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Q2: Country or customs territory: International organization

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Q4: Title of case story: Energy Integration: The Central American experience in designing and implementing the Regional Electricity Market.

Q5: Case story focus: Infrastructure upgrading and development of related services markets, including through support for investment climate reforms.

Q6: Case story abstract:

With the creation of a Regional Electricity Market (MER) and the establishment of regulatory and administrative mechanisms for the sector, the Central American Electrical Interconnection System (SIEPAC) is a success for the region. It is important to draw lessons learnt over the entire SIEPAC implementation period - from the pre-assessment and design stages, particularly with respect to the creation of funding mechanisms, to the actual process of bringing the mechanisms into full operation. The impact of the good practices implemented by the six Central American countries now forming part of the SIEPAC (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama), as well as the SIEPAC's extra-regional links with Mexico and Colombia, are a regional public good that has ensured a continuous supply of electricity to the Central American population.

Q7: Funding partner: Other (please specify): Own capital and debt issuance

Q8: Project/Programme type: Regional

Q9: Your text case story:

In the 1993 Protocol to the General Treaty on Central American Economic Integration (Guatemala Protocol), the States Parties undertook to promote "the development of physical infrastructure and services, particularly energy, transportation and telecommunications, in order to increase the efficiency and competitiveness of production sectors at national, regional and international level" (Article 28). The Parties also agreed to harmonize policies for the provision of services in these sectors, in order to address tariff issues and enhance the region's competitiveness.

Pursuant to this mandate, the countries involved created the Central American Electrical Interconnection System (SIEPAC), an initiative aimed at consolidating the Regional Electricity Market (MER) by developing legal, institutional and technical mechanisms to facilitate the private sector's participation in building up the region's electricity network.

The SIEPAC and the MER are currently helping Central America to optimize its national electricity markets and are encouraging power generation schemes on a larger scale and at international level, which may lead to greater investment and development of projects of this type.

Since demand profiles and energy supply structures differ across the region, the production and distribution of electricity throughout the MER are organized in such a way as to site power generation projects in the most cost-effective locations, thus helping to lower energy market costs. This also increases the countries' potential to ensure security of supply for their populations, along with the creation of a mechanism to import energy if necessary.

The Central American Electrical Interconnection System (SIEPAC)

The SIEPAC's key objective was to establish a power transmission infrastructure enabling the participating countries to exchange energy. This infrastructure includes transmission lines, compensation equipment and substations extending over close to 1,800 km of 230-KW transmission lines, designed to accommodate possible expansion to a second circuit, which would increase overall capacity. These lines connect 15 substations through 28 access bays.

Reactive power compensation equipment also had to be upgraded. The construction and initial interconnection process has now led to a secure and reliable energy transport system of up to 300 MW. The anticipated second circuit of transmission lines may even duplicate this capacity.

The initial cost of this infrastructure is estimated at around US\$494 million, a relatively low figure considering that the 1,800-km network affected close to 8,000 landowners in its layout.

Institutional development

In addition to designing the infrastructure, the Central American countries worked on the institutional framework needed to put it into operation.

The design stage began when the project was conceived in 1987, with a series of feasibility studies conducted between then and 1995. That year, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama agreed on an implementation plan and secured support from the Spanish Government and the Inter-American Development Bank (IADB) for the purpose.

The Framework Treaty for the Central American Electricity Market introduced a mechanism enabling the six participating countries to implement the project. The Treaty entered into force on 18 June 1998, with Panama ratifying it on 15 December of that year. At the time, Panama was not yet a member of the Central American Economic Integration Subsystem. Since its accession in 2013, it has been working on achieving full incorporation.

Among other provisions, the Treaty committed the countries to appoint a public body to participate in the grid owner Empresa Propietaria de la Red (EPR), which would be tasked with developing, designing, raising funds for, and maintaining the regional transmission system. The EPR is a private company established in Panama, with responsibility for the above duties.

The following agencies are involved: Guatemala's National Electrification Institute (INDE), El Salvador's Río Lempa Hydroelectric Executive Commission (CEL), Honduras' National Electricity Company (ENEE), Nicaragua's National Electricity Transmission Company (ENATREL), the Costa Rican Electricity Institute (ICE), and Panama's Electricity Transmission Company (ETESA). Extra-regional partners include Spain's Endesa, Colombia's Interconexión Eléctrica, S.A. (ISA), and Mexico's Federal Electricity Commission (CFE).

An initial agreement to finance the SIEPAC was struck in 1997. This provided the basis on which the IADB funded the development of the General Design of the Regional Electricity Market, approved in May 2000. The MER was thus established as a seventh market, superimposed over the six national markets, in which energy operators can exchange energy and conduct international energy transactions. The rules of procedure of the MER were adopted in December 2005 by the Regional Electrical Interconnection Commission (CRIE), which acts as the regulator, and were revised by the Regional Operator (EOR), which is the central operator of the MER.

The CRIE and the EOR are the governing bodies that respectively regulate and operate the MER, with support from the national entities in each of the countries.

Impact and operations

Following the entry into operation of the MER, energy input doubled between 2013 and 2014, rising from 688 GWh to 1,445 GWh. In 2015, input represented 1,368 GWh and output 1,358 GWh. Guatemala is the main exporter and El Salvador the leading importer of MER energy.

Extra-regional connections

The SIEPAC's main infrastructure is also integrated with neighbouring countries through extra-regional links. The interconnection between Mexico and Guatemala is already fully operational, whilst that between Panama and Colombia is in the design phase.

Mexico-Guatemala

The Mexico-Guatemala interconnection project was agreed in 2001 under the Tuxtla Dialogue Mechanism, which brought together the Governments of Mexico, Belize and the SIEPAC participants to discuss avenues of cooperation across the Mesoamerican region.

The extra-regional interconnection aimed to establish a 98.6 km-long transmission line, with a generation capacity of 400 KW, 72% of which was on the Guatemalan side of the border. The structures were also readied for a second circuit, as were the initial SIEPAC towers. This initiative also involved the expansion of two substations in Tapachula, Mexico, and Los Brillantes, Guatemala. The EOR authorized the entry into operation of this phase in February 2010, and regular operations started in April of that year.

Panama-Colombia

The Tuxtla Agreement also led to an agreement to implement a 614 km-long interconnection between Panama and Colombia, with a capacity of between 300 and 600 MW. The exchange would require authorizing operators from one country to participate in their counterparts. The current legislation therefore needs to be harmonized, and both countries are engaged in a public consultation process to analyse and discuss the mechanisms that will enable this phase of the project to take place. Completion of the project means that transmission via the MER would extend from Mexico to Colombia.

Financing

The electricity grid cost a total of US\$494 million, partly financed by a contribution of US\$58.5 million from all the participating agencies, which each contributed US\$6.5 million.

The IADB was the project's main sponsor, with a contribution of US\$253.5 million. It had initially provided 12 loans for a total of US\$240 million, with additional support provided subsequently to ensure completion of the initial implementation process.

The Central American Bank for Economic Integration (CABEI) approved three credit lines and three amendments which brought its total contribution to US\$109 million. Of these, US\$40 million were a contribution from the European Investment Bank, which CABEI channelled into the region. The Latin American Development Bank (CAF) offered US\$15 million and a liquidity reserve of US\$1.7 million, for a total of US\$16.7 million. The liquidity reserve is a provision contractually required to cover the repayment instalments and interest of one year.

The line, as previously mentioned, is operated by the EPR, in which the countries' energy companies participate as equal partners, together with three extra-regional partners (ISA of Colombia, Endesa of Spain, and CFE of Mexico), each providing a guarantee of US\$40 million over and above the registered capital contribution required to have a stake in the company.

In addition, guarantees from the company's national members helped to secure additional funding in the amount of US\$40.5 million, each shareholder contributing US\$4.5 million. This came from direct credit lines from three of the partners (INDE, CEL and ETESA); credit extensions guaranteed by another three (Endesa, ISA and CFE); and IADB credit transfers backed by the remaining three (ICE, ENEE and ENATREL).

In June 2013, the Regulations of the MER (RMER) and the Supplementary Detailed Procedure came into force. In this new stage, injections into the MER rose from 688 GWh in 2013 to 1,368.4 GWh in 2015. There was a peak in transactions in 2014 because of power shortages in Honduras, Costa Rica and Panama, which were covered by significant purchases from the MER.

An analysis of the economic benefits of participating in the MER, conducted by the CRIE, determined that in 2014 these amounted to US\$271.5 million, 52% of which were due to a reduction in national oil bills and 48% to savings from accessing a more efficient source of power generation. Besides overall savings, the SIEPAC and the MER provide a mechanism to ensure a sustained supply of energy in times of crisis or acute shortage. Soon after their full entry into operation, Panama suffered a major drought, with an ensuing shortage of energy, and the MER was instrumental in coping with the consequences.

Opportunities for future growth

The high cost of electricity in Central America remains a major issue. According to the IADB, the wholesale price stands at around US\$150 per MWh compared to US\$50 for other, comparable systems – making it three times as expensive. The SIEPAC and the MER can be strengthened to increase installed infrastructure capacity. This would raise capacity from 300 to 700 MW by the end of the decade but would require between US\$10 and US\$18 billion worth of investment and greater private-sector participation in both investment and the provision of energy services.

Signs of progress and increased political will to build on the SIEPAC's recent achievements came with the announcement by the US-Caribbean-Central American Energy Security Task Force in May 2016 of an agreement to expand the regional market and transmission system, including the initiation of feasibility studies to double the SIEPAC's capacity and explore market integration with Mexico, for which the State Department would seek to provide up to US\$5 million in assistance. This commitment could help set the stage for expansion of the SIEPAC and would foster growth in international trade in energy, which has quadrupled in the region since 2013. Central America and Mexico also announced the establishment of an Interconnection Commission to explore opportunities for expanding and deepening the integration of the electricity market.

Other power integration opportunities

Increased transmission capacity is one of the various areas in which the SIEPAC offers opportunities for Central America to achieve greater integration and boost its productivity.

This could provide the basis for setting up an integrated energy planning system – although energy-sector regulations have yet to be harmonized between the countries forming part of the system. While Guatemala, El Salvador, Nicaragua and Panama, for example, have relatively competitive power generation sectors, Costa Rica and Honduras supply electricity under a vertically integrated monopoly. By harmonizing their regulations, countries could reduce the barriers to participation in the regional market. Currently, only electricity generators authorized to participate in their countries' wholesale markets can tie into the regional grid, possibly limiting the participation of other sectors – including renewables – in the Central American system. In Costa Rica and Honduras, only the state-owned companies are allowed to participate, whereas in countries where the market is privatized, other energy generators are not expressly prohibited from participating in the SIEPAC, although their connection to the system may be limited by the need for a connection to the national high-voltage grid. Without a simple system that enables new players to connect to the grid, the process will remain lengthy and costly.

Improving the regulatory framework may also facilitate investment and the implementation of renewable energy projects that contribute to the diversification of the regional energy matrix. According to Norton Rose Fulbright data, Central America's overall generation capacity of 12 GW includes a large share of renewables (56%) and a diverse mix of biomass, geothermal, wind and hydro power. Costa Rica, El Salvador, Honduras and Nicaragua have developed geothermal resources, and wind farms in Costa Rica, Honduras and Nicaragua have a capacity of around 350 MW. Panama has 158 MW of wind power capacity. As the region continues to expand its use of renewable energy – a trend that is in the economic, social and environmental interest of Central American countries, a mechanism will be necessary to ensure the accessibility and stability of renewables.

Q10: Lessons learnt:

Current efforts to strengthen electricity integration in Central America through the SIEPAC and to streamline and standardize regional regulations across the electricity market stand to gain from a best practice identification exercise.

A number of lessons are being learned from the experience as a whole, both from and for the process of greater economic integration of the region.

First, there is the challenge of linking the integration of energy with the other economic integration initiatives in the region, since the regulatory harmonization process, as one of the options for future development of the SIEPAC, calls for the same negotiating and consensus-building procedures as those in which the six countries are engaged in other spheres of regulation at

regional level. Second, the efforts of different institutions in the economic subsystem can be coordinated in support of greater integration of the energy sector with other sectors directly involved in fostering competitive development and boosting productivity in the region.

The SIEPAC has consolidated a regional power transmission network which has effectively raised the quality, continuity and reliability of the electricity system across Central America. The results achieved to date also provide a market integration model that offers a wealth of experience in areas ranging from initial studies, design, adaptation to context, funding management and the creation of legal and institutional instruments to actual implementation of the system.

Underlying these procedures is a definite will to anticipate future needs for the project, ahead of an expansion of capacity by means of a second circuit, which ensues from a long-term planning logframe and takes into account the trend towards increased demand for this market-provided service.

Lastly, the emphasis on optimization of financing and fundraising schemes can also be adopted as best practice. First came the development of a relatively low-cost project compared to the extent of the advantages targeted. However, it was also agreed to implement a financing scheme with considerable leveraging and long terms of payment for services, which, taking into account the limited resources immediately available and the potential for future gains for the countries, effectively adapted international models to the local market.

In short, the Central American Electrical Interconnection System (SIEPAC) is a successful mechanism that led to the creation of the Regional Electricity Market (MER). It is a regional public good that helps member countries guarantee a core service, and is also a prerequisite for economic development and continuity of access to basic services for the Central American population.
