

REGIONAL POWER SECTOR INTEGRATION: CRITICAL SUCCESS FACTORS IN THE CENTRAL AMERICAN ELECTRICITY MARKET

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Abstract: Greater integration of electricity markets between neighboring countries is a strategic option for mutual strengthening of national systems through economies-of-scale in investments and enhanced energy security. There are different possible levels of integration: (i) the development of cross-border interconnections, (ii) long term purchase agreements for development power plants (like Itaipu between Paraguay and Brazil or Nam Theun 2 between Lao PDR and Thailand) or (iii) the creation of regional electricity markets or power pools. The first two are not real integration but interconnection because, although the infrastructures are physically linked, the planning and operation are not. Moreover the level of integration of regional electricity markets can be divided into two whether the dispatch is coordinated or centralized. The deeper the integration larger the benefits are, in fact the World Bank (2011) describes the difference between interconnection and integration and that between trading goods and having a common economic market.

Obviously the process for integration requires a harmonization process and some level of decision-power cession from national governments. These are the biggest barriers and can only be overcome with large political will and support. Nevertheless, that it is very challenging to achieve because of sovereignty and security concerns. For that, although the benefits of the integration are commonly understood, few regions have been able to overcome all the difficulties and to create a regional electricity market. Central American countries are an interesting example because of the large number of countries involved (six), the political and technical initial differences (from vertically integrated public monopoly to fully unbundled competitive electricity markets) and the creation of independent supranational institutions with decision power over the regional market (regional regulator and operator).

The development of the Central American regional electricity market (MER) is a process led by the Central American state-own utilities with the support of the Inter-American Development Bank (IADB) materialized through the SIEPAC project (System for the Electric Interconnection of the Central American countries). In this process they have sign an international treaty (Marco Treaty) to ensure the political support, one company for the design, construction and maintenance of the infrastructure (EPR), constructed a regional transmission line through a “regionally owned” special-purpose company, created two independent regional institutions for the operation (EOR) and the regulation (CRIE) of the MER, and approved and enforced a regional regulation to which national systems must harmonize. During the implementation process extra-regional private and public companies have also become shareholders of the EPR, Endesa from Spain, ISA from Colombia and CFE from Mexico. Moreover the project is growing to interconnect the region with Mexico (already implemented) and Colombia (under development).

Central American countries have just started to achieve some of the benefits like the management of the energy crisis in Panama during 2013. Nevertheless it took 25 years from the initial studies in 1987 until the final enforcement of the regional regulation in 2013, what is representative of the difficulties of the regional integration process. The combination of challenges and successes make the SIEPAC project an attractive case for the understanding of the complexity of the regional

cooperation processes in the power sector and for finding evidences that could be utilized for other regions.

The objective of this paper is to identify the critical success factors that have made possible to achieve the political support from the different Central American government even all the challenges faced during the implementation process. The causal analysis of the implementation process complemented from literature review and interview survey with stakeholders identified five critical success factors: (i) the concept of gradualism, which allowed to overcome the difficulties arose because of different national contexts; (ii) the involvement of the state-owned companies at the center of decision-making, critical for obtaining the required political support and to maintain the commitment of the countries during a long process with changes in the national political contexts; (iii) the incorporation of extra-regional partners, reducing the political interferences to the regional institutions and bringing the project to the national development agendas; (iv) the managerial and economic independence of the regional institutions, essential for creating a regional vision that move the project from inter-governmental to supra-national status and (v) the continuous support from the Inter-American Development Bank who played an important role as honest broker and main supporter of the project.

Keywords: Central America, energy, MER, regional cooperation, SIEPAC

INTRODUCTION

The development of national interconnected systems and electricity markets is a common objective of national policies in order to increase the efficiency and security of supply and reduce the overall cost of the electricity. But this process of greater interconnection and integration of electric systems is in most of the cases stopped at the national borders. If the integration would not be constrained by national borders, benefits would continue increasing. For example, Chatzivasileiadis S, Ernst D, Andersson G. (2013) found that the project for a globally integrated energy grid is technically feasible, economically profitable and would bring operational benefits and allow a 100% renewable energy supply by 2050 [3].

In fact the promotion of cross-border electricity grids integration is being strongly proposed these at several regions. The World Bank (ESMAP, 2011) explains that by regional power sector integration, countries can get benefited from enhanced energy security, economies-of-scale in the investments, easier financing, possible greater renewable energy penetration and synergic sharing of complementary resources [12]. This integration process has different stages starting from the development of interconnections between systems, continuing with the constitution of electric power pools and ending with the implementation of centralized electric dispatch. There are several examples of the initial stages like Itaipu Binational (Paraguay and Brazil) or Namh Tenh bi-national hydropower dams like Itaipu (Paraguay – Brazil) or Nam Theun 2 (Lao PDR and Thailand). But, in order to unblock the full potentials from power sector cooperation, it is necessary to move beyond the interconnection of independently designed and operated systems to further integration. In words of The World Bank (2011), “the difference between interconnection and integration is analogous to the difference between trading goods and having a common economic market” [9].

Different explanations have been given to this lack of progress in the integration process. For example the World Bank identified the following challenges: “difficulty aligning national and regional investment decisions, differences in regulatory environments between countries, insufficient regional institutions, dearth of financing, changes in political frameworks, and national sovereignty and energy independence concerns. But it is being achieved a common agreement of the importance of political factors as the main barrier for the development of regional power sector integration [5] [8] [13] [14].

The SIEPAC Project¹ is a good example of how countries can overcome political differences and reluctances and commit with an integration process in the power sector. Since the sign of an international treaty in 1996 until the enforcement of a regional regulation in 2013, Central American countries have been able to build the physical and

¹ System for the Electric Interconnection of Central American Countries

institutional infrastructures needed for the operation of a regional electricity market. The aim of this paper is to identify the main successful factors that helped to overcome those political barriers in Central America².

1.1. Regional Cooperation in the Electric Sector in Central America

The main motivation for the regional power sector integration is that the small size of the Central American national electric systems and economies. This make difficult to them to optimally utilize their large renewable resources, mainly hydro, because (i) they lack the economic resources needed and (ii) the construction of those power plants could destabilize their national systems. Moreover this small size make difficult to promote effective competition among the actors of the market and reduce incentives for new investors because, even in case of being able to get positive revenues, the profitability is limited. As a consequence Central American national electric systems face a number of challenges. Among those, the World Bank identifies four:

- (i) A tight balance between power supply and demand
- (ii) Significant exposure to oil price volatility and shocks due to a general dependence on oil imports
- (iii) Significant inefficiencies in the institutional and regulatory framework of several countries.
- (iv) Relatively low levels of electricity access in certain countries, particularly in rural areas.

Hence, the integration of the six markets into a single regional electric market is a mean for achieving the needed economies-of-scale in generation to unblock the hydropower capacity and promote effective competition between the different actors as well as to reduce the dependence on imported oil and the impact of seasonal draughts. [1] [4] [7]

In fact, by the time the SIEPAC project was started, the power sector integration of the Central American countries was a long time studied project. During the 1970s and 1980s, with the development of large hydropower dams and the first binational interconnections, the state-owned companies³ of the Central American countries, at that time vertically integrated monopolies, started to visualize the possibilities of exchanging electricity through third countries and develop coordinated operation of their national systems. Nevertheless governments always opposed these projects because fears of losing sovereignty and increasing dependency. Anyhow the integration remained as a will that gain more interest with the proposal from Endesa and Spanish to build the project through cooperation funds in the mid-1980s.

1.2. The SIEPAC Project and the Regional Electric Market (MER⁴)

In order to promote further integration of the regional power sector, the Central American state-owned companies, with the support of the IADB, are developing the SIEPAC Project. The objective of the project is to create a superposed regional electricity market for the transmissions of electricity between countries. Under this scheme countries realize their national dispatch and after that the surplus generation is offer to a regional dispatch considering only market actors and not countries. The MER also allows the sign of long-term contracts between generators and distributors of different countries, nevertheless there are still difficulties to implement them because of problems to guarantee transmission rights.

Despite maintaining a separated national dispatch, the MER is managed as a single market not in which the stakeholders are not the countries but actors (rather public or private). With that, when operating in the MER there are no differences due to nationalities.

The vision is that after proving its merits in price, attraction of investment and security of supply, the regional market will grow faster than the national ones and finally all will converge in a single regional electricity market with centralized dispatch. This is commonly known as "6+1=1". For that the SIEPAC project has two components:

- **Hardware or the physical infrastructure:** A trunk transmission line of 1799 km, 230 kV and 300MW with the possibility to be expanded with a second circuit of additional 300MW capacity. This line interconnect in several points with the national grids, which are being strengthened, creating a regional grid. An interconnection between Mexico and Guatemala (and therefore the region) was realized in 2002 and another with Colombia is under negotiation.

² Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama. Other countries as Belize or Dominican Republic are not relevant for this paper

³ Presently those state-owned companies are INDE (Guatemala), CEL and ETESAL (El Salvador), ENEE (Honduras), ENATREL (Nicaragua), ICE and CNFL (Costa Rica), ETESA (Panama).

⁴ Mercado Electrico Regional in Spanish

Figure 1: Geographical location of the SIEPAC line

Source: Proyecto Mesoamerica website

Table 1: Length and lot of the SIEPAC line

Country	Lot	Length (km)	Length/country (km)
Guatemala	Aguacapa – El Salvador border	99	283
	Guarda Norte – Panaluya	110	
	Panaluya – Honduras border	74	
El Salvador	Guatemala border – Ahuachapan	19	286
	Ahuachapan – Nejapa	89	
	Nejapa – 15 Septiembre	85	
	15 Septiembre – Honduras border	93	
Honduras	El Salvador border – Agua Caliente	52	270
	Agua Caliente – Nicaragua border	62	
	Torre “T” – Rio Lindo	13	
	Rio Lindo – Guatemala border	142	
Nicaragua	Honduras border – Sandino	116	307
	Sandino – Ticuantepe	65	
	Ticuantepe – Costa Rica border	126	
Costa Rica	Nicaragua border – Cañas	129	
	Cañas – Parrita	159	
	Parrita – Palmar Norte	131	
	Palmar Norte – Rio Claro	51	

Country	Lot	Length (km)	Length/country (km)
	Rio Claro – Panama border	23	493
Panama	Costa Rica border – Veladero	150	150
TOTAL			1799

Source: EPR website

- **Software or institutional infrastructure:** In order to operate and regulate the Regional Electric Market (MER), the Central American countries have created a regional operator (EOR) and regional regulator (CRIE). They also created a special unit for the coordination of the works, Unidad Ejecutora, and recently a governing board, Consejo Director del MER (CDMER), for the coordination of regional and national policies.

2. METHOD OF ANALYSIS

The objective of this paper is to identify the critical success factors for the development of the physical and institutional infrastructures for the creation of a regional electricity market in Central America. This is expected to provide valuable evidences for the development of regional power sector integration strategies in other regions.

For that, the political process of the SIEPAC project has been re-constructed from the review of existing literature (ECA, Castalia, Martin, Cayo) and newspapers (Europapress, Telesur, Prensa Libre among others) and through an interview survey with members of the state-owned companies, the regional institutions (EPR, EOR, CRIE, Unidad Ejecutora) and extra-regional members (Endesa). These interviews were carried out during November 2012 in Costa Rica, Panama, Guatemala and Honduras and in December 2012 in Madrid (Spain).

The political process was divided into six different phases, the three main outcomes of the process were investigated through causality analysis for identifying the most critical success factors or actions. The validation was done through the literature review and the interview survey.

3. THE POLITICAL PROCESS OF THE SIEPAC PROJECT:

SIEPAC project roots can be found as long as 1970s and 80s when the state-owned companies developed several bi-national interconnections and started to analyze better mechanisms for their optimization. Those studies recommended to promote greater integration of the national systems. But national sovereignty concerns and lack of confidence between national governments stopped any further movement. This was the situation until the proposal from Endesa and Spain of a regional electricity grid in 1983. This re-started the regional integration process. After several delays, Central American countries finally approved the enforcement of a regional regulation for the MER in 2013. With this the Central American countries have given themselves with a mechanism for the promotion of electricity trading through the region. In fact during the 2013, a 2,2% [2] of the regional demand was supplied through the MER. Despite this number is still small, it is needed to understand that it is double than the year before. Regional electricity trading is also behind the overcoming of energy crisis in Panama during 2013 [6].

For the analysis the process was divided into the five stages detailed below

- Bilateral interconnections and ERICA study
- Endesa's first approach to Central America
- Reformulation of the project and sign of Marco Treaty
- The physical construction and the Empresa Propietaria de la Red
- The institutional construction and the regional regulation

3.1. 1970s - 1980s, bilateral interconnections and ERICA study:

During the 1970s and 1980s several Central American countries constructed large hydropower dams, all of about 300 MW, creating national surplus generation capacities (Arenal-Corodobici in Costa Rica, Fortuna in Panama, Chixoy in Guatemala and El Cajon in Honduras). This motivated the Central American state-owned utilities, at that time vertically integrated monopolies, to develop the bi-national interconnections between neighboring countries for trading electricity and mutual support during emergencies. Those were designed as weak interconnections (single

circuit, 50 MW) between independent systems without integration of operation or planning. Due to the dominant role of each state-owned company in the electric sector of each country, and because of the interconnection didn't involve any integration of the operations, few political barriers arose (except for the case of Honduras and El Salvador, where the interconnection was not possible).

In 1976 the first interconnection was developed between Honduras and Nicaragua, then in 1982 Costa Rica and Nicaragua and in 1986 Costa Rica – Panama and El Salvador – Guatemala. After that, and without the interconnection between El Salvador and Honduras the region was divided into two “electric groups”: North (Guatemala and El Salvador) and South (Honduras, Nicaragua, Costa Rica and Panama).

In 1985, after the first agreement in 1979, the state-owned companies formally constituted the Central American Electrification Council (CEAC⁵ in the Spanish acronym) as a forum for sharing experiences with the recently developed interconnections and discussing better ways to manage them (for example how to trade electricity through a third country). In order to make a more efficient use of the energy resources and of the interconnections, they found that more robust interconnections and deeper integration of their systems would be needed. Similar conclusions have been found by the Economic Commission for Latin America and Caribbean (ECLAC)⁶ in the ERICA study carried out between 1975 and 1979. Further studies were carried out in order to identify what would be needed for trading electricity not only bi-nationally but regionally, what type of mechanism could be used for payments for the use of the physical infrastructures and what effects would have in the stability of third countries. Unfortunately these efforts didn't achieve the support from national governments, reluctant to cede sovereignty and unable to making large investments in a time of economic crisis.

3.2. 1983, Endesa's first approach to the region:

In the early 1980s Endesa, a public Spanish utility at that time, started a process of internationalization in order to prepare for the privatization triggered by the political changes in Spain (democratization and incorporation to the European Economic Community, EEC). This process was headed by a re-known specialist in transmission projects and included member with past experience in ECLAC, and therefore knowledge about the ERICA project, the interest of the state-owned companies and the difficulties for the integration process. This triggered the interest of Endesa in developing a large transmission project in Central America.

At the same time, the Spanish government was starting a new foreign policy aiming to increase the relations with Latin America. For that, and as a celebration of the 500 years anniversary of the arrival of Spanish people to America, the Spanish government created the V Centenario Funds⁷ managed by the Inter-American Development Bank (IADB) for the promotion of projects across Latin America and the Caribbean (LAC). Under the umbrella of the V Centenario Funds, Endesa introduced their project to the IADB, the main donor in the region, who was also interested in promoting improvements of the electric sector in the Central American countries, and with then to the Central American governments and state-owned utilities.

Endesa's vision of a regional transmission system gained interest among the Central American countries, partly because of the support of the IADB and the Spanish government, partly because of the great interest of the state-owned companies in the strengthening of the national systems through a greater utilization of the interconnections. A protocol of agreement was signed by all the parts in 1985, after which Endesa carried out its own feasibility studies for the project. The final proposal was the construction of a new independent transmission trunk line of 500 MW interconnecting with each country in the main cities, and the construction of large hydropower dams in each country, in order to supply the electricity needed by the new regional grid. The idea of a newly independent grid arose because of the knowledge from Endesa about the national sovereignty issues and the low capacity of the national transmission systems.

Nevertheless, despite the initial interest in Endesa' project, this proposal didn't get the support neither from the Central American state-owned companies nor from the IADB. The state-owned companies were worried about the effects that a strong regional electricity grid, owned by a foreign company, with a strong capacity could create in

⁵ Consejo de Electrificación de América Central

⁶ The Study for the Interconnection of the Central American Isthmus (ERICA)

⁷ A US\$500 million trust fund of the Spanish government to be managed by the Inter-American Development Bank for projects (not only infrastructures) in all Latin American and Caribbean countries

their weak national systems. The IADB considered that the improvement of national systems management was a pre-requisite before integrating them, so the creation of that regional grid could make the problems of the region bigger. Without the support of the IADB, the financing of the project was not so clear. Also without the approval of the state-owned companies, governments could difficult accept any project of that dimensions. As a consequence, the project didn't gain the political support and it was not approved.

3.3. 1989 – 1996, project reformulation and sign of Marco Treaty:

Although this initial rejection, Spanish government and IADB still considered interesting the regional project in Central America. For Spain it was the opportunity to utilize part of the V Centenario Funds in several countries at the same time, and for the IADB the regional integration was a project that, in any case, should probably be done in the future for taking advantage of the large hydropower resources of the region. Furthermore, the sector reforms introduced in Central America was facing challenges due to the small size of the national market that was a barrier for promoting effective competition. For that representatives from Spain and IADB continued discussing the project among them for finding the way to enable the project. Moreover the regional electricity market was seen as a mean for attracting private investors to the region, attracting both IADB for easing financing in the region, and state-owned companies for strengthening national systems. As a consequence, further negotiations included representatives from state-owned companies (CEAC) and the main lenders (IADB and Spain). The two confronted visions were either to implement more market reforms before or increase level of interconnectivity. The final agreement was to include both perspectives: regional infrastructure and regional market.

IADB provided funding for new technical and economic studies, this time those coordinated by the Central American state-owned companies. These created a special unit for this task under the umbrella of CEAC, the Unidad Ejecutora, who commissioned the studies to the University Pontificia Comillas (Madrid, Spain) and Power Technologies Inc. (USA). The outputs of these studies analyzed different possible scenarios considering different levels of integration. The largest benefits were when considering full integration of the Central American systems, including a unified regional dispatch and planning. Nevertheless, the state-owned companies, concern that such agreement was impossible to be accepted by the governments, preferred the second best alternative. This was a superposed regional electricity market, easier to be accepted by the governments because cession of sovereignty was much reduced. Moreover, this alternative allowed a possible further integration in the future. This was called the “6 + 1 = 1” vision, understood as the process in which adding the superposed regional market competing with the 6 national markets would tend to integrate in one single regional market. This introduced the concept of gradualism for the first time in the integration process.

The support achieved by this alternative from the IADB and the state-owned companies was critical for mobilizing the political will and the sign of a binding international treaty, the Marco Treaty. IADB involvement was essential for ensuring the feasibility of the project, funding and providing technical assistance; as well as a role of honest broker guaranteeing the commitment of the different countries. The work of the state-owned companies negotiating in advance the Marco Treaty was critical for making it acceptable to the governments, by removing conflicting clauses like a diplomatic status envisioned for the employees of the regional institutions, while at the same time of keeping the commitment with the 6+1+1 vision.

Finally, in 1996, Central American presidents signed the Marco Treaty after the negotiations of the state-owned companies including strict conditions for its termination. Marco Treaty also included three principles for the integration process:

- *Competition: freedom in the development of the service provision activities according to objective, transparent and no discriminatory rules.*
- *Gradualism: forecast for the progressive evolution of the market, through the incorporation of new participants, the progressive increase of coordinated operations, the development of interconnection networks and the strengthening of the regional entities.*
- *Reciprocity: right of each state to apply to another state the same rules and norms that the second state applies temporally, in accordance with the principle of gradualism.*

3.4. The physical construction and the Empresa Propietaria de la Red (EPR):

Marco Treaty included the need of constituting a company with representatives of each country for the construction and ownership of the regional infrastructure.

“Each government shall designate a public body of its country to participate in a company with public or private capital in order to design, finance, build and maintain a first regional transmission system that will interconnect the electric systems of the six countries. None of its members shall have direct or indirect control of the company. This company named Empresa Propietaria de la Red (EPR), will be governed by private law and legally domiciled in one country of Central America.” (Marco Treaty, article 15)

Although in 1993 Endesa and the state-owned companies had created the company SIEPAC Inc. in Madrid for the same purpose as the EPR, after the signing and ratification of the Marco Treaty, Endesa was not included as a shareholder of EPR. This was mainly because the Central American state-owned companies was willing to make a “Central American” project and the incorporation of Endesa, an company outside the region, was not positively seen by all the members. Moreover, with the financial and technical support from the IADB guaranteed after the sign of Marco Treaty, the feasibility of the project was considered to be ensured. For that, state-owned companies created the Empresa Propietaria de la Red (EPR) without including Endesa as a shareholder.

The state-owned companies were also reluctant to cede sovereignty to supranational institutions, so the operations of EPR started with representatives from each company that meet in a regular base in different countries of the region. The costs of such meeting were borne by each state-owned company, leaving EPR without managerial or budget independence. Nevertheless, it was always difficult to make consensus on the details of the project because each company/country had different views of the project or different capacity/willingness to invest and the national interests were always first than the regional. Under this situation, the beginning of the project was delayed, leading to a decrease of the political support and concerns from the IADB.

State-owned companies assumed then the need of increasing the independent capabilities of EPR, the problem was how to finance that. Endesa, who was still interested in participating in the project, offered to finance the first year operations of EPR to consideration of becoming equal shareholder (for which it should pay the corresponding amount) and getting the top managerial position during the first year. State-owned companies accepted that because the “regional ownership” was effective with a majority in the board of directors and the personnel from Central American countries (Endesa only chose the top manager, rest were from state-owned companies or locally hired).

The incorporation of Endesa to EPR triggered some big changes in the company. EPR started to operate as a private corporation looking for increase the pace of acquiring the rights of way through direct negotiation with land owners and working towards ensure economic profitability with the utilization of the regional infrastructures (for example, it created REDCA for the construction of the Regional Broadband Transport Network using the SIEPAC line). Presence of Endesa was also important impact for the smooth operations of EPR. Being perceived as neutral in “political” discussions (those due to different national interests), top manager of EPR, that is the person from Endesa, could help to find consensus. The promotion of consensus also facilitated the creation of a regional vision among the EPR employees who started to concentrate more in how to promote the use of the regional infrastructure.

The progress in the construction of the regional infrastructure gained the attention of the two big neighboring countries of Central America, Mexico and Colombia. For both, a Central American regional electricity market was an attractive destination for exporting electricity. Moreover a continental transmission system started to be considered. Concerning to Mexico, it was the opportunity to promote development in the South of the country, while for Colombia (or ISA, a major privatized utility with several international projects) the opportunity to utilize the large energy resources of the country. Hence both countries were willing to foster the Central American integration process. The interest from Mexico and Colombia, and the positive experience with Endesa, facilitated two new capital increases of EPR incorporating ISA in 2005 and CFE (Mexico) in 2007 to the shareholders. This brought more capital to the project and technical support and the will of integrating both countries as operators in the regional market with the development of interconnections through Guatemala in the North (already in operation) and Panama in the South (still being developed).

The SIEPAC project is also being used as a model for promoting greater regional cooperation in other areas through the Mesoamerica Project, increasing the political support to the project which is now supported by all the Central American governments.

3.5. The institutional construction and the regional regulation:

Marco Treaty also included the need of creating a regional regulator (CRIE⁸) and a regional operator (EOR⁹) for the regional electricity market (MER). Their structure and responsibilities are explicitly described in the Articles 19 – 24 for the CRIE and Articles 25 – 29 for the EOR respectively. It is important to note that, since the MER was not a substitution of the national markets, both regulation and operation should be coordinated because there was not direct hierarchy of EOR or CRIE over their national counterparts.

Their first task was to create and approve the regional regulation of the MER, the RMER. This was approved by the CRIE in 2005 and included in the 2nd Protocol signed by the Central American countries in 2007, which was fully ratified in 2011 (after delays in Costa Rica due to differences in the national parliament because of the intention of the government to include also a major reform of the electric sector). Finally, in 2013 the CRIE enforced the RMER after the harmonization of the national regulations with it.

During the design and approval of the regional regulation, EOR and CRIE showed big differences in their constitution processes. Whilst EOR was characterized by its independence from national politics and its technical profile, CRIE became to be a political arena for disputes between countries. Following both processes are described for comparison:

- EOR: Since the state-owned companies (for that time majority mainly transmission companies) were in charge of the operation of the national markets and it was considered a technical issue, it was logic to choose from them the representatives from each country (2 per country with a rotatory presidency). The most important initial task of EOR was to create the rules for the operation of the superposed regional electricity market. That is to negotiate and propose a regional regulation to the CRIE for its approval. These negotiations were challenged by the prompt construction of the interconnection between Honduras and El Salvador. This were not constructed before because of the political tensions between both countries, but the high political support achieved with the sign of Marco Treaty, stimulated governments to construct it independently from EPR. This interconnection meant that the entire region was physically interconnected, what created a demand for the beginning of the operation of the regional market. This was not possible at that time due to the lack of regional rules, whose negotiations were still at an early stage. EOR managed to react quickly with the approval of a temporary regulation (RTMER) that enabled the trading of electricity between countries (although not the development of a regional market). EOR also created the Central American Market Operator (OMCA) for the operation, while its members focused in the negotiations for the RMER. It was commonly shared among members the “6 + 1 = 1”, so the RMER was negotiated thinking in a further integration into centralized dispatch. Obviously negotiations were difficult because that type of regulation would imply several modifications in the national regulations (especially for those countries with less open markets like Costa Rica). Nevertheless, without direct political influence and their technical capabilities, EOR could held intensive periods of meetings until achieving a satisfactory solution to pass to CRIE for approval.
- CRIE: the role of the regional regulator was initially set to supervise the smooth operation of the regional system and to serve as link between that and the national institutions. Nevertheless, the politicization of its board (one commissioner chose by governments, not necessarily from state-owned companies) and its low technical capabilities (no full time technical personnel and no independent funding), ended blocking several decisions. It was clear that CRIE decisions could have an important impact in national level policies (especially during the approval of the regional regulation). In order to overcome future political conflicts, it was agreed that CRIE decisions should be made under consensus. That in fact meant to give effective veto-power to every representative. Negotiations became more political rather than technical slowing down the

⁸ Spanish acronym for Regional Commission of Electric Interconnection (Comisión Regional de Interconexión Eléctrica)

⁹ Spanish acronym for Regional Operator Body (Entre Operador Regional)

process; what, in fact, was against the second task of CRIE, the promotion of the regional integration. This showed the need of strengthening of the independence of CRIE; so, together with the approval of the regional regulation, the 2nd Protocol¹⁰ to the Marco Treaty, it was agreed to increase the capabilities of the CRIE with full time personnel, define its financing mechanism and the creation of a Governing Board (CDMER). The role of the CDMER is to serve as an observer from the national governments of the regional integration process in order to detect possible conflicts and promote its prompt resolution. In fact, CDMER is aimed to reduce the politicization of the CRIE by increasing the direct involvement of the governments in the process.

3.6. The ratification and harmonization processes

After the sign of the 2nd Protocol, it was needed the ratification from every national parliament before its enforcing. This was relatively simple in every country except in Costa Rica, where became to be a big political dispute. This was triggered by the desire of the Costa Rica government to implement a major reform of the electric sector, basically increasing the private sector participation, at the same time (although there was a general support to the SIEPAC project). The electric sector in Costa Rica is characterized by the central role of ICE, its successful management of the system and its strong public support. The block was overcome with the decision of the government of separate the integration and reform processes, but it was not until 2011 that the 2nd Protocol could be ratified.

This delay in the ratification process was several times criticized by other countries because of the negatives consequences over the integration process (especially for countries as Guatemala eager to promote the construction of generation power plants for the export of electricity). Nevertheless, this criticism never ended in the breaching of the process or in an early implementation of the regional market in the rest of the Central American countries (what could have damaged the full integration process). The general acceptance of a gradual process from the state-owned companies also for the national level, not only for the regional integration, was key for that. ICE continued fulfilling all the commitments with the harmonization process and the financing of the regional institutions (although it was legally blinded) and the rest of the state-owned companies accepted the delay without accusing ICE of lack of compromise.

Finally, in 2011 Costa Rica parliament ratified the Second Protocol starting the process of harmonization of the national regulation with the RMER. After this process was concluded, CRIE approved its gradual enforcement during the first half of 2013, being RMER officially full enforced on June 1st of 2013.

4. CAUSAL ANALYSIS OF THE SIEPAC POLITICAL PROCESS

The SIEPAC project process has had three main successful milestones: (i) the sign of the binding commitment with the Marco Treaty, (ii) the constitution of a “regional transmission company” able to construct and manage the infrastructure and (iii) the development of a regional institutionalism (EOR, CRIE and CDMER) able to create and enforce a regional regulation. Therefore, the main question is “how were those possible?” In order to identify the critical success factors, causality analysis were done connecting actions with their consequences reproducing the political process of the SIEPAC project.

4.1. Sign of a binding commitment with the Marco Treaty

Before the SIEPAC got the political support needed, the national governments rejected the first proposal of Endesa. This was focusing in avoiding interferences in the project by making it fully independent from the national systems. Nevertheless, this proposal lost the support from the IADB and the state-owned companies and it was discarded.

After that, continue interest from the Spanish government (as well as Endesa) and the challenges to implement successful electric sector reforms in Central America, triggered new support to the integration process with IADB and state-owned companies. Although the initial visions were very different, IADB supporting the market reforms and state-owned companies the strengthening of utilization of the interconnections, a compromise were achieved. This was done by incorporating both visions to the project. Therefore, SIEPAC project consisted of two elements: the regional infrastructure and the regional market.

¹⁰ A 1st Protocol was signed right after the Marco Treaty in order to include some minor issues found during the ratification process

The preparation of the new proposal to the governments were then supervised by the state-owned companies through a newly created unit inside the CEAC. The involvement of the state-owned companies at the center of the decision-making process proved to very important for the definition of more suitable proposals and facilitating the negotiations at the national level and the promotion of a gradual integration (focusing on a superposed electricity market but with the goal of continuing the process for a fully integrated regional market)

Fig. 2: Endesa’s first proposal – failed to get the support

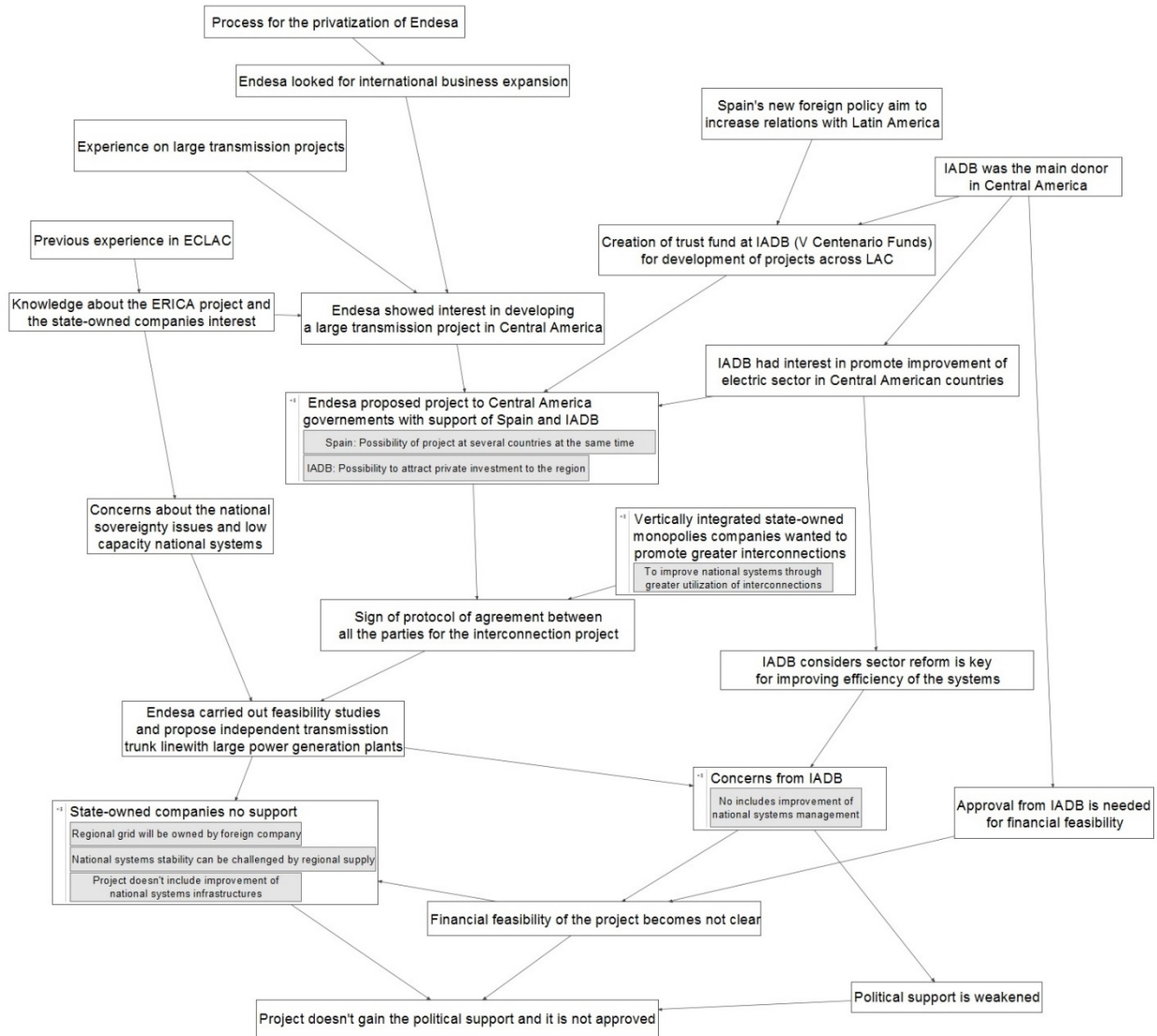
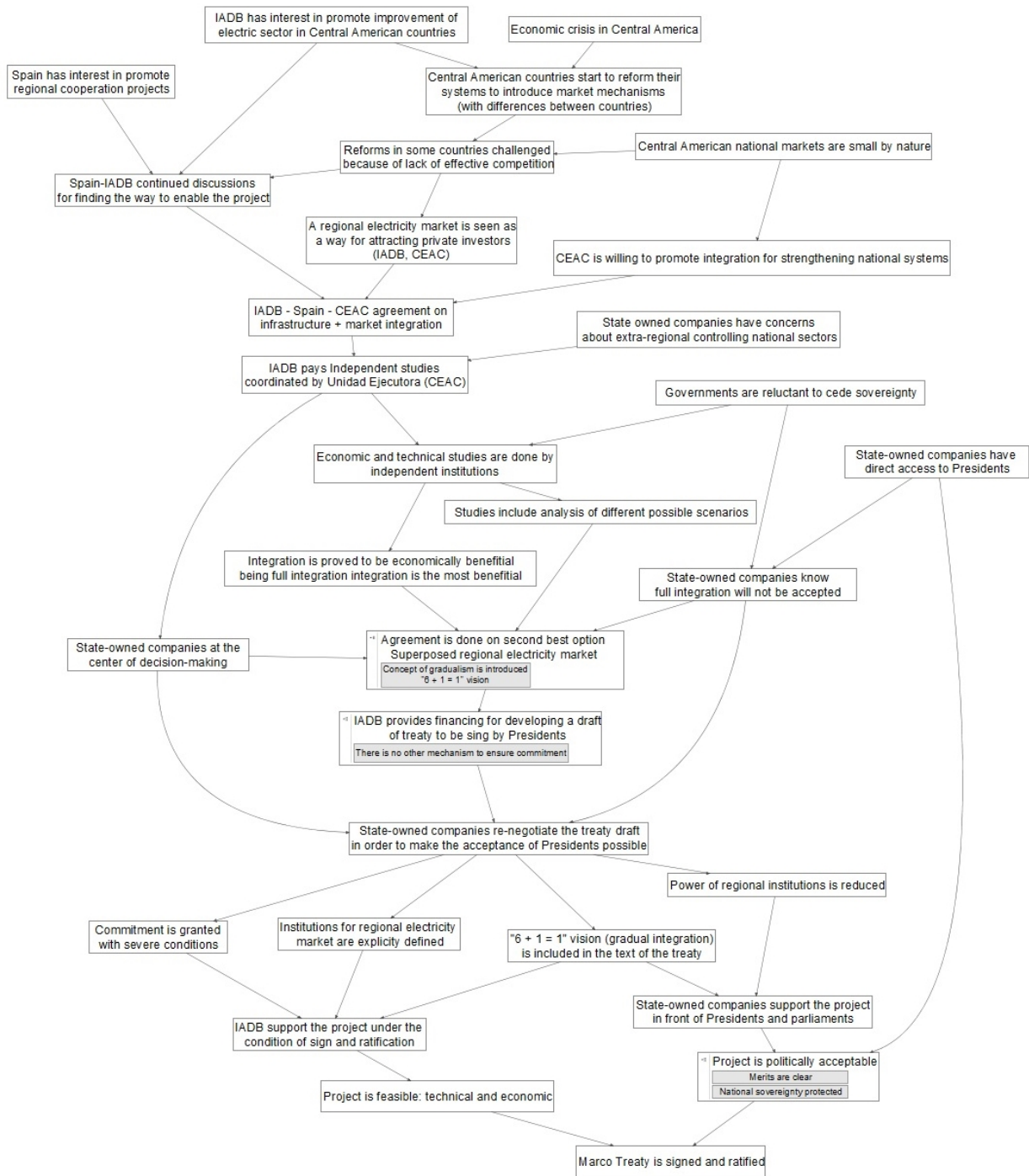


Fig. 3: Project reformulation – success to sign Marco Treaty:



4.2. Constitution process of EPR

Although the project started with Endesa proposal and a former company was formed in Madrid, concerns about including an extra-regional company in the board of the special-purpose company ended with Endesa out of EPR. Nevertheless, several problems for its smooth operation, mainly linked with its difficulties to create consensus in the works, made clear the need of strengthening EPR with an independent budget, full time employees and permanent

offices. Endesa offered the payment of the first year of the operations of a reformed EPR under the conditions of being equal shareholder and having the right of appointing the top manager during the first period. With Endesa as shareholder, EPR could better overcome the blockades due to political disputes and promote a regional mind among the employees.

Fig. 4: Beginnings without Endesa

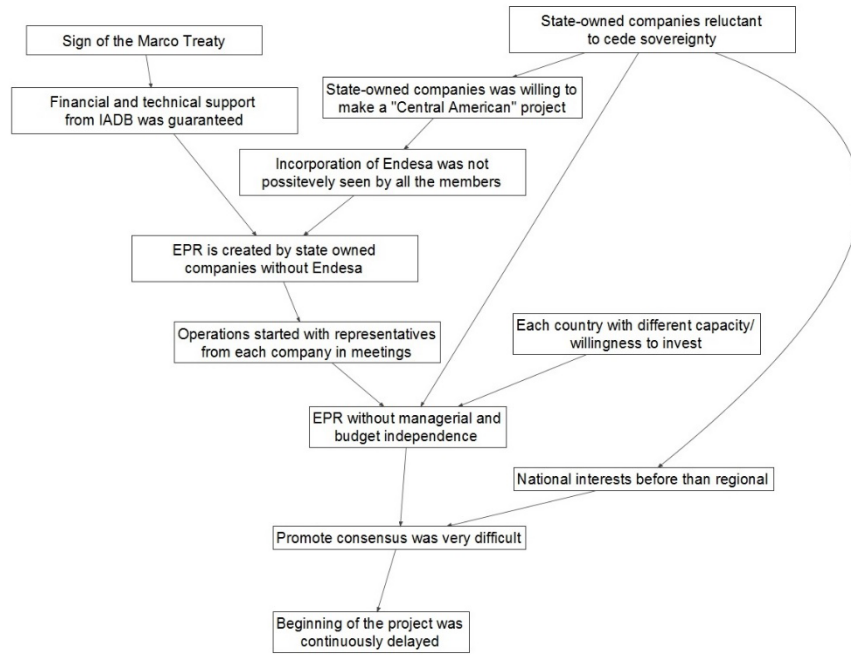
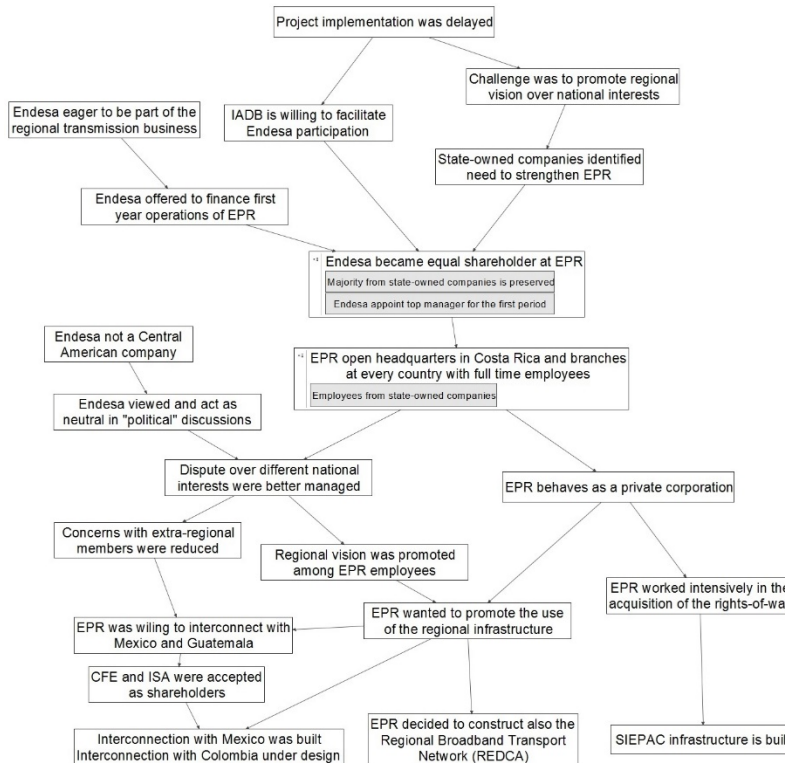


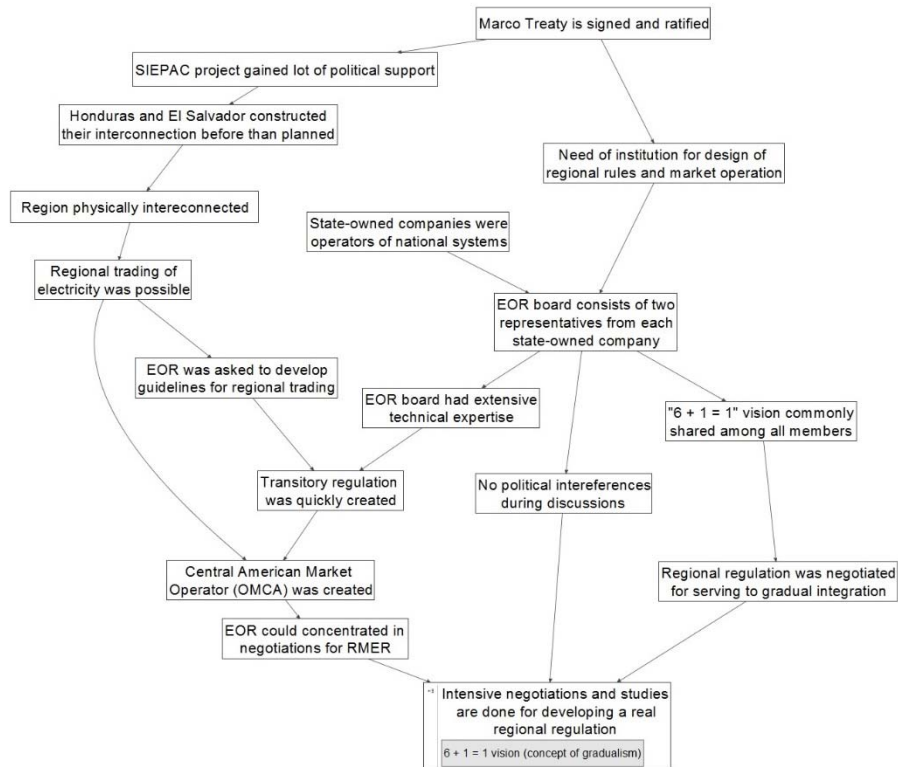
Fig. 5: Operations after incorporation Endesa as shareholder



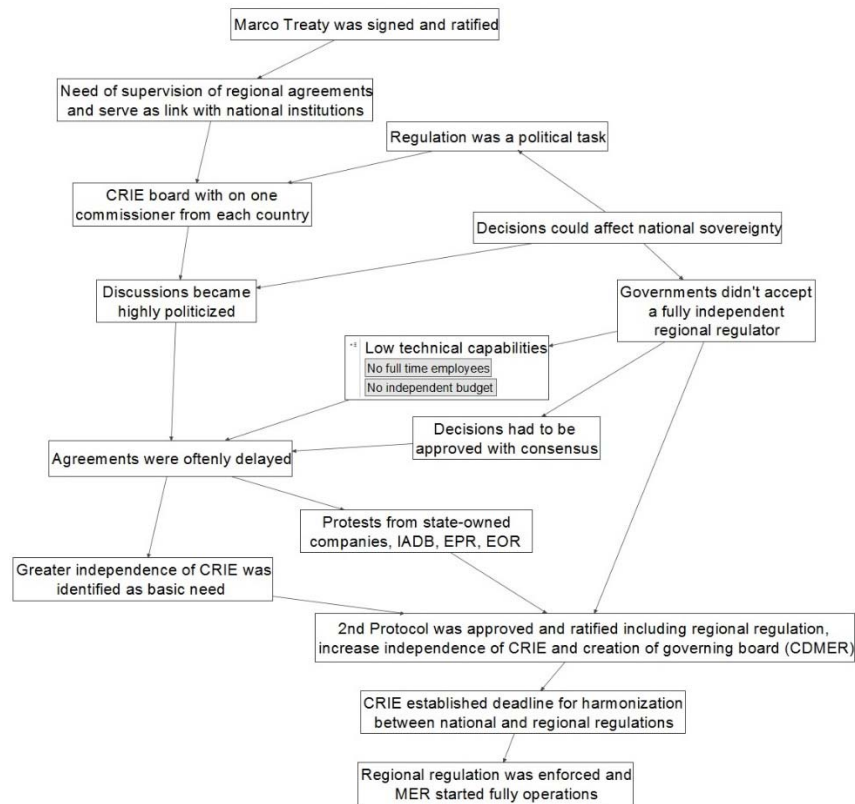
4.3. Development of the regional institutionalism

As mentioned before, the two regional institutions in charge of the operation and supervision of the MER (EOR and CRIE) showed very different outputs. Through the causality analysis it was found how those differences were due mainly to the different involvement of state-owned companies in their operation and the managerial and economic independence.

Fig. 6: First years of operation of the regional operator (EOR)



See next page

Fig 7: First years of operation of the regional regulator (CRIE)

5. CRITICAL SUCCESS FACTORS IN THE SIEPAC PROJECT

The success of SIEPAC project relies on the mobilization of the political will that has been helping to achieve consensus solutions and to move forward the process with sign of the Marco Treaty, the construction of the regional infrastructure and its expansion to interconnect with Mexico and Colombia (still on-going project) and the development of a regional regulation by independent regional institutions. Nevertheless, this political will was not given in the region at the beginning but been created by the actions of different stakeholders. The identification of the critical success factors that have made this possible can provide meaningful evidences for other similar processes. Previous causality analysis, realized from the beginnings of the project until the ratification of the 2nd Protocol, helped to the identification of five critical success factors were: (i) State-owned companies at the center of decision-making, (ii) Concept of gradualism, (iii) Incorporation of extra-regional partners (Endesa and neighboring countries), (iv) Managerial and economic independence of the regional institutions and (v) Continuous support from the Inter-American Development Bank.

5.1. State-owned companies at the center of decision-making:

Originally the involvement of the state-owned companies was essential due to the absence of any other national actors in the electric sector; but, with the implementation of reforms and the creation of new institutions for the electric sector at national level, this could have been reduced. Nevertheless, keeping them at the center of the decision-making during the entire process has had a positive impact in the progress. Their knowledge of national contexts, direct connections with country presidents and experience cooperating among them at the CEAC has allowed them to play an important role in regional and national negotiations.

- *Reduction of sovereignty concerns*: as representatives of each national government they have acted as guarantors of national interests. Once an agreement had their support, national governments were more eager to approve it.
- *Explanation of the merits of the project*: once an agreement was achieved, there was a need to mobilize the political support. The state-owned companies' top managers in Central America have a fluent communication with the presidents of the governments. Their work explaining the merits of the project directly to the parliaments was essential for reducing sovereignty concerns and facilitate national ratification of the regional agreements.
- *Keep discussions at technical level*: since the benefits of the integration are more technical and economic rather than political, agreement is usually easier between at the technical level rather than ministerial or presidential.

5.2. Concept of gradualism

The principle of gradualism is one of the three pillars of the Marco Treaty, where it is defined as “forecast for the progressive evolution of the market, through the incorporation of new participants, the progressive increase of coordinated operation, the development of interconnection networks and the strengthening of the regional entities”. Hence, it removed all the limits to the integration process based on the consideration that the regional electricity market should prove its merits before the full integration, what is usually referred as the “6+1=1” vision. This means that the 6 six national markets plus the superposed regional market will naturally tend to be a single integrated regional market. The importance of the principle of gradualism goes beyond the idea of a superposed regional market and has been critical at different phases of the process:

- *Facilitate the political support for the Marco Treaty*: the risks of moving towards a fully integrated regional electricity market without previous experience was not acceptable for the national governments. Nevertheless, by implementing small changes at national level until the complete harmonization of the national systems the transition is easier to be accepted because each country can overcome their own national level discussions at different pace.
- *Development of a regional regulation*: able to serve for a fully integrated regional market in the future.
- *Facilitate the incorporation of extra-regional members*: and therefore the development of interconnections with Mexico and Colombia and the independence of the EPR.
- *Allow different paces for harmonization process*: the starting point for each country was different, therefore the number and degree of reforms needed in order to harmonize national and regional regulations included different challenges for each country. For example in the need of reforming the state-owned company in Costa Rica and the problems for the ratification process (basically because of different points of view of the need of this reform or the way to implement it).

To summarize, the principle of gradualism has allowed a smooth but continuous integration process even though the differences between countries. It was also important to keep the commitment of the different governments during the long process.

5.3. Incorporation of extra-regional partners (Endesa and neighboring countries):

Although the role of Endesa, ISA and CFE in the process has been slightly different, their involvement has had common features as critical success factor:

- *Promotion of political support*: Spain, Mexico and Colombia are countries with a continuous involvement in the region supporting the countries in different initiatives. They usually hold summits where direct communication with governments and the highlighting of the merits of regional cooperation are possible. This is very important in order to keep the relevance of the project in the national and regional political agendas.
- *Facilitate to solve disputes between stakeholders*: being perceived as neutral by other members, their intervention was considered positive by different members, mainly at EPR. They can easily identify the importance of the promotion of the regional interests and how those will benefit each country.
- *Increase technical and economic resources*: although Central American state-owned companies had experience in transmission projects, they had not worked in projects of the size of SIEPAC. Also the economic burden of SIEPAC project was very large, then the incorporation of larger companies provided them additional resources both technical and economic.
- *Promote regional vision*: the main interest of the extra-regional members was to promote the greatest integration possible in order to achieve as much economies of scale as possible. This vision spread to other members of EPR, creating a regional vision into all of them.

5.4. Managerial and economic independence of the regional institutions:

In order to reduce sovereignty concerns, national governments commonly try to keep as much influence as possible in the regional institutions. This has negative consequences in the promotion of consensus solutions and the promotion of the regional project. For that strengthening the regional institutions with full time employees and independent budgets was very important in order to:

- *Promote regional vision*: full time employees at regional institutions have in common a strong willingness in the promotion of greater integration. They are also better concern about the different national contexts and therefore are able to better understand the difficulties in each country.
- *Protect reputation of the institutions*: in order to enforce their decisions, regional institutions reputation is critical. This is gained due to the high technical skills and experience of their employees, only achievable when they work full time for them.
- *Facilitate consensus*: because at technical level is usually easier to find a common area of agreement. Nevertheless, it is very important to keep also the political support for the project. In this case, it will be interesting to analyze the future relations between the Governing Board or CDMER (political body created after the strengthening of CRIE independence) and the other regional institutions.

5.5. Continuous support from the Inter-American Development Bank (IADB)

The IADB was commonly referred as the best supporter of the project. And, contrary to what was expected, not mainly because of the financial support but for its involvement:

- *Protecting independence of regional institutions*: strengthening their capabilities through the provision of technical studies. IADB has been important also in the monitoring of the smooth progress of the project.
- *As a honest broker*: discussions between governments tend to focus in the protection of short-term national interests, while obviating the long term benefits from the economies of scale of the regional project. Due to its commitment in the promotion of the development at every Central American country, IADB opinions are perceived with respect and it can mediate in the solution of the disputes. It can also monitor the process serving as a guarantee to every country member of the commitment of others.

6. CONCLUSIONS

The success of SIEPAC project is still to be determined. While the regional market is effectively operating now, it is also true that it took more than 10 years to sign the first agreement and it was not until 2013 that the regional regulation was finally enforced. Moreover long term contracts, essential for the growth of the MER, are not possible yet and the level of electricity traded in the MER is still too small. Regardless of these facts, it must accepted also that the level of integration that Central American countries are seeking, and already achieved, is one of the most ambitious in the world and they have successfully created independent regional institutionalism and started to design the future with interconnections to Mexico (already operating) and Colombia (planned but still under discussion). In that sense, Central America and SIEPAC offer a unique opportunity to review the difficulties and the possible solutions that other regions could face in similar integration process.

It was found that the cooperation between national and extra-regional stakeholders was able to mobilize and retain the political support needed for the integration process. This cooperation was possible because of the positive environment created thanks to the application of the concept of gradualism and the managerial and economic independence of the regional institutions. Therefore the SIEPAC project provide an example of how to overcome the political barriers to the regional power sector integration processes. It is expected that these lessons will be valuable for other regions in the world aiming to foster the development of regional electricity markets.

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