recent privatisation. The former could be correlated with higher prices due to a higher cost of capital, less tax advantages, and less access to low-cost hydro resources. In fact, in many countries in the panel, private ownership coincides with a highly concentrated market (*e.g.* Belgium). Furthermore, privatisation of historically public generators may still result in high prices in the short run. Governments may actually increase electricity prices in order to sell assets and generate revenue. Furthermore, while governments may use privatisation as a platform for horizontal unbundling, if horizontal unbundling does not reach far enough, post-privatisation prices may remain high. However, the coefficient on TPA was not statistically significant. This may be because TPA will not make a difference in prices if legal TPA does not result in actual entry and if the incumbent retains practical control of the market. The coefficient on the spot market indicator was statistically significant. A real spot market should lower prices by inducing competition.

The paper by F. Steiner (2000) has provided a first attempt to assess, on the basis of international evidence, to what extent regulatory reform in the electricity industry can contribute to improved efficiency and welfare outcomes. The primary empirical findings concerning the impact of regulatory reforms on efficiency and prices are as follows:

– The ratio of industrial to residential end-user electricity prices is reduced by the unbundling of generation and transmission, expansion of Third Party Access (TPA), and introduction of electricity markets. The existence of these markets also tends to reduce the levels of industrial end-user prices. However, a high degree of private ownership and imminence of both privatisation and liberalisation tend to increase industrial end-user prices.

– Unbundling of generation and transmission and private ownership each serve to improve the utilisation of capacity in electricity generation.

– Unbundling of generation and transmission also brings reserve margins (the ability of capacity to handle peak load) closer to their optimal level.

Taken together, these findings suggest that regulatory reforms involving vertical separation of the industry, market price determination and privatisation impacted favourably on efficiency. However, the effects of regulatory reform on prices appear to depend crucially on the ability of regulatory policies to control market power after reforms have been implemented. The Steiner's model with some modifications was applied in several studies following the similar approach. As the Steiner model includes only a subset of economic regulations affecting the generation sector, the impact measures calculated are unlikely to measure the full extent to which economic regulations impact industrial electricity prices. Doove *et al.* (2001) extended Steiner's approach and conducted study to assess the impact of regulation on electricity prices by applying benchmark regulation (Doove *et al.*, 2001). The appropriate benchmark against which the effect of regulatory regimes can be measured is necessary. This benchmark corresponds to the optimal level of regulation, namely socially least costly way of achieving the desired objectives. Doove *et al.* (2001) stressed that one practical option is to use the combination of regulation that minimize the prices implied by the estimated equation. All regulatory regimes: separation of generation from transmission, allowing TPA to the transmission grid and allowing for a wholesale electricity market are all found to lead to lower electricity prices. The other regimes: private ownership, time to liberalization, time to privatization is counterintuitive and they were not included in the calculations of price impacts. By applying the similar approach as F. Steiner the updated model assessed the price impacts for industrial electricity sector for each of 50 countries during 1990-1996 year period. The price impact of regulation in EU member states is presented in *Table 3*.

Table 3. Price impact of regulation in electricity sector of EU member states, %

Country	Price impact, %
Austria	13.2
Belgium	15.4
Denmark	8.5
Finland	0.0
France	16.0
Germany	8.3
Greece	16.6
Ireland	13.9
Italy	17.1
Luxemburg	13.8
Netherlands	15.5
Portugal	17.9
Spain	9.5
Sweden	0.0
United Kingdom	0.0

Source: Doove *et al.,* 2001.

The *Table 3* indicates that as a result of regulatory regime implemented in electricity sector for example in Portugal, during 1990-1996 the price of electricity was 17.9% higher than the price of electricity in Sweden and United Kingdom. This indicates positive impact of electricity market liberalization on decrease of electricity prices.

Hatori, Tsutsuialso applied the Steiner's model for the same 19 OECD countries and extended it through 1999 (Hattori, Tsutsui, 2004). The study re-examined the impact of the regulatory reforms on price in the electricity supply industry and compares results with those found in a previous studies (Steiner, 2000; Doove *et al.*, 2001). The study provided results for both random and fixed effect estimation. They found significant positive impact on electricity prices in the presence of wholesale electricity market and that TPA has negative impact. In addition the study Hattori, Tsutsui (2004) proved that the private ownership coefficient is significantly negative for prices. Some results obtained by Hattori, Tsutsui (2004) are contradictory to Steiner results. They also found that the extended retail market is likely to lower the industrial price and increase the price differential between industrial consumers and households.

Following F. Steiner's approach, the regression equations were developed to analyze the impact of regulatory reform in the electricity supply industry on the level of the industrial price and the ratio of the industrial price to the residential price. The two equations are estimated separately. Denoting the price level or price ratio as y, the equation is written as follows:

$$y_{it} = a + X'b + Z'g + m_i + v_{it}, \quad (2)$$

where X' is a set of regulatory reform indicators to reflect the degree of reform in various components of regulatory policy and Z' is a set of independent variables not directly related to regulatory reforms. Subscript indicates the country and t indicates the time period; m_i accounts for an unobservable time-invariant country-specific effect, while $v_{it}$is the normal disturbance term.

It was assumed that the country-specific effect exists, and authors utilized some basic panel-data-estimation techniques, namely, a one-way fixed effect model and a one-way random effect model. The results indicated that the unbundling of generation and the introduction of a wholesale spot market did not necessarily lower the price, and may possibly have resulted in a higher price. The findings as to the unbundling and the spot market are not consistent with expectation and are different from those of Steiner. However, the results of Hattori, Tsutsui (2004) study are plausible in the light of the experiences in some countries. It is possible that the unbundling of generation from transmission increases transaction costs, which would be paid by final customers.

It has also been observed that electricity spot markets are vulnerable to the exercise of market power by generators. In addition, these results indicated that there is a need for further analyses of the effect of reforms in the electricity supply industry. Study Hattori, Tsutsui (2004) also indicated that it is too early to reach concrete judgments as to policy recommendation for countries considering such reform in the future. The industry may yet be in a transitional state in which the policy makers are still working hard to ''get it right''. It may take much more time for the welfare enhancing effect of reforms to be realized. Estimation of the long-run effects of the reform on prices will have to wait until a longer time series becomes available, although it should not be forgotten that market participants will always respond very quickly to a changing electricity environment. The regulatory reform in the electricity supply is still an on-going process in many countries, and this underscores the importance of continuing efforts to analyze the net impact of the reform, as most of the reform policies are irreversible (Hattori, Tsutsui, 2004).

To determine if the difference between F. Steiner's results and Hatori, Tsutsui study is caused by the different sample period, the more recent study estimated the same model using the data for the period up to 1996. The parameter estimates for the regression equation (1) are shown in *Table 4*.

In *Table 4* "The model 0" is the result from Steiner's study, in which few regulatory indicators are statistically significant. The existence of a wholesale power market statistically significantly lowers the industrial price. Unbundling and TPA have negative parameter estimates, but are not statistically significant. Time to liberalization and privatization are both positive, but the time to privatization is not statistically significant. As expected, the share of hydro generation has a statistically significantly negative coefficient. The share of nuclear generation and GDP are not statistically significant.

Table 4. Regression results for the analysis of the price level

Model	0	1	2	3	4	5
Sample period	1986-1996	1987-1999	1987-1999	1987-1996	1987-1999	1987-1999
Estimation	Random effect (Steiner, 2000)	Fixed effect	Random effect	Random effect	Fixed effect	Fixed effect
Constant	0.067	-	0.077	0.078	-	-
Unbundling	-0.001	0.004	0.003	-0.002	0.004	0.005
Private ownership	0.003	-0.009	-0.007	-0.002	-0.009	-0.007
Retail access/TPA	-0.003	-0.005	-0.005	-0.002	-0.005	-0.004
Wholesale market	-0.005	0.009	0.007	0.005	0.008	0.009
Time to liberalization	0.001	0.001	0.002	0.002	0.002	0.00169
Share of hydro	-0.034	-0.027	-0.033	-0.029	-0.028	-0.031
Share of nuclear	0.002	0.037	-0.004	-0.040	0.043	0.062
GDP	0.000	-0.011	-0.006	-0.004	-0.010	-0.005
Time trend	-	-	-	-	-	-0.002
Hausman test statistics	16.39		25.59	13.19	20.21	13.48
(P-value)			0.0024	0.1544	0.0096	0.0963

Source: Hattori, Tsutsui, 2004.

In the next two columns (Models 1 and 2) of *Table 4*, the results obtained from other models that most closely replicate Steiner's model. These models are estimated using a data set extended to 1999. Model 1 is estimated as Model 3, is based on the random effect model, since the Hausman test statistics indicated that the random effect model is preferred. The unbundling of generation is statistically insignificant, as in Steiner's result. The retail access also is statistically insignificant, as was the TPA indicator in Steiner's study. On the other hand, the wholesale power market still takes a statistically significantly positive coefficient, and private ownership still takes a negative coefficient though it is insignificant. Based on this comparison, the effects of unbundling and retail access shown in Models 1 and 2 are at least partly due to the extension of our data set to 1999.

Comparing the results of Models 1 and 2 with those of F. Steiner's study (2001), it is possible to observe several differences. First, the existence of a wholesale power market was statistically significantly negative in Steiner's study, but is significantly positive in 1 and 2 models. TPA in Steiner's model was statistically insignificantly negative, but in following study (Hattori, Tsutsui, 2004) retail access parameter is statistically significantly negative in both Models 1 and 2. The share of private ownership was statistically significantly positive in Steiner's model, but is statistically significantly negative in (Hattori, Tsutsui, 2004) models. The share of hydro capacity is negative but not statistically significant. The share of nuclear capacity is not statistically significant, either. GDP is statistically significantly negative in 1 and 2 models.

According to Hattori, Tsutsui (2004) one of the potential problems with Steiner's model is that it includes both "time to liberalization" and "time to privatization". These variables are highly correlated, and in fact, one of them ("time to privatization") was statistically insignificant in his model. Another potential problem is that the effect of "time to liberalization" may serve as the effect of a simple linear time trend, by which the effect of technological progress in the electricity supply industry throughout the world may be captured.

Zhang *et al.* in the more recent study Zhang *et al.* (2008) also measured the effect of such variables as the existence of an independent regulatory agency, a wholesale electric power pool market, private electric business, electricity generation per capita, installed capacity per capita, electricity generation per employee and residential/industrial electricity prices using data from 51 developing countries in the time frame ranging from 1985 to 2000. The study Zhang *et al.* (2008) proved that nether privatization on its own, nor regulation on its own leads to obvious gains in economic performance. This is because of the effect either of privatization or having an autonomous regulator is statistically insignificant. Zhang *et al.* (2008) used real per-capita GDP, the urban population ratio, and the degree of economic freedom as well as three dummy variables relating to the competition and privatization used as the explaining variable. As pointed out in Zhang *et al.* (2008), privatization alone may not result in performance improvement. Competition and, in its absence, effective regulation may be required to capture any potential benefits privatization might bring.

In study conducted by Nagayama (2009) the effect of the selected liberalization models on electricity prices was investigated for 78 countries for period ranging from 1985 to 2003. The study Zhang *et al.* (2008) estimated the impact of the policy variable of the electric sector reform on electricity prices in order to examine the effect of the sector reforms. The following fixed-effect/random-effect model was developed:

$$\gamma_{it}^{*} = \alpha + \beta X_{it-2} + Z_{it} + \gamma_i + \varepsilon_{it} \tag{3}$$

γ_{it}^{*} - electricitypower prices, X_{it} selected liberalization model, Z_{it} is GDP per capita, γ_{it} - country specific effect and ε_{it} is the normal disturbance term.

Since the political democratic degree index can be seen as exogenous to the equation of interest and is deeply related to the selected liberalization model, the political democratic degree index, M_{it}. was employed. Other factors such as market power or regulatory costs are difficult to obtain for 78 countries with the same standards. Fuel prices have different impacts on the electricity prices for each country, due to taxes exercised by each country or by natural endowment. This factor was not considered in the model.

H. Nagayama (2009) applied Polity IV as the political democratic degree index. The Polity IV Project was created by the Center for International Development and Conflict Management atthe University of Maryland. The democratic degree of each country from 1800–2003 are arranged in a database as Political Regime Characteristics and Transitions at http:// www.cidcm.umd.edu/inscr/polity/. Under the Polity IV Project, since many polities have the characteristic of both democracy and autocracy, the characteristic of a government at a certain period is measured as Polity Index by representing both democracy (DEMOC) and autocracy (AUTOC) of each year with indicators and subtracting the AUTOC score from the DEMOC score. The range of numerical value is -10 (Full Autocracy) to 10 (Full Democracy). This means the polity of each country can be represented by a score of -10 to 10.

The results of Nagayma (2009) model indicated that in developed countries, the regulatory costs and the exercise of market power associated with shifting to higher liberalization models are stronger than the downward pressure to decrease electricity prices. Hence, it is more likely that prices will remain high in these countries. In the former Soviet Union and in Eastern Europe, the pressure of decreasing residential prices as the result of liberalization can be explained by governmental pressure to keep the electricity tariffs low. In Asian developing countries, cross-subsidies exist from industrial users to residential users as industrial users are less subsidized. The cross-subsidies are removed in these countries as the liberalization models progressed. In Latin American countries, the impact of liberalization on electricity prices is mixed as liberalization models progress. This is probably due to the fact that wholesale and retail prices tend to rise under the process of unbundling and privatization in order to assure profit to private investors, which are comprised mostly of multinational corporations.

As the liberalization model develops the number of stakeholders in the sector increases along with the maintenance cost. Developing countries need to be particularly careful regarding which models of liberalization they choose to employ. In terms of control variables, the study find that the industrial and the residential electric power prices decrease in the developed countries while GDP per capita increases. The statistically significant data for other areas were not obtained in Nagayma (2009).

There is still much room for improvement within the models and data presented in the study Nagayma (2009). There is a need to further scrutinize the models against further data in the future. In addition in developed countries within the EU, the directives of the European Commission also had an impact on the adoption of the reforms, irrespective of prices. The policy which was intended to promote competition and efficiency ended up with compromising efforts to secure the additional power supply necessary for developing countries, to achieve. It is necessary to understand that the number one root cause of the massive problems in a developing country's power sector is the high cost of electricity production which governments are unwilling to pass on to consumers for political reasons. Splitting public utilities into private companies in the name of power sector reform will not purely solve this problem. This problem can only be solved by pushing hard to implement low cost power generation projects. The results of study indicated that there is a need for continued analyses of the effect of reforms in the electricity supply industry. There is also an indication that it is too early to reach any concrete judgment for future policy recommendations based on the results of conducted study. An accurate calculation of the long-term effects of reforms on prices will require much additional study over longer periods of time. In many countries, regulatory reform in electricity supply is still an on-going process, a fact that also highlights the need for continued studies of electricity market reforms impact on electricity prices.

Several other studies examining the impact of electricity market liberalization on electricity prices have presented contradictory results. In looking at the impact of unbundling on retail price the study Bushnell *et al.* (2008) found that had New England markets been forced to fully unbundle (as happened in California), retail prices in those areas would have been significantly higher due to production inefficiencies. Hogan, Meade (2007) also found that generators tend to overstate their wholesale prices when there is unbundling, resulting in higher retail prices. On the other hand, Fiorio *et al.* (2008) examining the impact of reform on household electricity prices in 15 EU countries over the period 1978 and 2005, found that less vertical integration is associated with lower prices. Joskow (2006) used time series econometrics to find that competitive wholesale and retail markets reduced prices (relative to their absence) by 5-10% for residential customers and 5% for industrial customers.

International Energy Agency observed indications of cycles in liberalized electricity markets in some IEA member countries (IEA, 2007). Kadoya *et al.* (2005) used a substantial excess of capacity as an indication for strong capacity boom and bust cycles. Arango, Larsen (2011) showed in their study that deregulation and competition can lead to sustained cycles in electricity systems. They proved that deregulation and competition are actually the reasons for this long-term behaviour. They proved that the introduction of deregulation in an electricity system leads to systematic fluctuations of over- and under-capacity. Such an occurrence of cycles is one of the major threats for electricity markets since it affects consumers and producers alike. The cycle hypothesis was formulated based on analogies with capital-intensive industries, behavioural simulation models, and experimental electricity markets. The support for this hypothesis was backed by examples of the English and Chilean markets, which comes from visual inspections of historical data, and autocorrelation analysis. Evidence from the Nordpool so far is not as clear as it is with the other two markets. Cyclical behaviour in electricity markets has important implications for security of supply as well as for prices of electricity. For example, the consequences of wrong timing and insufficient generation capacity led to the well-known crisis in California (Sweeney, 2002). Periods of low reserve margin may be triggered by external shocks, such as severe droughts in a hydro-based system, gas supply cuts, etc., but insufficient capacity at the time of the shock amplifies the security of supply problem (i.e., if the shocks hit when a country is at the bottom of the cycle). So far, there is no agreement on which market structure of an electricity system will lead to sufficient long-term investments. In deregulated electricity markets, investments are profit driven (at least for private firms), and in theory a well-functioning market should be resilient enough to guarantee sufficient generation capacity. The problem is that energy-only markets ‘‘rely on high prices during periods of capacity scarcity to remunerate peaking units’’ (Roques *et al.*, 2005), in other words in many cases the cycles are necessary for the investors to recover their investment. On the other hand, regulators often look for a mechanism to prevent or cap the extreme prices. It is also widely accepted that many electricity markets have "market-failure", i.e., that they would not function properly, nor display the right signal for investments, and that regulators have an important function in correcting these market failures (Sioshansi, 2008). Moreover, the prevention of shortages of electricity creates the need for stabilizing policies, known as ‘‘keeping the lights on’’, which is the imperative of policy, market design, and regulation (Roques, 2008).

Though the long-term stability of electricity markets is a desired state, but it is a complicated topic (Arango, Larsen, 2011). In fact, the question about stabilizing policies is still open. There is no agreement as to whether there should be a coordination mechanism for investments or whether it should be left to the action of market forces (Roques *et al.,* 2005; Roques, 2008).

The study by Yarrow (2008) provided that in terms of its implications for assessment of retail energy price deregulation in Victoria and elsewhere, the UK record since the lifting of price controls in 2000-2002 supports the view that effective competition provides strong protection for consumers generally, including domestic/residential consumers. There is general recognition that, in competitive markets, prices go up and down, and that it is also recognised that, in the case of energy, there are powerful, global factors at work which are driving prices upwards. Contrary to fears that household consumers would fare worse relative to no-household customers as a result of deregulation, the evidence suggested that, at least in the years immediately before and after deregulation, they fared better. As in the case of non-household customers, therefore, the evidence indicates that competitive, deregulated markets have served the interests of household consumers at least as well as, and most likely better than, regulatory supervision of prices. Although not directly comparable to the approaches to retail price regulation in Australia, the UK or the United States, the experience of retail market opening in Norway and Sweden, including in relation to the evolution of prices and price offerings, nevertheless provides some interesting information. The Scandinavian developments have been low key and measured, but there have been relatively significant changes in market structures over a relatively short period of time, and some major price shocks have been absorbed without threat to the integrity of the overall market arrangements (Yarrow, 2008).

The results of reviewed studies showed that the development of liberalization models in electricity sector does not necessarily reduce electricity prices and can cause economic cycles. In fact, contrary to expectation in some cases prices had tendency to rise. Therefore more attention has to be paid to selection of a liberalization model and careful considerations should be given to the types of reforms that would best suit to expected priority goals of EU energy policy. In addition it is necessary to mention that the aims of EU energy policy are conflicting as the decrease of electricity prices which is the main indicator of competitiveness mitigates the effort to go forward for energy savings, for investments in renewable energy and other new energy saving technologies. The decrease of environmental impact is related with the increase of electricity prices and consequently with decrease in competiveness. Therefore some trade of between EU energy policy goals is necessary when deciding on electricity market liberalization model. The multi-criteria assessment framework can help in ranking energy liberalization models.

Table 5 presents the generalized results of studies aiming at assessment of electricity market liberalization impacts.

Table 5. The impact of electricity market liberalization on energy prices

Studies	The steps of electricity market liberalization	Electricity prices: Households	Electricity prices: Industrial consumers
Steiner (2000)	Wholesale electricity market, unbundling of electricity production from transmission, allowing TPA access to the grid	↑	↓
	Privatization	↑	↑
Doove *et al.* (2001)	Wholesale electricity market, unbundling of electricity production from transmission, allowing TPA access to the grid	↓	↓
Zhang *et al.* (2002)	Wholesale electricity market, privatization, independent regulatory agency	-	-
Evans, Green (2003)	Wholesale electricity market	↑	↑
Hatori, Tsutsui (2004)	Wholesale electricity market,	↓	↓
	Unbundling of electricity production from transmission, TPA access to the grid, privatization	↑	↑
	Retail electricity market	↑	↓
Roques *et al.* (2005)	Liberalization of electricity markets	-	-
Joskow (2006)	Wholesale electricity market, retail electricity market	↓	↓
Hogan, Meade (2007)	Unbundling of electricity production from transmission	↑	↑
Fiorio *et al.* (2008)	Unbundling of electricity production from transmission	↓	↓
Bushnell *et al.* (2008)	Unbundling of electricity production from transmission	↑	↑
Yarrow (2008)	Liberalization of electricity markets	↓	↓
Nagayama (2009)	Liberalization of electricity market in Easter Europe	↓	↓

Source: created by authors.

As one see from information provided in *Table 5* previous empirical studies on relationship between energy market reforms and energy prices provided that relationships between energy market liberalization and electricity prices are complicated and reciprocal. In addition the impact on other important issues such as energy supply security, sustainability needs more broad investigations as studies concentrated on liberalization impact on energy prices and other important issues were skipped from analysis.

2. EU Energy Policy Priorities

The EU Green paper on European Strategy for Sustainable, Competitive and Secure Energy (SEC (2006) 317) sets the main priorities for EU energy strategy: competitiveness of the EU economy, security of supply and environmental protection. These objectives should help to address central policy concerns such as job creation, boosting overall productivity of the EU economy, protection of the environment and climate change. The main EU policy documents and directives which have impact on sustainable energy development are directives promoting energy efficiency and use of renewable energy sources, directives implementing greenhouse gas mitigation and atmospheric pollution reduction policies and other policy documents and strategies targeting energy sector. On 10 January 2007 the Commission adopted an Energy and climate change package, calling on the Council and European Parliament to approve: an independent EU commitment to achieve a reduction of at least 20% in the emission of greenhouse gases by 2020 compared to 1990 levels and the objective of a 30% reduction by 2020, subject to the conclusion of a comprehensive international climate change agreement; a mandatory EU target of 20% renewable energy by 2020 including a 10% bio-fuels target. This strategy was endorsed both by the European Parliament and by EU leaders at the March 2007 European Council. The European Council invited the Commission to come forward with concrete proposals, including how efforts could be shared among Member States to achieve these targets. The Commission's Green Paper on energy efficiency COM (2005) 265 (EU, 2005) stresses the importance of energy efficiency improvement for the controlling of demand growth and security of supply. According to estimates, the economic potential for improving energy efficiency in 2010 for all sectors combined is 20% of the total annual primary energy consumption of the current level. There are several directives aiming to implement Commissions Green Paper on energy efficiency: 2006/32/EC Directive on energy end-use efficiency and energy services, 2002/91/EC Directive on the energy performance of buildings and 2004/8/EC Directive on the promotion of cogeneration.

In 2008, the EU adopted the Strategic Energy Technology Plan (SET-Plan). This Plan is the energy technology policy of the European Union. Despite having been initially focused on power technologies, the European Commission has now received the mandate to investigate the role of technological innovation to achieve a more efficient energy intensive industry and with less CO2 emissions. In 2011 EU has prepared the Roadmap and Energy Action Plan for moving to a competitive low-carbon economy in 2050. The European Commission is looking beyond these 2020 objectives and setting out a plan to meet the long-term target of reducing domestic emissions by 80 to 95% by mid-century. The plan indicates how the sectors responsible for Europe's emissions - power generation, industry, transport, buildings and construction, as well as agriculture - can make the transition to a low-carbon economy over the coming decades. The short-term priorities of Roadmap towards low carbon economy and Energy Roadmap 2050: energy efficiency, low carbon technologies.

EU energy security and solidarity action plan COM (2008) 781 final states that The EU produces 46% of its total energy consumption. 9% of the energy consumed within the EU comes from renewable sources. The EU intends to increase the share of these energy sources to 20% by 2020.

The main priorities for EU energy strategy: competitiveness of the EU economy, environmental sustainability and security of energy supply. The main issues related with competiveness are energy prices, energy intensity of GDP, costs of energy imports etc. The main issues related with environmental sustainability are related with GHG emission reduction including measures to increase energy efficiency and enhanced use of renewables, reduction of emissions of classical pollutants such as SO2, NOx and particulates emissions. Security of energy supply is related with diversification of energy supply, energy import dependency, energy supply quality including outage rate, the structure of energy balance etc. Therefore seeking to assess the impact of electricity market liberalization of achievement of EU energy policy goals the integrated indicators approach can be developed allowing to integrate various indicators representing three pillars of EU energy policy. As EU energy policy priorities are contradicting the multi-criteria decision adding tool are helpful in order to trade between EU energy policy priority goals. In the following chapter of the paper the integrated indicators approach is applied for multi-criteria assessment of progress achieved by EU member states in implementing EU energy policy targets.

3. Framework for Assessing Progress in Achieving EU Energy Policy Priorities

Taking into account the priorities of EU energy policy the framework of indicators for assessing energy market liberalization impact on the three main pillars of EU energy policy needs to be developed. The Energy Architecture Performance Index (EAPI) developed by WEF can be applied for this purpose as the EAPI measures an energy system's specific contribution to the three imperatives of the energy triangle: economic growth and development, environmental sustainability, and access and security of supply (WEF, 2012). It comprises 15 indicators aggregated into three baskets relating to these three imperatives. The EAPI helps stakeholders as they look for performance areas to improve and balance the imperatives of the energy triangle over the long term. By measuring and reporting on a various set of indicators. Therefore the EAPI is a composite index that measures a global energy systems' performance across three imperatives: competitiveness, environmental sustainability, and energy access and security. The EAPI is split into three sub-indices. The score attained on each sub-index is averaged to generate an overall score. Within the aggregate score, each of the three baskets receives equal priority and weighting (WEF, 2012).

Table 6 provides the framework for assessing the progress achieved towards priorities of EU energy policies evaluated by applying modified EAPI index developed by WEF. Some simplifications in assessing specific indicators were introduced seeking to faster the process of evaluation based on Eurostat energy data provided for EU member states.

Table 6. Indicators for assessing progress achieved towards EU energy policy priorities

Competitiveness				
Energy intensity (GDP per unit of energy use in PPP USS per toe	Electricity prices for industry (US $ per kilowatt-hour)	Electricity prices for households (US $ per kilowatt-hour	Cost of energy imports (% GDP)	Value of energy exports (% GDP)
Sustainability				
$C0_2$ emissions from electricity and heat, thou thou/capita	Particulate emissions, thou t/capita	SO2 emissions from energy sector, thou t /capita	NOx emissions from energy sector, thou t/capita	The share of renewables in energy consumption, %
Security of energy supply				
Diversity of total primary energy supply (Herfindahl index)	Quality of electricity supply (survey score between 1-7)	Percentage of population using solid fuels for cooking (%)	Electrification rate (% of population)	Import dependence (energy imports, net % energy use)

Source: created by authors.

Further based on the framework presented in *Table 6* the impact of electricity market liberalization on EU energy policy targets will be assessed by performing of comparative analysis of electricity market liberalization indicators and Energy Architecture Performance Index (EAPI) developed by WEF.

4. Assessment of Electricity Market Liberalization Progress

The electricity market can be divided into 2 types of activities: competitive and non-competitive activities. Within each of the two basic categories, three key areas of focus were identified. A number of individual indicators were developed in each area to cover aspects of the market influenced by liberalisation. For (potentially) competitive areas of the supply chain, the areas identified were generation markets, wholesale markets, and customer supply the following three dimensions of indicators were developed OXERA (OXERA, 2001):

Competition in power generation indicators: market concentration; generation market characteristics; entry and decommissioning; and pan-European integration, such as cross-border flows.

Development of wholesale markets indicators: the emergence, growth and international character of standardized wholesale markets; wholesale price movements; the existence of balancing and penalty regimes.

Competition in the supply of customers indicators: market opening and concentration; entry conditions and the existence of customer load profiling; internationalisation of supply markets; customer switching and contract renegotiations; and price and quality indicators.

Market Competition and Non-competitive Activities are called as high level indicators of electricity market in OXERA's terminology. These high level indicators are obtained by aggregating the primary indicators to intermediate level indicators first, and then by further aggregating these intermediate level indicators to high level indicators. High level indicators indicate the degree liberalisation in electricity market in terms of competitive and non-competitive activities. Dividing the electricity market into two parts, indeed, matches with the objective of electricity market liberalisation, which is to separate the upstream (generation) and downstream (supply) markets and introduce competition into these markets while ensuring easy entries to noncompetitive areas through efficient regulation (OXERA, 2001). Based on OXERA model the following scoring system for electricity market liberalization progress was developed (*Table 7*).

Table 7. Electricity market liberalization indicators

MARKET LIBERALIZATION INDICATORS	SCORING METHOD IN OXERA
UPSTREAM (GENERATION) AND WHOLESALE MARKET	
Quantitative:	
Compliance with Electricity Directive	Yes=10; No=0
Market Share of largest upstream generator (%)	<25% = 10; >80%=0; linear in between
Market share of three largest generators (%)	<50% = 10; 100%=0; linear in between
Existence of wholesale market	Yes=10; No=0
Qualitative:	
New entry in generation	High = 10; medium = 5; low = 0
DOWNSTREAM MARKET AND CUSTOMER IMPACT (RETAILING)	
Quantitative:	
Compliance with Electricity Directive	Yes=10; No=0
Degree of market opening (%)	100% = 10; 0%=0; linear in between
Market share of largest supplier (%)	<25% = 10; >80%=0; linear in between
Market share of three largest suppliers (%)	<50% = 10; 100%=0; linear in between
Industrial customers switching (%)	>50% = 10; 0%=0; linear in between
Domestic customers switching (%)	>25% = 10; 0%=0; linear in between
Change in industrial consumer prices (%)	>20% reduction = 10;0% reduction or increased; linear in between
Change in domestic consumer prices (%)	>20% reduction = 10; 0% reduction or increased; linear in between
European rank in prices	First tier=10; second tier=5; third tier=0
Qualitative:	
New entry to the supply market	High = 10; medium = 5; low=0

Source: OXERA, 2001.

Aggregation to higher level is achieved by weighting the score of each primary indicator. This is done by multiplying the score of each indicator by its corresponding weighting factor and summing up the weighted scores of each indicator in that level to obtain a combined score for the level, which ranges between zero and 10. The equal scores were applied for all structural indices comprising the indicator. Further the electricity liberalization indicators will be assessed for EU member states.

5. Comparative Assessment of Electricity Market Liberalization on Success in Implementing EU Energy Policy Priorities

The scores of electricity market liberalization for EU member states were developed based on simplified OXERA model presented in *Table 7*. The statistical data on energy provided by EUROSTAT was applied for the assessing electricity market liberalization indicators for year 2012. The scores of electricity market liberalization for EU member states and their ranking are provided in *Table 8*. In the same *Table 8* the scores according three dimensions of EAIP for EU members states developed by WEF were presented for year 2013. The ranking is provided just for EU members states according scores. In WEF methodology 105 countries were ranked according the scores for competitiveness, environmental sustainability and security of energy supply.

Table 8. Ranking of EU member states based on electricity liberalization indicators and success in implementing EU energy policy targets based on EAPI (2013)

EU member states	Score of electricity market liberalization	Rank	Competitiveness	Sustainability	Security of energy supply	Overall score	Rank
Belgium	3.55	14	0.51	0.56	0.77	0.61	16
Denmark	5.24	10	0.64	0.56	0.82	0.67	4
Germany	5.88	7	0.6	0.58	0.79	0.66	9
Greece	1.73	20	0.63	0.48	0.7	0.60	18
Spain	4.83	11	0.71	0.55	0.75	0.67	5
France	3.18	17	0.58	0.76	0.8	0.70	2
Ireland	2.46	20	0.61	0.63	0.74	0.66	8
Italy	5.57	8	0.48	0.53	0.72	0.58	22
Netherlands	5.84	6	0.5	0.5	0.77	0.59	21
Austria	6.45	4	0.61	0.52	0.79	0.64	13
Portugal	2.55	19	0.64	0.56	0.75	0.65	12
Finland	6.5	3	0.58	0.47	0.81	0.6	20
Sweden	6.37	5	0.58	0.76	0.8	0.71	1
UK	7.69	1	0.59	0.63	0.78	0.67	6
Bulgaria	3.27	16	0.56	0.55	0.62	0.57	23
Czech Republic	4.46	12	0.5	0.4	0.78	0.56	24
Estonia	0.35	23	0.56	0.59	0.67	0.61	17
Hungary	5.46	9	0.53	0.67	0.76	0.65	10
Latvia	0.16	23	0.62	0.74	0.71	0.69	3
Lithuania	0.7	22	0.58	0.64	0.73	0.63	14
Poland	7.3	2	0.6	0.48	0.71	0.6	19
Romania	1.09	21	0.65	0.63	0.73	0.67	7
Slovak Republic	3.13	18	0.48	0.69	0.78	0.65	11
Slovenia	3.70	13	0.55	0.56	0.77	0.63	15

Source: EAPI, 2013.

As one can see from information provided in *Table 8* the UK is ranked as the best performing country in terms of electricity market liberalization however the country is ranked as 6-th accordingly EAPI. The second mostly advanced country in terms of electricity market liberalization – Poland is ranked just as 19th accordingly EAIP. The Estonia which ranked as having the lowest electricity market liberalization indicator according EAIP is ranked as 17th.

Therefore the countries ranked with high energy market liberalization indicators not necessarily have been ranked with high scores according the Energy Architecture Performance Index (EAPI) providing for the evaluation of success of countries in implementing EU energy policy goals: competitiveness of the EU economy, environmental sustainability and security of energy supply. More studies are necessary for the assessment of electricity market liberalization impacts and these impacts should cover all important priorities of EU energy policies: competitiveness, sustainability and security of supply.

Over the last decades, important steps have been taken across Europe in order to liberalize the energy market at the national level of each member to make possible the birth of a common energy market at a European level, characterized by price alignment, market transparency, access of suppliers on every energy market in Europe, consumers' right to choose the best possible offer. Though the level of market liberalization reached by the members on their attempt to deregulate their national market is different from one country to another, the basic steps have been taken by most countries meaning that, in theory, each consumer can freely choose their supplier. In practice, this hardly applies, the markets are not that open and there are still several barriers that need to be overcome. The common energy market will not be achieved too soon. At the moment, prices are not sufficiently competitive, consumers have difficulties in adapting to the new situation and understanding their rights as they are used to the idea that decisions should be taken for them.

The liberalization should bring benefits to both consumers and to the economic environment. But the liberalized markets cannot influence two important price components: the price of energy, often related to global/regional prices of fuels and the level of taxes and levies. It takes a long time for markets to be fully implemented and developed so that consumers can benefit from competitive prices. The deregulation process in electricity markets is still in progress. Although the first step in opening the market was successfully made by most European members, several measures still have to be taken so that consumers can enjoy the full benefits of a free market. Though empirical evidence does not suggest that, in general, deregulation has played a positive impact on electricity price reduction in EU member states more studies are necessary to assess the impact of energy market liberalization on progress in achieving EU energy policy priorities.

Conclusions

1) The results of reviewed studies dealing with the impacts of liberalization on competitiveness showed that the development of liberalization models in electricity sector does not necessarily reduce electricity prices. In fact, contrary to expectation in some cases prices had tendency to rise. Therefore more attention has to be paid to selection of a liberalization model and careful considerations should be given to the types of reforms that would best suit to expected priority goals of EU energy policy.

2) As the aims of EU energy policy are conflicting as the decrease of electricity prices which is the main indicator of competitiveness mitigates the effort to go forward for energy savings, for investments in renewable energy and other new energy saving technologies. The decrease of environmental impact is related with the increase of electricity prices and consequently with decrease in competiveness. Therefore some trade of between EU energy policy goals is necessary when deciding on electricity market liberalization model. The multi-criteria assessment framework can help in ranking energy liberalization models.

3) Previous empirical studies on relationship between energy market reforms and energy prices provided that relationships between electricity market liberalization and electricity prices are complicated and reciprocal. In addition the impact on other important issues such as energy supply security, sustainability needs more broad investigations.

4) WEF report on Energy Architecture Performance Index (EAPI) ranks energy systems of 105 countries from an economic, environmental and energy security perspective.

This index can be applied for ranking EU member states in terms of achieving EU energy policy priorities: competitiveness, sustainability and security of supply;

5) The progress in electricity market liberalization can be assessed by applying OXERA model based on the scores of electricity market liberalization for EU member states;

6) Analysis of electricity market liberalization impact on EU energy policy priorities indicated that EU member states ranked with high energy market liberalization indicators not necessarily have been ranked with high scores according the Energy Architecture Performance Index (EAPI) providing for the evaluation of success of countries in implementing EU energy policy goals: competitiveness of the EU economy, environmental sustainability and security of energy supply. Therefore the implementing of EU energy liberalization directives not necessarily would have positive impact on success of implementing EU energy policy priorities.

The research was funded by a grant (No. IEP-01/2012 from Research Council of Lithuania).

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ELEKTROS RINKOS LIBERALIZAVIMO ĮTAKOS ELEKTROS KAINOMS APŽVALGA

Dalia Štreimikienė, Jurgita Bruneckienė, Akvilė Cibinskienė

SANTRAUKA

Straipsnio tikslas yra išnagrinėti ir apibendrinti empirinių studijų skirtų elektros rinkos liberalizavimo įtakos elektros kainai vertinti, rezultatus. Atliktų studijų analizė parodė, kad elektros rinkos liberalizavimo modelių plėtra ne visada turėjo teigiamos įtakos elektros kainų mažėjimui bei šalies konkurencingumo augimui. Atlikti tyrimai parodė, kad elektros rinkos reformų ryšys su elektros kainų dinamika yra nevienareikšmis ir komplikuotas. Be to ne tik elektros kainos svarbios, vertinant elektros rinkos liberalizavimo sėkmę, kiti svarbūs aspektai, kaip elektros liberalizavimo įtaka energijos tiekimo patikimumui bei aplinkosauginiam darnumui reikalauja papildomų tyrimų ir dėmesio. Pasirinktas elektros rinkos liberalizavimo efektyvumo rodiklis – ES energetikos politikos prioritetinių krypčių įgyvendinimo rezultatyvumas leidžia įvairiapusiškiau įvertinti teigiamą elektros rinkos liberalizavimo įtaką. Atlikus elektros rinkos liberalizavimo pažangos bei ES energetikos politikos prioritetinių tikslų įgyvendino rezultatyvumo palyginimą tarp ES šalių narių, nustatyta, kad ES šalys narės pasižyminčius aukštu elektros rinkos atvėrimo laipsniu nebūtinai turi aukštus Energetikos Architektūros Veiksmingumo Indeksus, parodančius ES šalių narių pasiektus rezultatus, įgyvendinat ES energetikos politikos prioritetinius tikslus: ekonomikos konkurencingumas, aplinkosauginis darnumas ir energijos tiekimo patikimumas. Galima daryti išvadą, kad elektros rinkos liberalizavimas nebūtinai padeda įgyvendinti ES energetikos politikos prioritetinius tikslus.

REIKŠMINIAI ŽODŽIAI: elektros rinkų liberalizavimas, ES energetikos politikos prioritetai, konkurencingumas, aplinkosauginis darnumas, energijos tiekimo patikimumas.