Benefits of successful market integration

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The International Confederation of Energy Regulators is voluntary framework for cooperation between energy regulators from around the globe. Its aim is to improve public, and policy-maker, awareness and understanding of energy regulation and its role in addressing a wide spectrum of socio-economic, environmental and market issues. By establishing this voluntary confederation, with regular and structured contacts and cooperation between regulators, the world's energy regulatory authorities hope to exchange information and best practices in the regulation field and to make a significant contribution to the evolution towards a sustainable planet. This report was prepared by ICER's Virtual Working Group on Opening & Integration of Regional Markets.

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1 INTRODUCTION

The electricity plays an important role in the economy and its supply has to be planned so that it satisfies the constant increasing demand. Between 2012 and 2040[1], it is expected that the world electricity demand will grow by 29%, from 3,826 billion kilowatt-hours (kWh) to 4,954 billion kWh[2], at an annual average rate of 0.9%. The national energy policy makers around the world focus an important part of their planning tasks to promote the adequate incentives so that the necessary infrastructure is developed and the security of supply is guaranteed. The energy regulators are key players in achieving this goal so they constantly issue and revise regulatory instruments to increase competiveness in the electricity market by finding new ways to improve the energy production, transportation and distribution. In this process, measures to promote the liberalization and integration of the energy markets are becoming a global trend as a solution.

Liberalization of the energy industry involves a combination of competitive energy and retail markets, and regulated transmission and distribution activities. In the process of looking for the equilibrium of this combination, experiences from electricity liberalization around the world have applied a series of generic measures for achieving a well- functioning market-oriented industry; such as: sector restructuring, introduction of competition in wholesale generation and retail supply, incentive regulation of transmission and distribution networks, establishing an independent regulator, and privatization.[3]

Regarding the energy market integration, it refers to a process of convergence of two or more national or regional energy systems that looks for increasing the overall social welfare through a better and more efficient operation of the individual systems, a reduction of the price gap between exporters and importers of energy, and an increase in the security of supply. For this to happen, the harmonization of the existing national regulatory frameworks becomes a necessary condition.

The regional integration of the energy markets occur in different ways and paces depending on the maturity of the national energy systems, the transmission capacity situation in the borders, the congestion problems in the region, and the national energy policies. This integration of markets involves a more complex process than simply the power exchange.

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[1] http://sener.gob.mx/res/PE_y_DT/pub/2013/Prospectiva_del_Sector_Electrico_2013-2027.pdf

[2] http://www.eia.gov/forecasts/aeo/MT_electric.cfm

[3] Jamasb and Pollit (2005), Electricity Market Reform in the European Union: Review of Progress toward Liberalization & Integration.

This working paper analyzes specific cases of regional market integration, identifying characteristics, type of integration, role of energy regulators and the benefits associated with energy market integration. In doing so, the paper is developed as follows: first, reviewing some literature on this topic; secondly, describing the six cases of regional integration provided by members of the International Confederation of Energy Regulators (ICER); in third place, an analysis of the regulators' role on the energy market integration is presented; and finally, there is a section of general conclusions.

2 LITERATURE REVIEW

Basic microeconomics explains that competition results in a higher production and market efficiency and that its benefits are passed on to customers and the economy in the form of lower prices and costs. The energy supply industry linked to grids has important physical characteristics that demands more of a "visible hand" in the form of regulators than to let the "invisible hand" of competition to try to obtain the above-mentioned benefits. These physical characteristics involve (i) large sunk costs which limit entry possibilities, (ii) vertical stages (generation, transmission/transport, distribution and retailing) of production with different optimal scales, and (iii) a non-storable good delivered via a network which requires instantaneous physical balance of supply and demand at all nodes. The national regulatory framework applied to deal with these characteristics is fundamental when the individual systems are in the process or operation of a regional integrated market.

The integration of energy markets involves the creation of a combination of competitive energy and retail markets, and regulated transmission and distribution activities. The regional market integration's success requires well-organized energy, associated ancillary services and transmission capacity markets to achieve competition with physical balancing and appropriate regulation of monopoly power.

The power exchange among the integrated market participants can happen through an optional or mandatory spot market, and as a complement, a market for financial instruments (futures, forwards and options). The spot market accommodates suppliers and consumers in an auction determining market clearing prices and quantities, while the financial market performs price hedging. The success of the mechanism depends, necessarily, on the existence of enough transmission cross-border capacity that allows for the market clearings. The energy regulators, along the energy policy makers, face huge challenges in determining, promoting and developing the required transmission infrastructure, and more challenging even, in allocating the costs of it when the benefits might not be the same for all the participants in the integrated market.

The literature refers to two market-based options to combine cross-border trade and cross-border transmission capacities: explicit and implicit capacity auctions. In the case of explicit auctions, power trading does not directly integrate the auction of cross-border capacities; instead, the potential energy seller bids for energy and transmission capacities separately. This method faces two main inefficiencies when auctioning for transmission because most of

the times the power is traded via day-ahead energy markets. So the first inefficiency has to do with the fact that the cross-border transmission capacities are booked prior to the actual day-ahead market. This means that the transmission auction is based on predictions of the expected day-ahead prices with the potential consequence that the booked transmission capacity will not necessarily equal to the power units finally sold. The second inefficiency stems from the fact that transmission capacities are booked for both directions; so capacities can be booked for the "wrong" direction.

On the other hand, an implicit auction combines both energy and transmission trade to resolve the problems just mentioned. A necessary condition for the success of this method is the existence of a common auction office where all the information related to the transmission capacity availability and needs is gathered from the participating transmission system operators. This information is considered in the respective power auctions among market participants, eliminating the aforementioned inefficiencies. However, this method faces a different problem. This is the fact that the responsible auction office is a monopolist so the proper regulatory framework must be designed and applied to make sure that the auctioneer remains independent from other market participants and does not discriminate among different generators and/or traders.[4]

Market coupling and market splitting are two subclasses of the implicit auction concept. The former concept defines relevant local markets, that are fixed for a given period, and among which the implicit auction is performed. When there is no congestion on the borders between coupled markets then there is full price convergence in the region. On the contrary, when congestion is a problem, there will be a price difference between the electricity exchanges. Market coupling looks to optimize the use of the available transmission capacity, as well as the adequate congestion management across interconnection borders with the consequent benefits for energy consumers: harmonized electricity prices and greater security of supply.

Market splitting defines the relevant local submarkets according to congestion. If there is a congestion problem between two points at a specific submarket, then it will be treated as a separate area within a same market. For instance within Europe, where there is a goal to concrete a single European electricity market[5], there are clear differences in models applied by many of their countries. There is the case of the French, Belgian, Dutch and German power exchanges which are integrated via a market-coupling model, where every country constitutes as separate market. The Nordic countries, Sweden, Denmark, Norway and Finland, are linked via market splitting, meaning that there is not necessarily a full power price conversion within one of the national energy integrated system. This is the case of

[4] Böckers, Haucap and Heimeshoff (2013), Cost of Non-Europe in the Single Market for Energy, ANNEX IV, Benefits of an integrated European electricity market: the role of competition.

[5] The European electricity market generally refers to the European Union - 15 countries plus Norway and Switzerland (EU- 15+2) as the latter two are closely associated with the Union.

Sweden, which is not a single area but fragments defined by transmission capacities and potential congestion. [6]

Böckers, Haucap and Heimeshoff (2013) explains how the existence of cross-border network capacities is the cornerstone of any market covering more than one region. This is the core of the discussion about the integration of European energy markets.

Regarding electricity market integration; Yanrui Wu (2012) reviews the trends in regional electricity market integration and analyzes the implications for the electricity market development in the East Asia Summit (EAS)[7]. He mentions that in order to promote an integrated electricity market it is crucial to achieve cross-border interconnectivity, which refers to the capacity to connect and transmit electricity to different regions or neighboring countries. The creation of a national market is also a precondition for sub-regional and regional electricity market integration. To accomplish this second requirement the creation of new reforms in the electricity sector is needed. He mentions that these reforms would have to work together to harmonize the regulation and the technical standards associated with consumer protection, legal and tax issues, standardized contract forms, tariff-setting mechanism and trading systems.

Meanwhile, Seth Blumsack (2007)[8] studies the formation of a regional transmission operator (RTO) which is an independent nonprofit organization that manages the joint transmission assets of a number of transmission-owning electric utilities. The major difference between RTO markets and their predecessors is the integration of generation resources for economic dispatch, i.e. the generation resources over a number of utility control areas are cost-optimized and dispatched jointly. His preliminary result indicated that the regional electric grid integration and centralized RTO spot market would benefit consumers, increasing operating efficiencies and decreasing production cost and consumer rates.

Additionally, this document comes across what many authors agreed on and is that there are multiple benefits derived from implementing electric market integration. Pierce, Trebilcock and Thomas (2006) analyzes the effects of greater regional integration of electric markets and conclude that greater integration has the potential to improve the performance of electricity markets in many ways which include: reducing the total cost of electricity (through increases in efficiency); reducing consumer cost; reducing price volatility and mitigating market power by the dominant players. They identify seven preconditions for successfully designing and implementing large regional markets: (i) vertical separation of functions (between generation and sales on one hand, and transmission and distribution on the other);

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[6] Böckers, Haucap and Heimeshoff (2013), Cost of Non-Europe in the Single Market for Energy, ANNEX IV, Benefits of an integrated European electricity market: the role of competition.

[7] Yanrui Wu (2012); Electricity Market Integration, Global Trends and Implications for the EAS Region.

[8] Seth Blumsack (2007); Measuring the benefits and cost of regional electric grid integration.

(ii) horizontal integration (of transmission and network operations, and reliability standards); (iii) non-discriminatory access to the transmission grid; (iv) an effectively functioning spot market; (v) consumer incentives to respond to price changes; (vi) a mechanism for allocating scarce transmission capacity; and (vii) mechanisms that introduce or require adequate investment in transmission capacity.[9]

Oseni and Pollit (2014) analyzes several case-studies of cross jurisdictional electricity trading in Africa, Central America, US, Ireland and South East Europe. They search for evidence to facilitate the electricity trade, the nature of the trading platform, what institutions where set up to support it, the governance of these institutions, the practical steps for the implementation and the concrete evidence on the benefits of the trade. The authors found that the existence of a regional trade can help to reduce possible regional electricity trade barriers; they also support the idea that an adequate transmission capacity is essential for power trading to occur. They state that an integrated power pool needs an efficient operator who can oversee and sanction the activities of participants in order to prevent predatory pricing, non-disclosure of capacity and other forms of unruly behavior. Another important finding is that the viability of an international power pool should be assessed in advance by a careful cost-benefit analysis[10].

3 IS REGIONAL ELECTRICITY MARKET INTEGRATION A GOOD IDEA?

In recent years the global economy has shown a trend towards market liberalization and integration in the electricity sector. There are many advantages associated with this concept and a large body of literature shows the short and long-term benefits.

The various world-wide experiences of transition to competitive electricity markets have generated intense debate surrounding the principles, design, standards, institutional structure and consequences associated with the introduction of open markets in a sector long considered public, “protected from the markets”. This dynamic environment of energy policy represents an opportunity for politicians and planners to find the best way to boost both profits and environmental benefits of more integrated energy markets.

In this section, six specific case studies of regions that liberalized and opened to trade their electricity market will be analyzed: 1. The Nordic Integration, 2. The Southern African Power

[9] Pierce, Trebilcock and Thomas (2006), Beyond Gridlock: The case of greater integration of regional electricity markets.

[10] Oseni and Pollit (2014), Institutional arrangement for the promotion of regional integration of electricity markets: International experience.

Pool, 3. The Iberian Electricity Markets, 4. The SIEPAC, 5. The North America Regional Electricity Interconnections, finally the case number 6. The implications of the shale gas in New England, which points out how important it is for the correct functioning of a regional electricity integrated market, the efficient provision of the necessary fuel, in this case, shale gas, to satisfy the expected supply. In each case, the paper goes through the incentives that led to the creation of the electric liberalized market, the challenges encountered, as well as the advantages associated with a free trade market.

They all agree and emphasize the following benefits:

a. Security of supply
b. Reduction of operating costs
c. Infrastructure development
d. Foreign investment in power generation and transmission

2.1 THE NORDIC INTEGRATION[11]

Norway was the first Nordic country to initiate the process to a free trade electricity market followed by Sweden, Finland and finally Denmark; these countries created the Nordic Electricity Market or Nordic market. The liberalization process of this market has taken some time but now their common wholesale market is working fine and the majority of the Nordic consumption is commercialized through the Nordic power exchange.

The main characteristics of this market configuration are: First, the creation of a common retail market. Second, the creation of a common set of rules for cooperation among the participants that have harmonized the trade. Third, the definition of the regulator role; and finally, the establishment of non-discriminatory, transparent and objective balancing mechanism of settlement. The building of the Nordic market took time and as a prerequisite it was required that the entire members fulfilled the measures that were implemented.

A central factor of this integration was the establishment of the Nordic electricity exchange (Nord Pool), a common Nordic marketplace for power trading which consists of a spot market and a forward market. The core of the Nord Pool was an hourly spot market where the price of electricity for each hour is set where demand and supply curves meet. In case of congestions between bidding areas, the region is split into smaller areas with consequence

[11] The following information was pull out from the paper: The Nordic integration of the electricity markets.

of having one regulating price for each area. When there is no congestion, the regulating price will be the same for the whole region.

Which where the problems that Nordic countries went through, in order to put this method into action?

Nordic countries have faced several difficulties such as monopolistic markets, insufficient production given the seasonal variation of consumption and diverse forms of electricity production that were inefficient. For these reasons, such countries chose to create an open market that created better conditions for competition, improved the use of the production resources and produced gains from a more efficient operation of their networks.

One of the specific benefits of integration of this market, has to do with the historical hydropower generation as the leading source for producing electricity. It was clear for them that the cost for water reserves could be vastly reduced if their major producers could gather their different kinds of technologies and optimize the use of the power plants. Therefore, the integration of the electricity market has represented a very good opportunity to increase their production and an optimal way to reduce costs.

The Nordic regional open market integration has helped to achieve a developed, effective, secure and well-functioning energy market.

2.2 THE SOUTHERN AFRICAN POWER POOL[12]

The market structure of the South African Electricity Supply Industry (ESI) is dominated by a state-owned vertically integrated utility, namely Eskom. It supplies about 90% of South Africa's electricity requirements which equals more than half of the electricity generated on the African continent. Eskom is a licensed Transmission Network Service Provider (TNSP) mandated to plan in response to the network requirements in terms of the South African Grid Code under the National Energy Regulator of South Africa's (NERSA's) custodianship.

The South African electricity market is characterized by power generated and consumed both locally, and outside the borders in the form of imports and exports to/from neighbouring countries by Eskom. Reliable electrical power supply of acceptable quality is transported by transmission lines/networks to the transmission substations where these networks terminate.

Faced with a looming power shortage and challenges relating to the integrity of infrastructure, capital expenditure, short-term reliability and ability to avoid intentional and

[12] Ronald Chauke (2013), Case study on electricity cross- border trading within the Southern African Development Community (SADC) region.

unintentional damage, Southern African countries have committed to RPSI under the auspices of the Southern African Development Community (SADC)[13].

SADC, aimed at increased energy supply and consumption, resulting in increased energy security through regional cooperation, has put in place a number of legal and policy frameworks through the adoption of instruments such as protocol, policy and strategy guidelines, regulatory frameworks, and technical standards to facilitate infrastructure development in the region.6 These include the SADC Energy Protocol, SADC Energy Sector Action Plan, Southern African Power Pool (SAPP) and the Regional Energy Regulators Association (RERA)[14].

However, like most regional power integration efforts, SADC has faced a number of challenges that have slowed progress on a number of initiatives and projects thus limiting the benefits of regional integration. These include lack of political commitment to regional power integration programmes and initiatives, differences in regulatory environments, financing of investment plans, and environmental concerns.

In the cross-border mentioned below, Shanduka/Aggreko joint venture partners have invested in the construction of a number of significant infrastructure projects to bring the overall project to fruition. This includes the building of a 1.2 kilometres high pressure gas pipeline, gas processing and de-pressurising infrastructure, a major substation and 1.5 kilometres of 275kV transmission line.

The construction and commissioning of the entire project was delivered in the space of 14 weeks. The fast-track deployment of significant power generation infrastructure of this type is a hallmark of Aggreko's worldwide operations[15].

The Aggreko-Shanduka cross border power project has been awarded Africa's Best Fast Track Power Project in 2012 at the Africa Energy Awards. The objective of this project was to supply a fast-tracked cross-border power to two utilities in the Southern Africa region and to work as a catalyst that could give credibility to Public Private Partnerships (PPPs). Also, this project brought great benefits to the local population, providing opportunities for employment and stimulating the economic activity.

[13] Mwenya Balya (2012), Managing Energy Security in the SADC Region

[14] SADC Infrastructure Development Status Report for Council and Summit, http://www.sadc.int/cms/uploads/K7543%20RTFP%20SADC%20Infrastructure%20brochure_English_V11_LR.pdf

[15] Ronald Chauke (2013), Case study on electricity cross- border trading within the Southern African Development Community (SADC) region.

2.3 THE IBERIAN ELECTRICITY MARKETS (MIBEL)

The creation of the Iberian market was driven primarily by the desire of the Portuguese and Spanish administrations to establish the Iberian electricity market and increase the benefits to electricity consumers in both countries by allowing free access under conditions of equality of rights and obligations, transparency and objectivity, and promoting economic efficiency of the companies.

The Iberian Electricity Market was a crucial step towards the development of the internal electricity market, with its emergence, it becomes possible for any consumer in the Iberian zone to acquire electrical energy under a free competition regime, from any producer or retailer that acts either in Portugal or Spain. The management of MIBEL is based on an interconnected bipolar structure, where the day and intraday markets are operated by the Spanish division (OMEL) and the derivatives market is under the responsibility of the Portuguese division (OMIP)[16].

The Iberian system as a whole is treated as a single market, if at a certain hour of the day the capacity of the interconnection is such that it permits the flow of the electricity trades by the agents, the price of electricity for that hour will be the same for Spain and Portugal (coupled market[17]). If, on the other hand, the interconnection is fully occupied, market splitting is used to assign interconnection capacity and there is a price difference between the two countries.

2.4 THE CENTRAL AMERICAN ELECTRICAL INTERCONNECTION SYSTEM (SIEPAC)

The SIEPAC is a network made up of 15 substations along six countries from Guatemala to Panama, with its lines of transmission and distribution, which allows the conveyance of energy from one region to another country (Panama, Costa Rica, Honduras, Nicaragua, El Salvador and Guatemala).

The six-country competitive regional electricity market (MER) forms a seventh market and began operating under a transition code in 2002 moving to an updated code in 2005. Each country retains its domestic market and regulatory framework with the necessary changes to ensure compliance with MER and to ensure that it can interact with the regional market. The

[16] OMIP, “MIBEL Derivatives Market – Operational Guide”, June 2009

[17] José María Marín- Quemada (2014), “The Iberian Electricity Market- MIBEL: an example of regional integration before the European single market.

MER is supported by a regional market and system operator (EOR) and a regional regulator (CRIE), with the associated technical and market codes. MER consists of a firm and non-firm contracts market and a day-ahead and real-time spot market for short-term trades with prices set at specified physical trading points (nodes) in the RTR. The terms (e.g., duration and capacity) are freely decided by the buyers and sellers. Access and use of the RTR is auctioned in the form of financial and physical transmission rights by the regional market operator.[18]

One of the main objectives of this project was to turn this MER into an engine of regional development consolidating the integration of electrical systems and thereby reducing energy costs, increasing the reliability of supply, enhancing competition in domestic markets, generating economies of scale, and as a result, creating a more secure network with higher capacity, to attract more foreign investment. SIEPAC shows that developing regions such as Central America are capable to overcome long-standing historical differences and work together in long-term projects such as this one. But it has also pointed out the need of a harmonized institutional network that follows best international practices in order to succeed.

3.5 THE NORTH AMERICAN REGIONAL ELECTRICITY INTERCONNECTIONS

The case of North America is very interesting since their electricity industry has shown several problems that have been approached through the creation of the necessary regulatory framework to facilitate and encourage the efficiency and transparency of the regional market.

The most important problems that the North American electric system has encountered are known as: "*seams isuess* which are defined by the ISO of New England as the barriers and inefficiencies that inhibit the economic transaction of capacity between neighboring whole-sale electricity markets, or control areas, as a result of differences in market rules and design, operating and scheduling protocols and other control area practices. Seams exist between most control areas because wholesale electricity markets have evolved using different sets of rules and procedures. For example, seams can result from different pricing models, inconsistent transaction submittal times, and variations in transmission tariff services"[19]. In the case of the North American electricity sector, every state has his own

[18] Economic Consulting Associates (2010), Central American Electric nterconnection System (SIEPAC, Transmission &Trading Case Study

[19] http://www.iso-ne.com/nwsiss/grid_mkts/how_mkts_wrk/faq/#faq26.

regulatory framework and procedures for the transportation and sale of power between regions; so, the borders between them are becoming an impediment to good trade.

Therefore, the operational problems are related to the rules and procedures used by regions to manage electricity flows; specifically with the capacity of the generator to fulfill the sale contracts. Another operational problem has to do with the stream power, although the electricity companies want to predict their production capacity, sometimes they fall short because the stream power follows physical laws and they become out of control.

Another relevant characteristic of the electricity sector in North America has to do with prices arbitrages, given that each State has a different structure, different methodologies of prices and different rates of transmission. “For example, transmission systems that utilize fixed-cost pricing policies can create disincentives for interregional trade by making it uneconomic for some users”[20].

Finally, it is worth mentioning that the number of interregional interconnections is insufficient to create interregional trades of electricity[21]. So, in order to facilitate the trade it is necessary that the interconnection and transmission facilities in existence are capable of covering the require power flow.

In order to solve the problems mentioned above, the American authorities jointly with electricity associations are persuading the federal government to create federal regulatory instruments to promote a competitive market that generates confidence in investors.

3.6 THE IMPLICATIONS OF SHALE GAS PRODUCTION ON NEW ENGLAND ENERGY MARKETS[22]

The Independent System Operator New England (ISO-NE) was created in 1997 by the Federal Energy Regulatory Commission, it is an independent organization which dispatches power plants over six states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont), ensures the day-to-day reliable operation of New England's bulk power

[20] Garvey, Obiora and Mcnamara (2013). Cross-Border Power Flows: A case study on interregional electricity interconnections in North America.

[21] Garvey, Obiora and Mcnamara (2013). Cross-Border Power Flows: A case study on interregional electricity interconnections in North America.

[22] Jason N. Rauch, Ph.D., “The Implications of Shale Gas Production on New England Energy Markets”, March 11, 2014

generation and transmission system, ensures the fair administration of the region's wholesale electricity markets, and manages comprehensive, regional planning processes.

Undoubtedly one of the main objectives of the creation of the ISO-NE was to secure the electricity supply in the six States in the short and long term. In this sense, looking for the best tool of policy to avoid the problems that can be caused by power cuts, the operator of the electricity market in New England developed the mechanism of Future Capacity Auctions (FCM).

The capacity of the pipeline has long been a concern in New England, but the situation has become more serious in recent years since the region has increased its dependence on natural gas[23]. The operator of the regional energy ISO New England, has already warned that the limited capacity of local pipes would lead to a lack of supply in the event of extreme weather and high demand.

Demand for natural gas is widely expected to grow for the purposes of electricity production and home heating as improved extraction techniques in recent years have significantly reduced the costs of producing gas from shale formations. These advances have opened up a potential vast resource of shale gas in United States domestic regions fairly proximate to New England, namely the Marcellus and Utica shale gas formations in Pennsylvania and New York.

While these shale gas formations hold promise to supply vast quantities of natural gas at relatively low prices over the long-term, gas pipeline transmission constraints into New England cause high marginal demand to drive up a transmission supply-constrained resource. These transmission capacity constraints contribute to natural gas prices in New England that can be significantly higher than the rest of the United States. Constraint problems become particularly acute at winter peak times, when demand for electricity for winter heating loads combines with high demand for direct natural gas heating.

There is a high probability that additional pipeline capacity will be needed in this region, even more, if significant shale gas resources are discovered and developed to the east of New England, like in New Brunswick, Canada. Exploration is ongoing, and a significant find would reduce gas prices, rendering investment in transmission capacity into southern New England less marginally beneficial in reducing price differentials.

Shale gas production presents both opportunities and challenges to New England. In the near-term, while providing the promise of a cheap, domestic energy source, pipeline transmission constraints prevent consistent affordable access to what would otherwise be a

[23] New England is a net importer of electricity, accounting for about 10% of electricity consumption. The predominate source of these imports is from hydroelectricity generated in Quebec, Canada; as such, natural gas ultimately generates about 45% of the electricity to serve net load in New England.

cheap natural gas source. Existing market dynamics in New England might limit optimal investment in transmission capacity, resulting in suboptimal pipeline construction. While proper pipeline investment, coupled with shut-downs and repowering of New England's oil and coal fleet, provide for the potential for a cheaper, cleaner electricity generation mix in the near to medium term, long-term challenges remain. Existing challenges, such as greenhouse gas emissions, will likely continue to remain in the long-term, as natural gas only provides, at best, a bridge to a future with dramatically lower carbon pollution. New challenges, such as the risk of overreliance upon a single energy source for a large portion of heating and electricity needs, will grow in importance as New England's energy systems transitions to higher consumption of natural gas made available by the boom in shale gas production[24].

4 THE ROLE OF THE REGULATOR IN THE INTEGRATION OF ELECTRICITY MARKETS

Economic regulation was born as the second best given the existence of competition failures. However, when the authorities have to intervene to mitigate them, they face several obstacles to accomplish optimal results mainly due to the asymmetry of information[25].

Regulation can be perceived as a traffic light which restricts unwanted activities or behaviors in a society; or which transforms them so that they end up being beneficial. For this reason in many occasions, regulation is referred to as "the visible hand" that operates when the "invisible hand" is not able to encourage certain behaviors in favor of social welfare[26].

However, as Jean-Jacques Laffont points out, there are two types of regulators who must be "feared": those without power and under the total control of the Government and those with excessive independence, which can be captured by the regulated industry.

As we have mentioned above, the Nordic market is competitive and free so the task of the energy regulators in the Nordic electricity market is limited. Therefore, Nordic regulators' biannual meetings focus in outlining each country's progress due to new regulation looking to encourage cooperation and greater competitiveness.

[24] Jason N. Rauch, Ph.D., "The Implications of Shale Gas Production on New England Energy Markets", March 11, 2014

[25] Comisión Federal de Mejora Regulatoria (COFEMER). Fortaleza Institucional de las agencias reguladoras en México. Documento de Investigación en Regulación Núm. 2012-03, Noviembre 2012

[26] Comisión Federal de Mejora Regulatoria (COFEMER)-Red Latinoamericana de Mejora Regulatoria y Competitividad. Introducción a la regulación, Marzo 2012

In the Nordic retail market regulators are involved in drawing up proposals of new solutions to common problems. The main mission for Nordic regulators is to monitor how the issued recommendations on regulation are implemented so that they are put into operation in the best possible way. For example, there were no rules concerning international trading, so there was a need to formulate them taking into consideration the benefits that these rules could provide to the society as a whole. Hereby, the clear objective is to build the best framework for the development of a cost-effective borderless Nordic market with a successful international trade. The energy ministry, regulators and energy associations work together in mutual collaboration looking to harmonize the general conditions for the entire players in this Nordic market and provide identical conditions for competition and development of the transmission network between Nordic regions.

In the case of SADC, most of the power trade within the region is based on bilateral agreements between participating states governed by long-term power purchase agreements. These agreements are differ from one country to another due to different energy regulatory regimes in each member states, thereby lacking in regional regulatory transparency and efficiency. With RERA's functions being restricted to information sharing and facilitating the harmonisation of electricity supply industry (ESI) policies in the MS, it is difficult to sanction members for non-compliance to regional guidelines or programmes. Further, with only nine out of twelve SAPP members being affiliated to RERA, the benefits of harmonised ESI policy are yet to be fully realised[27].

In the case of the MIBEL, governments identified a set of actions to deepen the integration of the energy markets, some of which are located in the sphere of exclusive intervention by governments and others whose development is a responsibility shared by governments and the Board of Regulators of the MIBEL (CR MIBEL).

The regulatory harmonization actions of exclusive intervention by the governments focus on the definition of the general principles of organization and management of the "Operador del Mercado Ibérico" (OMI). Those actions shared by the governments and the CR MIBEL, focus on the following areas: (i) the definition of common rules to increase competition in the MIBEL; (ii) encouragement of liberalization and the definition of the plan of convergence of rates; (iii) the implementation of a mechanism for interconnections management; and (iv) the standardization of mechanisms to guarantee power.[28]

The Central American Electrical Interconnection System shows that in order to create and expand the infrastructure and the corresponding benefits, institutional and long lasting arrangements are a prerequisite. Supranational and technical institutions are crucial for providing clear and predictable rules and outcomes, which are needed to foster huge long

[27] Mwenya Balya (2012), Managing Energy Security in the SADC Region

[28] http://www.cne.es/cne/doc/mercados/Estudio_MIBEL_ES.pdf

term sunk costs investments, to promote and follow-up the harmonization of national laws and regulations for the benefit of the region.

Compared with the rest of the processes of integration of electricity markets, the Central American is showing further progress on the institutional aspect in the sense that they have already created supranational entities materialized in the SIEPAC Project. They have a single institution responsible for the regulation of the process, and a single entity operator, within the framework of the macro-market, in addition to having a treaty framework.

The electricity market in the USA is free and regulated, nonetheless. This idea may sound peculiar but since 1935 the USA government endorses the Federal Power Act (FPA) which created the Federal Power Commission with the authority to regulate the transmission of electricity. Today, each state has a regulatory commission and there is also the Federal Energy Regulatory Commission (FERC), both follow similar basic functions: designing prices, setting services' quality standards and consumer protection requirements, overseeing the financial responsibilities of the utility; determining the revenue requirements and allocating cost among different costumers.

FERC regulates inter-state, international electricity sales, wholesale electricity rates, transactions and hydroelectric licensing but the distribution and regulation of intra-state electricity remained under state control. It established that transmission providers, as well as the ISO and RTO must include aspects of economic planning, reliability, and allocation of cost of the networks. In addition, the Commission established that planning must be a coordinated, open and transparent process at both the regional and local and with the participation of investors. In the northeast of the US, mechanisms have been established to coordinate between different network operators, including ISO New England, New York and PJM ISO, even the creation of an international committee which integrates Canada with the same purpose. This allows coordination between expansion plans for the improvement of the reliability of the transmission system[29].

It is important to note that all of these benefits depend entirely on the effectiveness of regulation. Moreover, all the difficulties that entail integration of electricity markets are actually regulatory difficulties. At the end, regulation is responsible for properly designing market, in such a way that it provides price signals and incentives for efficiency and appropriate investment decisions and also to prevent that market abuses are being perpetrated. Therefore, an integrated electricity market will not function properly unless there is an adequate control in function.

[29] J.D. Molina, GSM, IEEE y H. Rudnick, Fellow. Expansión de la red para la integración de ERNC: ¿Oportunidades para América Latina?

5 CONCLUSIONS

The different aspects that exist regarding the benefits of power integrations are not necessarily convergent. Whilst there are real benefits for all, there might be specific impacts that can cause damage to certain actors or countries. This indicates the need for an accurate conceptual identification and measurement of the effects resulting from the integration, the advantages, resistance and barriers that can be generated and the regulatory instruments to avoid them, or at least reduce them.

A regional electricity market will allow the adequate flow of import and export through transmission networks, cost reduction, economies of scale, market opportunities, increase investment and provide greater security to the systems of integrated networks. For this to happen, regulators face a major challenge in establishing the method to apply in the integration process, the required transmission capacity, the adequate differentiation and quantification of net income, and the cost allocation of the infrastructure. Given the fact that there is no single and best way to establish a scheme of charging across networks of transmission of a regional market, it will depend on the particular characteristics of the system and the different objectives that the regulation decides to establish.

Finally, we can conclude that in the medium and long term regional electrical integration contributes to a greater security of supply, as it allows the diversification of the energy matrix. Also, allowing economic exchanges of electric power between two or more countries, can significantly influence the structure of energy production, reducing costs of generation and improving utilization, efficiency and effectiveness of their transmission equipment and generating plants. The development of necessary infrastructure and the correspondent investment reflect many of the economic and social benefits that detonates a regional integration.

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ANNEX 1 – Case studies

- Case study by Mr. Ronald Chauke, (NERSA, South Africa): Electricity Cross-Border Trading within the Southern African Development Community (SADC) Region
- Case study by Energy Markets Inspectorate (Sweden): The Nordic integration of the electricity markets
- Case study by John Garvey (New Jersey Board of Public Utilities), Noel Obiora (California Public Utilities Commission) and Ed McNamara (Vermont Service Department): Interregional Electricity Interconnections in North America
- Case study by Lorenzo Meyer Falcón: Iberian Electricity Market (MIBEL)
- Case study by Lorenzo Meyer Falcón: Central American Electrical Interconnection System (SIEPAC)
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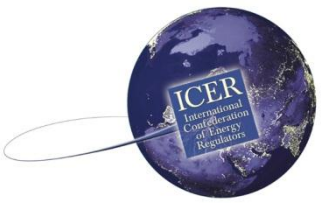

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