STATUS OF CROATIA'S ENERGY SECTOR FRAMEWORK
Progress, potential, challenges, and recommendations

by

Alfredo VIŠKOVIĆ and Vladimir FRANKI *

Faculty of Engineering Rijeka, University of Rijeka, Rijeka, Croatia

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Following the accession of Croatia in the European Union a number of questions are raised regarding Croatia's legal framework and its ability to cope with the demands that it faces. This paper provides an overview of the current status of the Croatian energy sector framework and discusses the prospects of successful reform in this new Member State. One of the main aims of this paper is to discuss the current progress, potential prospects and challenges for implementing a successful reform model in the newest EU Member State – Croatia. In this context, it is necessary to note the difficulties in analysing electricity reform which derive from the fact that it can take many different forms, that it involves a number of interrelated steps and that it is an ongoing process. With that in mind, the approach to the problem was a thorough literature review of all possible factors influencing the development of the Croatian energy sector and a detailed analysis of all the options and problems the sector faces. The study offers a detail structure of the energy sector discusses its situation, problems and offers insights on possible paths to improvement.

Key words: *regulatory framework, europeanization, South East Europe*

Introduction

During the last course of years the energy sector in Europe has been characterised by the processes of reorganisation. This correlates to the processes of functional, accounting and controlling unbundling of vertical, monopolistic companies according to different activities such as production, transmission, distribution, and supply. It also correlates to the process of electricity market liberalisation. When observing current various experiences of Western European countries, in general, we can say that the overall process has started with restructuring of companies which was followed by the liberalisation of the electricity market and privatisation. All the countries have followed this procedure obeying the laws proscribed by the common European legislation. However, countries outside the EU, have mostly kept their vertically-monopolistic organisation of the energy sector. With the accession to the EU, new Member States needed to swiftly fulfil the requirements set by the EU legislation. A well-functioning energy market should encourage efficient investment decisions in the regional power market [1].

Along with the restructuring of the vertically integrated companies and the establishment of quality interconnections between the electrical systems of Member States of the EU,

* Corresponding author; e-mail: vfranki@riteh.hr

they form the basic necessary steps towards the establishment of the single European electricity market [2]. The most successful regional energy market in Europe, the Nordic market (Nord Pool), owes its success to the strong cooperation between the member countries. In the case of South East Europe (SEE), through its own and recently founded institutions, the EU is trying to encourage the countries of the region to be more determined in taking action towards creating coordinated conditions for organising a common energy market. SEE countries have been going through extensive economic, political, and institutional changes already since the nineties. Changes in the infrastructure sector represent an important segment of their transition reforms. The SEE region possesses the potential to constitute an important electricity reform experiment for the whole world. This is because these countries have been given a clear reform model to follow, have been given access to substantial amounts of technical assistance and because reform is happening in the context of associated reforms in other sectors and the government. These are the main reasons why SEE could prove to be a test of both the transferability of the EU reform model within the EU, but also its transferability to a set of developing countries in general. World Bank, the European Bank for Reconstruction and Development (EBRD) and the EU are carefully monitoring this experiment [3].

The process of liberalisation of the electricity markets is currently one of the most debated topics regarding the energy sector. As there are a number of different factors and developments that affect countries' energy policies [4], reform itself is an accordingly complicated issue. It can take many different forms, involve a number of interrelated steps and is an ongoing process [3]. One of the main aims of this paper is to discuss the current progress, potential prospects and challenges for implementing a successful reform model in the newest EU Member State – Croatia. In this context, it is necessary to note the difficulties in analysing electricity reform which derive from the fact that it can take many different forms, that it involves a number of interrelated steps and that it is an ongoing process. With that in mind, the approach to the problem was a thorough literature review of all possible factors influencing the development of the Croatian energy sector and a detailed analysis of all the options and problems the sector faces. The study offers a detail structure of the energy sector discusses its situation, problems and offers insights on possible paths to improvement. In the following few chapters, the results of the analyses are presented, whilst chapter six offers discussion and conclusions respectively.

Electricity market reform in SEE

During the past two decades the SEE electricity sector has gone through extensive reforms raising the importance of regulation. In view of the electricity sector, the reforms were primarily aimed at changing the centralized organization of monopolistic utilities and introducing market-oriented structures and public regulation. There is a perception that privately owned generating companies are able to move faster toward the efficiency frontier [5] as competition and a stronger desire for higher profits are expected to drive changes resulting in a more efficient system [6]. The EU initiative to establish the regional electricity market compatible with the internal electricity market of the EU facilitated these changes [7]. Diversifying energy sources and developing alternative supply routes are some of the advantages that trading on the electricity market should enable [8]. One of the main driving factors in the process of adoption of the EU Acquis Communautaire is mostly related to both the aspirations to a membership in the EU and to a realization that without major investments in generation and transmission capacities, consumers might suffer from future supply shortages [9]. This would suggest that successful liberalization of economic activities also requires a certain amount of political acceptability. Considering the current business climate, investments needed for revitalisation, development and

modernisation of the electricity sector are mostly to be achieved by project financing arrangements [10]. Financial institutions funding such projects require the presence of a regulatory framework that is capable of ensuring certainty and transparency over the long run in order to reduce investment risks. Therefore, a stable legal framework is necessary to attract investment. In theory, reform is to raise efficiency and lower costs and prices providing for a competitive and integrated energy market. Best practice in regulatory reform involves three of the main aspects: form, progress, and outcome of regulation [11]. A well-constructed, stable regulatory framework is one of the perquisites for achieving a transparent, competitive electricity market that is efficient, cost-reflective and able to attract foreign investment necessary for providing its development. In addition, achieving a stable regulatory framework country by country would be a significant step forward towards the creation of a common energy market that would help the region to realize its potential. All countries of the region inclined to the EU are required to implement the EU Energy Policy and pursue its three fundamental objectives: competitiveness, security of supply, and sustainability [9]. Having relatively small systems integrate into a larger one is beneficial to power trade and market competitiveness especially when resource endowments differ across countries. The existence of a wholesale market is statistically significantly positive for prices [12]. A big step towards the goal of the common market was the signing of the Energy Community Treaty. Driven by the main goal of creating a stable regulatory and market framework capable of attracting investment in the energy sector, The Energy Community Treaty is the main legislative framework that operates in regard to establishment and development of the Energy Community in SEE.

The question remains whether national energy policies of the countries in the region will be able to achieve a coherent regional energy policy. A key factor in the success of reform will be the institutional and administrative capacity of the established national energy and regulatory authorities [3]. However, looking at the quality of governance across the region, it can be noticed that it substantially varies and in most cases falls behind that of other members of the EU [8]. Considering past experiences, reforms have encountered difficulties in a number of countries having a far more complex path than anticipated [13]. One of the reasons for this occurrence is the need for real time balancing of supply and demand which requires better design and regulation than most other deregulated sectors. Another difficulty arises from rebalancing tariffs to cost-recovering levels as it is an important precondition to an effective market. This raises the issues of political sensitivity through social aspect of reform as reform which raises tariffs will have significant effects and may cause political difficulty in a region where incomes are generally low and have a wide dispersion [14]. Low-income households spend a significant share of income on utility services and the potential difficulties that these socially vulnerable consumers would have in affording further tariff increases is often used as an argument against tariff reform [15].

Croatia's electricity sector legal framework

The most important initiator of many national reforms is undoubtedly Croatia's accession to the EU. A series of reforms needs to be implemented in order to fully adopt the EU acquis communautaire. Approximately 1,200 laws were passed between 2008 and 2010 – an average of almost three laws per day. This hurry in passing laws does, however, often lead to a certain amount of sidestepping required consultation procedures and, therefore, causing an increase in the risk of authority abuse and lowering the quality of these very laws. Furthermore, the swift approval of laws often inadequately examined and discussed by the Parliament, increases the risk of legal loopholes. In a number of respects, Croatia is, at present, an advanced transition

country still facing significant challenges. Since the commencement of the EU accession process, despite the mentioned swiftness in adopting new laws and regulations, Croatia has made significant improvements in numerous areas of commercial legislation.

As a new member of the EU, Croatia is focused on fully adjusting its energy legal framework with the EU Acquis Communautaire. The EU Acquis Communautaire along with the international agreements which Croatia has signed with the EU form the basis of the legal framework of the energy sector. In this respect, Croatia has obligated itself to implement all accepted legal solutions, taking into consideration its particularities in a need to ensure economic and social development. The legal framework for the energy sector includes other international agreements ratified in accordance with the Constitution of the Republic of Croatia. These are: the Energy Charter Treaty, the Energy Community Treaty, the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects, the Convention on Nuclear safety, *etc*. Regarding the electricity sector, the framework recognises five types of activity: generation, transmission, distribution and the sale of electricity and organisation of the electricity market. Legal framework for energy sector in Croatia is defined through the package of energy laws that consist of the following primary legislation published by the Croatian Official Gazette:

– Energy Law [16],
– Law on the Electricity Market [17],
– Law on the Regulation of Energy Activities [16],
– Law on the Gas Market [18], and
– Law on the Production, Distribution and Supply of Heat [19].

The most important bylaws regarding the functioning of the electricity market are:

– Tariff system for the transmission of electricity [20],
– Tariff system for the distribution of electricity [20],
– Tariff system for the production of electricity from renewable energy sources and co-generation [21],
– General conditions for the supply of electricity [22], and
– Grid rules [23].

Energy Law [17] is the key legal document for the Croatian energy sector. It defines the measures for safe supply and efficient production and use of energy. It also defines the laws that are the basis of energy policy, development of the energy sector, energy activities on the market and energy activities with respect to the environmental protection measures. It names the Energy Strategy [24] as the basic energy policy document and defines the role of national energy programmes. Croatian energy policy formulated in the Energy Strategy of the Republic of Croatia has the following objectives:

– establishment of a competitive energy system,
– having security of energy supply,
– achieving a sustainable energy sector development,
– energy efficiency increase,
– diversification of energy sources,
– utilisation of renewable resources,
– realistic energy prices, energy market and private entrepreneurship development, and
– environmental protection.

In order to archive these goals it is necessary to ensure a diversification of energy sources, to promote efficient energy systems and renewable energy sources as well as to encourage an efficient price policy and environmental protection [25]. The Strategy envisages a need for the construction of a number of projects and a further development of the transmission and

distribution networks. The Law on the Electricity Market [17] governs the rules and measures for a safe and reliable generation, transmission, distribution and supply of electricity. It defines electricity trading including tariffs and eligible customers and aims to organise the electricity market as a part of the common EU market. It also states that eligible producers are entitled to the incentive price defined in the Tariff system for electricity produced from renewable energy sources and co-generation. After gaining conditions for becoming an eligible producer, as defined by the Croatian Energy Market Operator (HROTE), the Electricity Market Law sets a legal obligation to purchase the electricity produced by an eligible producer. HROTE collects the compensation for promotion of renewable energy sources and co-generation and distributes it to the eligible producers according to Tariff system. Transmission and distribution system operators are obliged to take over entire electricity production of eligible producers.

The Law on the Gas Market [18] governs the status of the eligible customers - customers who use gas for simultaneous production of electricity and heat. The Law on the Production, Distribution and Supply of Thermal Energy [19] defines co-generation plants as the ones having priority when it comes to the development of new generation capacities.

In 2010 the National Renewable Energy Action Plan (NREAP) [26] was prepared to comply with the requirements of the EU Renewable Energy Directive [27]. However, despite the existing framework and encouraging tariffs, there are still a number of barriers preventing a faster development of this sector. Some of the issues are complex authorisation procedures of renewable energy projects, a market monopoly of HEP and a rather low level of acceptability from financial institutions which deem the project risks are too high to insure a safe return.

One of the key and crucial issues for foreign investors or financial institutions is the country's regulatory framework that is capable of ensuring transparency and certainty over the long run. Continuous changes in the tariff system and the legislation present a high risk for foreign investors which are less likely to support the much needed boost to the country's development. Businesses need to take decisions in terms of investment choices and cannot bare uncertainties [28]. In the transformation to an open and liberal market, profitability, transparency, perception towards market entry and social benefit dominates investment decision mechanisms. In terms of these four criteria, the Croatian electricity market needs improvements despite considerable progress [29].

Electricity market

In the Croatian electricity market the Croatian Energy Market Operator (HROTE) is responsible for organizing the day-ahead market. The transmission part of HEP-TSO (Transmission System Operator) provides ancillary services if imbalances occur. There is only one electricity market in Croatia. Following the opening of the electricity and gas markets in 2008, HROTE gained a significant role in the Croatian energy system and a responsibility for organising them. In the initial phase of the market opening, the bilateral market model has been chosen and electricity trading has been carried out through bilateral contracts. The two contractual parties in electricity supply contracts are the customer and the supplier. Bilateral contracts concerning electricity trades (whether purchase or sale) are concluded between the supplier, the trader or the producer. HROTE is also responsible for collecting fees for incentivising renewable electricity production sources and co-generation. Furthermore, HROTE regulates the repurchase of the entire amount of generated electricity from eligible producers as well as the distribution to the electricity suppliers in Croatia. Electricity market procedures and relationships between HROTE, transmission system operator (TSO), and distribution system operator (DSO) are arranged by the Electricity Market Rules. The basic tasks of the electricity market are:

– adoption of rules Electricity Market (Market Rules),
– keeping records of entities in the electricity market,
– recording of contractual obligations between entities in the electricity market,
– calculating Croatia's energy balance, and
– analyzing the electricity market and proposing measures for its improvement.

At present, Croatia's electrification rate is 99% [30], or 96.5% when considering a value estimated by a satellite detecting night time lighting [30]. Decentralized supply systems might provide cheaper electricity and enhance the development of these rural areas [32].

Regulation

Appropriate regulation of energy activities has become increasingly important over the past decade [33]. Effective regulatory practice requires both the clarity of the regulator's mandate and the clarity of rules defining its relationship with other bodies [34]. The four most important regulatory functions are licensing, monitoring, control and inspection of the aforementioned activities and customer protection [35]. The main regulatory body in Croatia is HERA. HERA is an autonomous, independent and non-profit public institution which obligations and responsibilities have been established by the framework consisting of the Energy Law, the Law on the Regulation of Energy Activities [36] and laws and by-laws on related to licenses for performance of energy-related activities. The Energy Law defines a total of 25 energy activities, among which the following 10 are performed as a public service:

(a) electricity
– generation for tariff consumers,
– transmission,
– distribution,
– supply of tariff consumers, and
– organization of the electricity market,

(b) natural gas
– storage,
– transport,
– distribution,
– supply of tariff consumers

(c) thermal energy
– distribution.

For its work HERA answers to the Croatian Parliament. The following activities form the core of its functioning:
– electricity market regulation,
– establishing methodologies and tariff systems,
– granting of the status of eligible electricity producer,
– establishing by-law regulations in the Energy sector, and
– providing opinions and recommendations for the Ministry.

Despite the adoption of the first package of energy laws, real functioning of the electric energy market has not yet been established. Although formally fully open, generation does not have a sufficient number of participants to create real market competition. Signs of improvement are showing in the supply part which took a leap forward as a few prominent players emerged on the market enabling consumers the choice of their supplier. In generation, however, the existing, exclusively bilateral power trading mechanism is inapt for market development and

transparent electric prices setting. Because of this issue, there are no major foreign investments and the domination of a single power producer continues.

In general, the energy sector in Croatia is partially subject to free market conditions with substantial state control in most areas. Although the EU legal framework demands the creation of a transparent and competitive energy sector and despite the fact legal and institutional framework for establishing such principles are in place and support the development of new energy projects, challenges remain as low transparency, low competitiveness and a high perceived risk fend off significant investments.

Tariff system structure

Transparent network tariffs have been identified by the European Commission as a major factor in identifying and eliminating price distortions and cross-subsidies. Choosing the right approach to determine the methodology of a tariff system is an important issue because of the potentially serious consequences that the wrong concept might bring [37]. The current tariff system is defined in areas of electrical energy, gas, oil and thermal energy. The activities of the tariff systems are twofold: one determining the prices of electricity for tariff consumers and two, determining the incentive prices paid to eligible producers. Average tariffs are to cover the average operating costs in order that there is an adequate cash flow to pay for power imports. Residential to industrial tariff ratios are relatively low. Among other initiatives, the average monthly electricity bill has been increased as each consumer does pay an extra renewable energy resources (RES) fee for every kWh spent. However, these fees need to be carefully monitored so that they would optimally derive from the market equilibrium in order to avoid causing inefficiency, penalizing household consumers and distorting markets. Starting from 1st of July 2008, the Electricity Market Law stipulates that all electricity customers are considered eligible customers. Low residential tariffs, although still high compared with other East European systems in transition, do not fully reflect the long-term marginal costs of household supply. Despite recent increases (by 20 per cent for households and for companies in July 2008, followed by another 20 per cent for households in May 2012), tariffs are still not considered to be cost-reflective. To be exact, in order to support national competition, effective tariffs (tariffs and payments) should provide sufficient cash flow to cover costs [38]. There is a fixed tariff system in place used to encourage the growth of the renewable energy sector with small biomass, biogas and geothermal power plants reaching highest incentive prices.

Incentives

The Croatian Government adopted the new Investment Promotion and Development of Investment Climate Act in 2012 with the incentive measures aimed at strengthening activities and the use of new technologies, encouraging research and development and stimulating employment. It marked a further enhancement of legislation supporting renewable energy implemented in 2007 with the introduction of a new tariff system and extension of the validity of support mechanisms from 12 to 14 years. The main stimulation for renewable energy sources is in the form of the feed-in-tariffs set by HERA which have relatively high incentive prices, for some technologies even higher than in other European countries. The adjustment mechanism of the price in place is based on the consumer price index and thus also taking into account inflation. In addition, a Fund for Environmental Protection and Energy Efficiency (FZOEU) has been established in 2004 with the responsibility of financing investments primarily through long-term loans and grants.

Environmental protection

Over the recent years, the environmental protection issues are raising increasing concerns and are starting to present a major factor in forming national energy policies and determining the development strategies of the energy sector as required emission require a major transformation of energy and economic systems worldwide [39]. Following the accession of Croatia in the EU, the same standards that apply to EU member states are now present in Croatia as well. Achieving a sustainable energy sector represents the challenge of modern development [40-46]. Energy sectors in Croatia participate with approximately three quarters in total greenhouse gas emissions. Considering the fact that climate change and greenhouse gas emissions are the priority of the environmental protection issue, the main challenge has become a long-term development with decreased emission of carbon dioxide. To mitigate this issue, there is a general trend of achieving a more effective use of energy, encouraging the use of renewable energy sources and sources that do not produce greenhouse gases, establishing a more efficient transport system and creating a system that would charge the remaining emitters of greenhouse gases.

Croatia's parliament ratified the Kyoto Protocol in May 2007 after getting approval for a higher limit of annual carbon dioxide emissions set at 34.6 million tons. Following the ratification of the Kyoto Protocol Croatia made a commitment to decrease its emission of greenhouse gases. It should be noted, however, that emission *per capita* is relatively small when compared to the emissions of EU countries and other developed countries in the world. Croatia established an emission trading mechanism which implies the participation of all large emission sources from the energy sector in line with the European Union emission trading scheme (EU ETS). However, a number of countries in the SEE region did not take the commitment to reduce greenhouse gas emissions, but have signed the Energy Community Treaty. This puts Croatia in a less favourable position not only regarding the power sector, but other energy-intensive sectors as well.

The environmental policy in Croatia seems to focus primarily on air quality and waste management. The main threat to its environment is, however, coastal degradation, crucial to its tourism potential. The Environmental Protection and Energy Efficiency Fund (EPEEF) was established with the aim of financing the preparations, implementation of development of programmes and projects in the field of environmental protection, energy efficiency and the use of renewable energy sources and mitigating climate change.

Energy efficiency

Energy efficiency is closely correlated with public and personal standard of living and the climate situation. It should, therefore, present a key element of a long-term energy strategy and a strategy of climate and environment protection [47, 48]. There are no generally accepted criteria for assessment and perception of efficiency. Each EU Member State has set an energy efficiency target for 2020 and the methodology behind these targets varies considerably [49]. There are, however, two common measures that are most often used as an indicator of the overall energy efficiency of a certain economy. These are the primary energy intensity and the final energy intensity measures [50]. It should be noted that these two indicators can be affected by climatic variations from year to year.

Energy efficiency plays an important role in the Croatian energy policy. Energy efficiency policy is in responsibility of Ministry of Economics in cooperation with Ministry of Construction and Physical planning in buildings sector. In 2008, an energy efficiency master plan was finished and an Act on Energy End-use Efficiency adopted. The National Energy Efficiency

Action Plan (NEEAP) [51] complies with the requirements of the EU directives on energy end-use efficiency and energy services. On a more recent note, the government of Croatia has adopted its NEEAP until 2020, which is in line with the EU directive on renewable sources and sets a target of having 20% of renewable energy sources in energy consumption by the year 2020 [52]. In addition, Croatia also adopted a national indicative energy savings target of 9% of final inland energy consumption by 2016. A further goal is to decrease the final energy consumption by 10% until 2020, when compared to the average consumption for the period 2001-2005. A fund has been established for funding projects to improve energy efficiency and promote renewable energy, the already mentioned EPEEF. Croatia also introduced obligations to purchase all electrical energy produced by privileged energy producers and aims to increase the share of renewable sources apart from large hydro-electricity plants. The three main pieces of legislation regarding the energy efficiency issue are:

– Energy Law, which regulates measures for efficient energy production and use as well as a reliable and safe supply,
– Law on the Efficient Utilization of Energy in Final Consumption, which regulates the efficient use of energy in the final consumption, and
– Physical Planning and Building Law, which regulates the construction of new buildings, reconstruction, removal and maintenance of buildings.

Due to these efforts and the legislation in place, energy efficiency in Croatia continues to improve in recent years. When looking at the period from 1995 to 2010, the energy efficiency index for the whole economy (ODEX) decreased by 14.5%. The industrial and transport sector contributed most to this improvement with 20.4% and 19%, respectively. The household sector recorded the least successful improvement of 4% [53].

Discussion

Progress with reform and potential prospects

Croatia has the geopolitical advantage of being situated along three pan-European transport corridors linking the EU and SEE. Croatia launched major reforms for the electricity sector in compliance with EU directives. Despite the sector still facing numerous institutional and organizational issues and challenges, Croatia's accession to the EU provides unique opportunities for the country to modernize its key elements and to open up the sector to increased investment, market competitiveness, and efficiency. Energy sector reforms in Croatia have objectives similar to other national policies [54-56]. Although the three pillars of the Energy Strategy of the Republic of Croatia are identified as security of energy supply, competitive energy system and sustainable energy sector development [24], the extent of the Strategy, as well as the energy sector reforms extends to issues of encouraging competition, decreasing imports, sustainable industrial development, employment increase, *etc.* [25, 57]. At present, Croatia is moving towards a full adoption of the EU regulation, policies and strategy, showing signs of progress in moving towards a sustainable system for the future. Regulatory procedures for electricity production from RES and high efficient co-generation (CHP) evidently do favour this type of production [16, 17, 21]. Hopefully, new development strategies of the future will continue to follow the successful examples from the EU [58, 59] and precipitate a move towards environmentally acceptable electricity generation and a sustainable development of the electricity sector.

Looking at a wider context, the establishment of the Energy Community for SEE is a bold experiment in Europeanization and Croatia represents a stepping stone towards the full integration of the SEE region into the EU. Although, at some cases, the large size of the energy

market might mean that the benefits of energy market reform may be achievable by a purely domestic reform programme [60], for a significant number of countries in the region, the only practical reform route is the regional approach. One of the most important and concrete achievements in establishing the SEE regional electricity market and its further integration with the EU electricity market is the inter-TSO Compensation (ITC) mechanism which aims to compensate affected TSO for costs of infrastructures and network losses raised due to hosting transits [61]. For the case of Croatia, we have identified attractions regarding the proper implementation of the energy market reform to include:

– economic benefits,
– greater competitiveness,
– achieving a more efficient system,
– ability to attract foreign investment,
– power trade able to use the potential of different resource endowments,
– lowered costs,
– prices in line with costs,
– greater transparency,
– lesser corruption, and
– integration into the EU system.

Market price and market position of energy entities is a powerful incentive to the market development [25]. What should precipitate progress in reform is the current state of the energy sector which, despite a good potential in a number of renewable energy sources (wind, small hydro, solar, biomass), is overly dependent on imports and needs significant investments in order to keep pace with the requirements needed for achieving a competitive sustainable energy system.

Some of the key challenges facing successful reform

On a macroeconomic level, as a number of European countries, Croatia recorded a significant contraction in economic activity since the beginning of the global financial crisis [62]. Its impact affected negatively on business developments and investments. Despite efforts and some progress in recent years, the business environment remains disincentive. According to a survey by the World Bank entitled Doing Business 2014, out of 189 countries, Croatia was ranked at a low 89th spot, right above Albania [63]. Some of the most serious constraints are the difficulties in gaining construction permits, registering property and protecting investors. Also, Croatia is continuously facing challenges in the sphere of legal reform and in the fight against corruption. According to Transparency International's Corruption Perception Index 2013, Croatia ranked 57th out of 177 countries [64]. The score, even though significantly below the OECD average, is still slightly above the transition country average and better than many of its regional neighbours. On the positive side, it should be noted that Croatia made noticeable improvements which resulted in the better rankings than in recent years (Croatia moved from 103rd in 2010 into the 89th position in 2014 in the World Bank Doing Business report and from 66th in 2009 to the current 57th in Transparency International's Corruption Perception Index). In terms of international competitiveness, Croatia is ranked at 81 out of 144 countries by the World Economic Forum [65]. In addition, according to the Heritage Foundation's 2013 Index for Economic Freedom, Croatia's economic freedom score is 61.3, making its economy rank 78th in the 2013 Index [66]. It recorded an overall score 0.4 point higher than last year having gains in the management of government spending and investment freedom largely offset by declines in labour and fiscal freedom and freedom from corruption. Significant improvements are being made

in building a legal framework that would allow and promote a better environment able to attract investments and encourage growth. With the exception of labour regulations, typical red tape and regulatory issues are not seen as particularly large obstacles in business development.

In order to address weaknesses mentioned above and facilitate growth, Croatia's government adopted a comprehensive structural reform programme in August 2012 which aims to improve the business climate and competition, foster labour force participation by reducing administrative barriers to investment, precipitate restructuring and privatising state-owned enterprises and reforming pensions and health care systems. All these issues, although, perhaps, not being directly linked to the electricity sector, have a deep influence on the key issues regarding its development.

Regional context

South East Europe is a specific region, especially when it comes to the field of the electric power sector. The SEE electricity markets are undergoing structural changes following the reforms imposed by the EU primarily driven by two electricity directives in 1996 and 2003 [67]. At present, there are a number of issues still to be addressed if the experiment of regional energy market integration is to lead to further regional integration. From open political issues following the disintegration of Yugoslavia, Kosovo's recent declaration of independence, to a background of decades of communist rule, the challenges of transition economies remain as political, economic, and cultural differences stay a major obstacle in integration. The Balkans conflict had a significant detrimental effect on the energy infrastructure in parts of the region from which some of the countries are only recently emerging [68]. Having countries with rather different views on regulation and further development in terms of legislation, offers a rather unbalanced situation in which competitors find themselves facing disloyal competition on the market. Two of the main difficulties regarding a successful integration into a regional electricity market are the EU emission trading scheme (EU ETS) and the low competitiveness in throughout the countries of the region. As it can be seen from fig. 1, some of the countries of the region are a part of the ETS while some remain apart. This creates a rather significant imbalance between competitors on the market resulting in considerable risk rather unappealing for investors as thoroughly discussed in [69]. With regard to the thermal electricity sector, a solution might prove to be the carbon capture and storage (CCS) system. However, looking at the current situation for the case of SEE, this seems less likely as it is not feasible [70, 71].

Despite both the accession to the EU and the adoption of acquis communautaire regulating the electricity sector, it can be said that Croatia is still moving slowly to achieving successful reform in a practical manner. The unbundling process of the TSO is still not fully completed as in 2013 a model to be used for the unbundling of the transmission system operators was selected. Croatia's power exchange seems to be a long way from being operational. Despite all the obstacles, it seems to only be a

Figure 1. South East Europe countries ETS affiliation

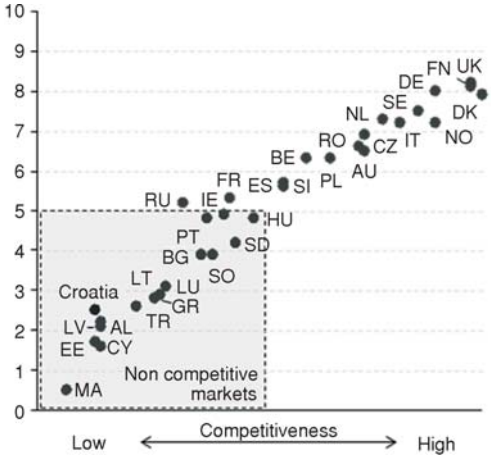

Figure 2. MCI score 2013 (source: Datamonitor [72])

matter of time when all this will be sorted and Croatia will have a fully liberalised and deregulated electricity market. It should be noted that, at present, the Croatian electricity market is one of the lowest competitive electricity markets in Europe (ranked 28th on 33 countries analyzed in 2013) [72]. With regard to the wholesale market structure, Croatia is a strongly concentrated market: the generation segment is entirely dominated by the country's main utility company – HEP. The same situation is perceivable also in the retail-end segment of the value chain. Dominance of HEP across all segments of the value chain does not facilitate market transparency as well as access to consumer information. Current market dynamics along with the mentioned dominance mean that Croatia is perceived as a challenging market for new entrants. Figure 2 shows the results of the Datamonitor MCI index competition intensity analysis [72]. MCI is the index which measures the development of the electricity markets competitiveness, comparing between each other 34 European markets.

The regional context offers a somewhat unbalanced non-coherent group of energy policies. The obstacles towards Europeanization are identified as listed:

– political and governance challenges,
– different EU ETS affiliation,
– low competitiveness,
– background of decades of communist rule,
– difficulties to meet technical demands, and
– politically sensitive issue of rising tariffs (dissolving the so called social aspect of the price).

Consumers in a country with low production costs may lose from integration even if total welfare in that country increases [14]. Also, even to willing national authorities, the quality of governance in SEE falls short of that in Western European countries [8]. However, despite all these challenges, the countries of the SEE region continue to make efforts in the legislative reform progress and strive to achieve improvements relating to the improvement of the overall state of their electricity sectors – Croatia being a fine example of such practice.

Croatia's main issues

As per report provided by the European Commission [73], the quality of public governance is low; there is only a weak coordination between different levels of government and little or over formalistic use of evidence-based policy-making and assessment. The story is similar with state-owned or state-controlled companies which are negatively affected by weak governance. The main reason for such an occurrence is that, at present, there is still no competitive selection procedure for supervisory board members and management. Despite taking measures in order to improve the anti-corruption framework, there is still a considerable amount of work to be done in the effort to prevent corruption. In addition, despite certain progress in increasing the transparency of public procurement procedures, risk assessment tools are not being systematically used and vulnerable sectors appear to be insufficiently prioritised. The current regulatory

framework for doing business in Croatia imposes a high burden on businesses, including lack of legal certainty, untransparent decision-making in particular at local level, and numerous para-fiscal charges [73].

Generation portfolio prospects

Unlike the rest of the SEE region, Croatia possesses no coal mines that could support the operation of a larger coal-fired power plant. However, it is eager to add to its portfolio a unit of 500 MW net capacity. This unit is to be fuelled by imported fuel. There are a few drawbacks regarding this type of technology. It has a highly unfavourable environmental impact and is socially rather unacceptable. In addition, the unpredictable nature of the carbon market might also present a deal-breaker for this type of projects. On the other hand, new generation capacities are needed in order to keep pace with the demands of the electricity sector, as a major part of the thermal generation set in Croatia is unable to successfully compete on the market. Eastern Europe and the Balkans might continue to hold an important role in the future of coal power generation as there are plans to build more than 10 GW of new coal-fired generations plants [72]. However, this data should be taken with a certain dose of reserve. First of all, European energy utilities are, for the most part, simply replacing, or planning to replace, their ageing coal-fired generation sets. Secondly, the already mentioned difficulties regarding investments in coal-fired units proved to be too challenging for a number of projects as several of them have encountered problems that led to delays or even abandonment due to technical, legal and/or financial/economic matters.

Simulation model

Different external influences require that plant utilization factors be evaluated in the context of a network of generating plants meeting a specified, time-dependent electricity demand [74]. In other words, in order to be able to evaluate a performance of a unit or an entire sector, it is necessary to conduct a detailed electricity market analysis. The forecast of the wholesale energy prices and power units' production in the year 2015 is performed using a software tool called Programmazione di medio termine (PROMED), a day-ahead market simulator developed by the Centro Elettrotecnico Sperimentale Italiano (CESI) of Milan. In addition, we have created an extension to this software and built a database of the region so it can best correspond to the up-to-date real-life situation found in SEE. The main goal of the market analysis is to investigate the impacts of different factors on the techno-economic performances of a new entrant independent power producer (IPP) based on coal on the South East Europe Regional Electricity Market (SEE REM). PROMED operates using a detailed database of the region's electricity sector. The basic input data includes [75]: zonal market structure and relative net transfer capacities, load demand, fuel prices, emission prices, thermal generation set, thermal units constrains, hydro generation set, competitors bidding strategy on the day-ahead electricity market and equivalent influence of energy exchanges between SEE regional electrical system and its neighbouring systems on an hourly basis.

Assuming full competition in all hours, the competitors' bid-up strategy is aimed to cover the estimated levelised cost of electricity (LCOE) of power units. Electricity price forecasting is performed trough two computational steps [75]:

– unit commitment; during which the hourly merit order is formed based on the constraints of the power system, and
– dispatching; during which the hourly production schedule of each thermal unit in coordination with the hydro dispatching is formed.

The main difficulty was creating a database of the region and modelling the electricity sector so it can best represent the real life situation lies in the difficulty to predict future demand. As our analysis confirmed, the global crisis significantly affected the economies of SEE countries. In the past few years, they have recorded a drop or, at best, a stagnation in the demand for electricity. We based our forecast of the future national demands on the basis of an elaboration of the historical data of the national electricity consumption published by ENTSO-E [76].

Market analysis

The market analysis was conducted using the premises presented in [70, 71, 77]. The referent scenario showed a rather interesting result confirming the current troubled status of electricity generation through the use of traditional sources. Our analysis showed that the main problem of an IPP based on coal is not the obligation to purchase emission allowances, but the overall state of the electricity sector. The mentioned stagnation/drop of consumption along with the EU support to renewable energy sources resulted in a highly unfavourable situation for the thermal sector with significantly decreased electricity prices. The following analysis shows the dispatch and the profits (disregarding financing) that a coal based unit would achieve operating in Croatia for the year of 2015. Taking into consideration the uncertainties regarding the referent scenario, a sensitivity market analysis has been conducted. Five major factors were taken into consideration: EUA prices, fuel costs, hydrology, demand, and the impact of renewables. The analysis took into consideration a variation of EUA prices from 0-40 €/tCO_2 (scenarios 2-6), fuel prices from –20% to +20% (scenarios 7-11), pessimal and optimal hydrological conditions based on historical conditions (scenarios 12-14), electricity consumption variation ±10% (scenarios 15-17). The last of the sensitivity cases involved the use of renewable sources (scenarios 18-22) assuming their production from 1000 GWh to 4000 GWh, or, in other words, 6%, 11%, 17%, and 22% of the annual overall Croatian consumption, respectively. The coal unit is not significantly influenced by this growth and still achieves a stable dispatch. Our analysis showed that the unit can also bare a heavy burden imposed by the EU ETS (even up to 40 €/tCO_2) – despite the lower dispatch, higher electricity prices result in higher profits. What the analysis pointed out is the significant dependency of the coal unit on hydrological conditions and consumption. However, in both cases, the unit's performance was stable even under highly unfavourable conditions. On one hand, this goes to prove the necessity of new base load capacities in the Croatian electricity generation portfolio. On the other hand (and as explained in the following text), coal generation proved unfeasible under current market conditions raising concerns whether this type of technology really is the solution to the Croatian generation mix problem. One additional finding of the market analysis was the high influence of falling demand on electricity prices. Raising the demand for 5% caused the prices to soar over 10 €/MWh proving the crucial influence of demand on forming successful development strategies. The following figure (fig. 3) shows the basic results of the market analysis. Cases 9, 13, and 16 present the referent case and were incorporated into the figure for providing a better perspective.

With the current market conditions considered, the presumed LCOE of the IPP on coal would equal 55.27 €/MWh. Investment, O&M, fuel and CO_2 costs contribute with 34%, 9%, 43% and 14%, respectively, (detailed costs structure is presented in [77]). Figure 3 offers an insight on the unit's dispatch and the profits it would make on the market. However, these profits present only the difference between variable costs and the average marginal price on the market. When investment costs are added into the equation, a difference of 71.9 M€ surfaces causing the coal based unit, at present market conditions, unfeasible. For example, considering the referent scenario, if the IPP would compete on the electricity market without having a beneficial power

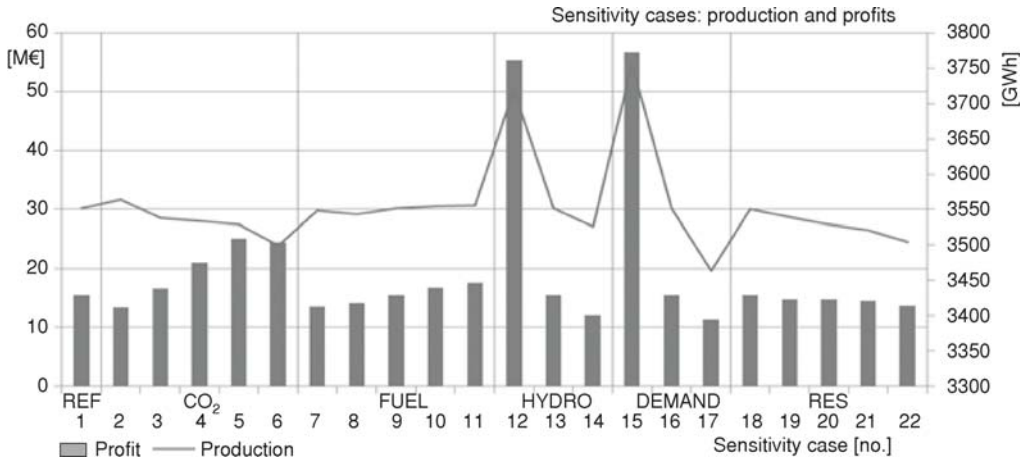

Figure 3. Market analysis sensitivity cases

purchase agreement (PPA), it would achieve a deficit of over 55 M€ during the course of a year. Although this does not necessarily mean that the project would generate such losses during its entire lifetime, it does reveal the current negative climate regarding this type of generation. Figure 4 reveals the dependence between demand and marginal electricity prices during the course of a year. The average marginal price is calculated to equal 41.7 €/MWh. This price reveals why a coal based IPP would have trouble achieving economic balance.

Figure 5 reveals why a new entrant coal unit would achieve dispatch in the Croatian system even with having a LCOE higher that the marginal price. Compared to other thermal units, it would not only have much lower variable costs, its LCOE would be lower than the variable costs of most units of the Croatian thermal generation set.

The goal of providing affordable and reliable electricity able to support domestic industry development while at the same time reducing the carbon footprint is not even imaginable without renewable energy sources such as biomass, solar, wind and hydro [40, 57, 78-81]. As shown by [82-84], Croatia also possesses significant potential in municipal solid waste (MSW).

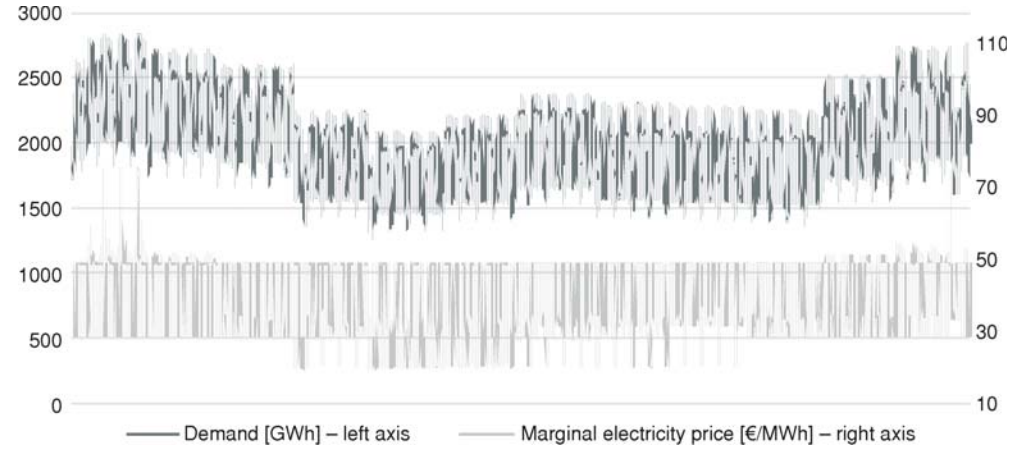

Figure 4. Electricity price demand dependence

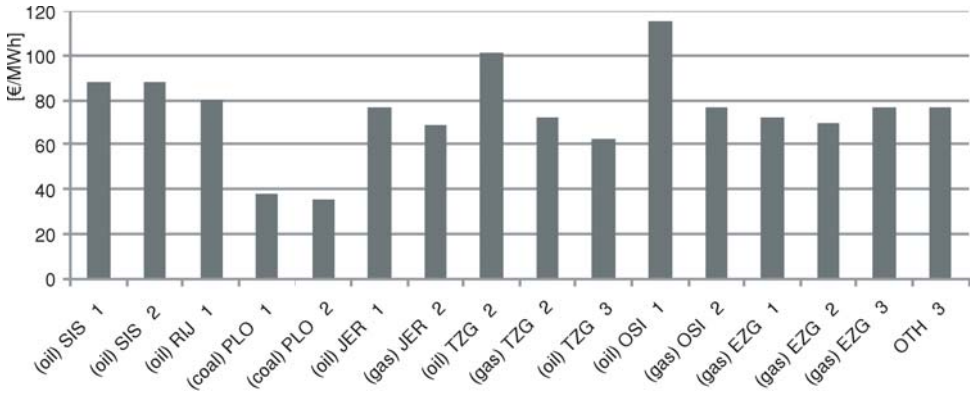

Figure 5. Croatia thermal sector's specific production costs

Despite the fact that conventional mind-set might suggest that RES increase both costs and risks of the energy sector, from a portfolio choice perspective, domestically produced renewables improve the energy security reducing the risk-cost trade-off [85]. Today's renewables are so-called zero marginal-cost technologies having no fuel costs. They are, therefore, able to reduce the exposure of a portfolio to fuel price volatility. When it comes to the Croatian generation capacities development strategy, reforms are similar to national policies of EU countries that favour renewable energy. Hopefully, new strategies will continue this path towards a 100% sustainable electricity sector of the future [58, 59].

Conclusions and Policy implications

Recommendations and discussion towards successful reform

As mentioned, considering the current business climate, financial institutions play a crucial role in the development of the electricity sector. One of the main prerequisites for a successful project is, naturally, achieving successful project funding. Proper risk allocation presents the single most important issue regarding project preparation as lenders tend to avoid projects with high levels of uncertainty and risks. This is one of the reasons why the presence of a national regulatory framework capable of ensuring certainty over the long run is desperately needed in order to attract investment. In order to successfully function within these conditions the necessary steps required from the Croatian electricity sector should involve the following issues listed below:

– rationalise and improve control over public subsidies and guarantees,
– reinforce the oversight over the effective implementation of public procurement rules and increase transparency of public procurement procedures in general,
– establish a competitive selection procedure for supervisory board members and management,
– complete the unbundling process of the TSO in a practical manner,
– establish a power exchange,
– restructure the DSO,
– restructure HEP Production and provide for a transparent electricity market through the power exchange (unlike the bilateral contracts currently in place), and
– regulation should ensure the stability of off-take prices in support regimes.

The key is, once more, on stable regulation able to reduce risks and as such provide for achieving successful project financing. A study made by KPMG [10] enforces such presumptions, as the banks interviewed saw regulation as the most important factor behind granting approval for a deal whilst some expressed that they internally filter projects based upon both the quality of the sponsor and the quality of national regulation, in equal proportions. It should be noted that, governments should not necessarily be involved in direct financing, but instead in risk allocation measures. In terms of regulation, governments need to establish consensus around their national energy strategy, and support technologies that need substantial investment. Considering the banks conservative approach to lending in times of austerity and crisis, an example being the European Investment Bank (EIB) [86], it is of utmost importance to be able to provide a stable regulatory framework that guarantees certainty and transparency on the long run, providing safety for the lenders and raising the attractiveness of the projects within the sector.

Conclusion

In order to fulfil the goals leading to a sustainable energy system for the future, the first step to take is the establishment of a stable regulatory framework that is able to support the necessary changes and foster development. A well-constructed, stable regulatory framework is one of the perquisites for achieving a transparent, competitive electricity market that is efficient, cost-reflective and able to attract foreign investment necessary for providing its development. In addition, achieving a stable regulatory framework country by country would be a significant step forward towards the creation of a common energy market that would help the region to realize its energy potential. In the paper an insight was offered into the current state of the Croatian legal framework, progress with reform, potential prospects and main challenges. In addition, further steps regarding the electricity sector necessary for the successful implementation of the reform process were suggested.

Considering the fact that the primary aim of reform is to improve the productive efficiency of the sector and lower costs and prices by providing for a competitive and integrated energy market Croatia still has a long way to achieve this goal in a more significant matter. The issue of electricity sector reform is that it is not a solemn reform process, but needs to be accompanied by a wider set of institutional reforms in order for it to be effective. The question that arises in this process is whether the EU reform model is applicable in its entire form and is it the optimal choice for not just Croatia, but for the rest of the region as well. If the reform process proves to be successful in practice, Croatia holds the potential to lead by its example in the context of the rest of the countries in the region. A cohesive energy market would help the region realize its potential to improve efficiency and attract foreign capital over the long run. As noted in the paper, the political and institutional challenges posed by market integration represent a significant obstacle despite the crucial role of reforms and regionalization for the continued development of the SEE region. At present, it is somewhat unclear as to how national energy policies of the countries in the region will be able to achieve a coherent regional energy policy that complies with the three objectives of the EU energy policy: competitiveness, security of supply, and sustainability.

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