Electrical Integration in Central America

"International best practice for developing cross-border electricity transmission infrastructure."

Delhi, India. February 2024

Central America in figures

Population approx. 2023: 50 million
Area: 499,100 km²

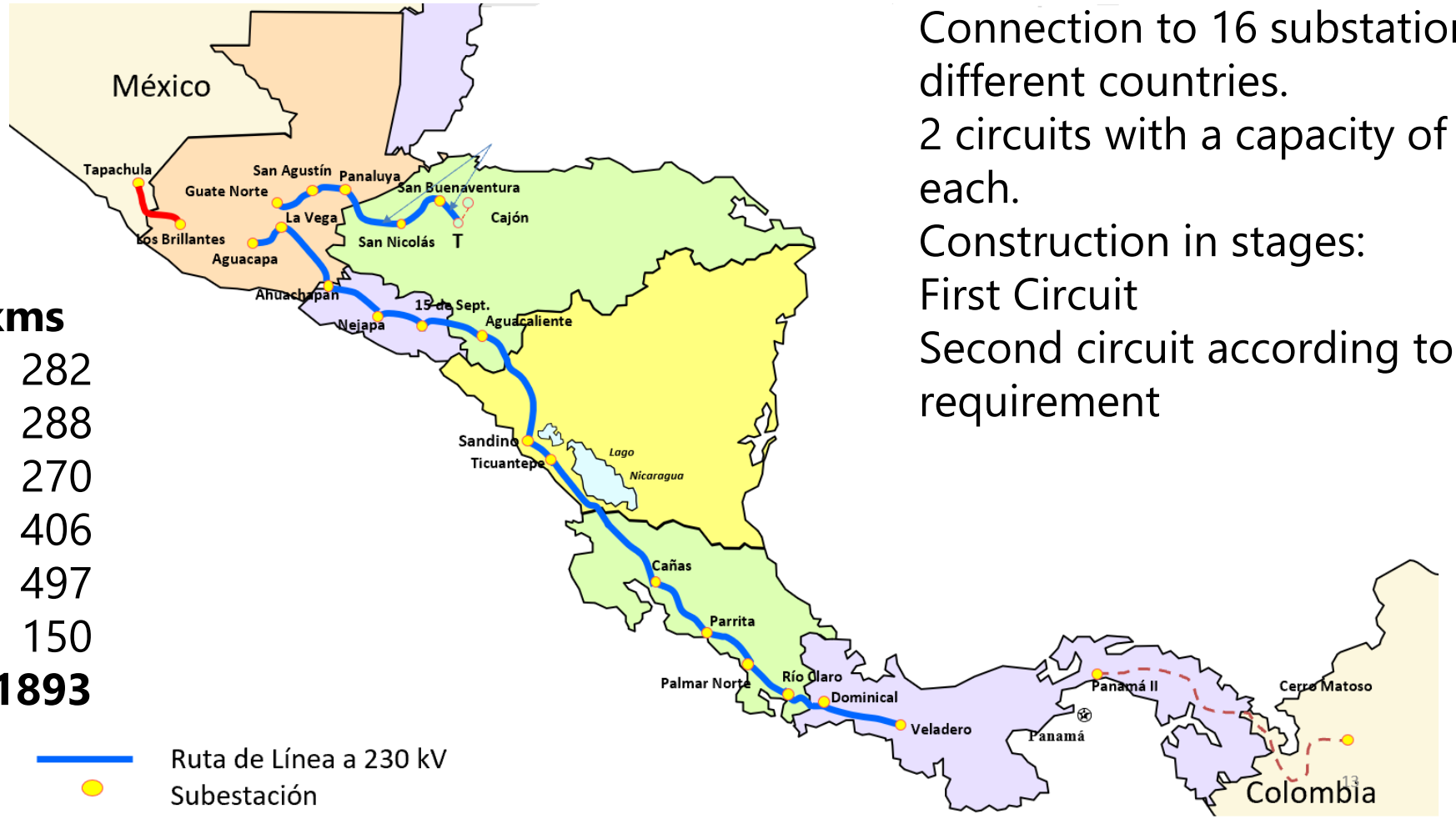
Source: www.sica.int

2021 Installed Capacity: 18,701 MW
Energy demand 2021: 55,454 GWh
Peak demand: 9,108 MW

Source: https://www.cepal.org/es/publicaciones/48602-estadisticas-subsector-electrico-paises-sistema-la-integracion-centroamericana

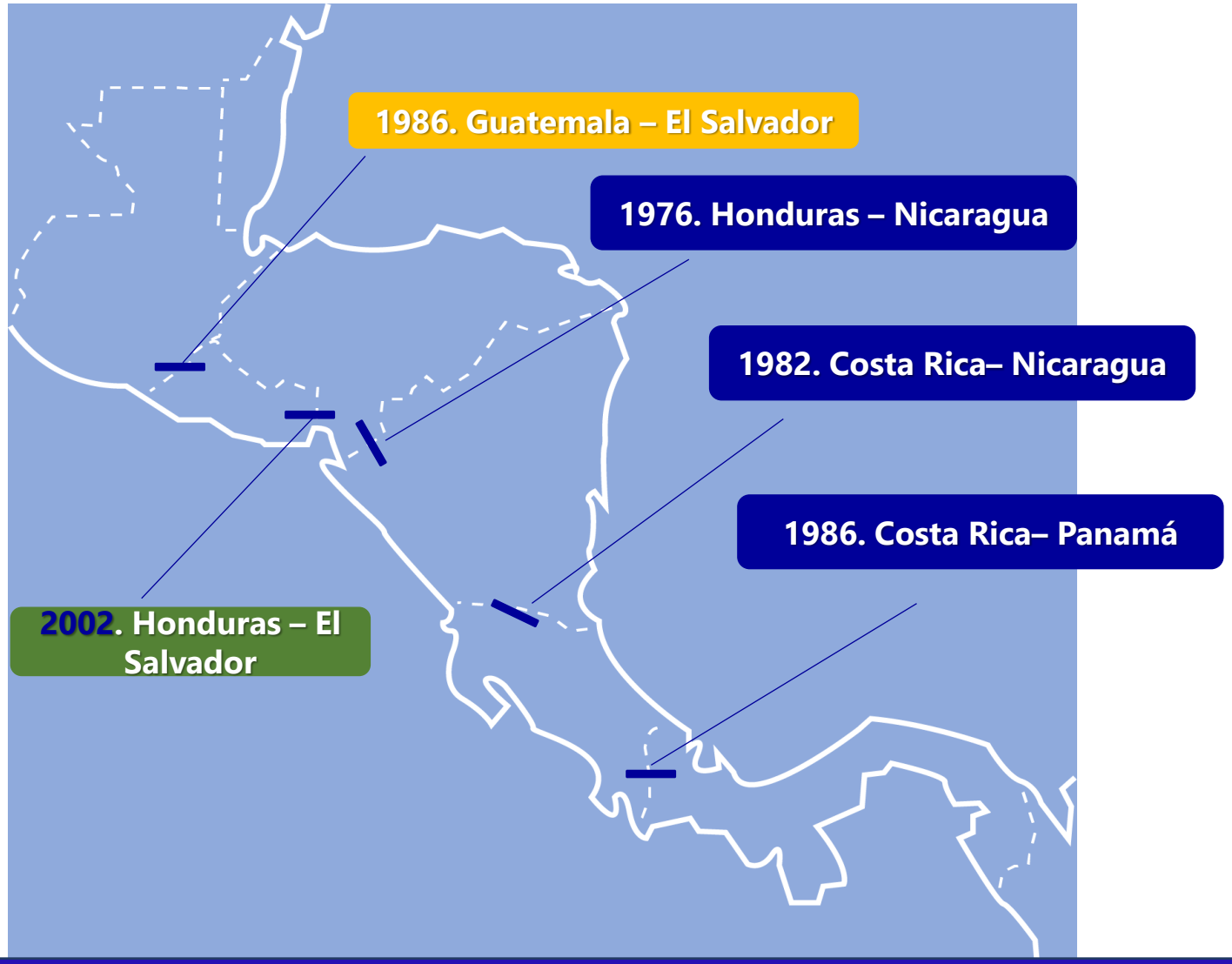
Electrical Interconnection System for Central American Countries - SIEPAC

País	kms
Guatemala	282
El Salvador	288
Honduras	270
Nicaragua	406
Costa Rica	497
Panamá	150
Total	**1893**



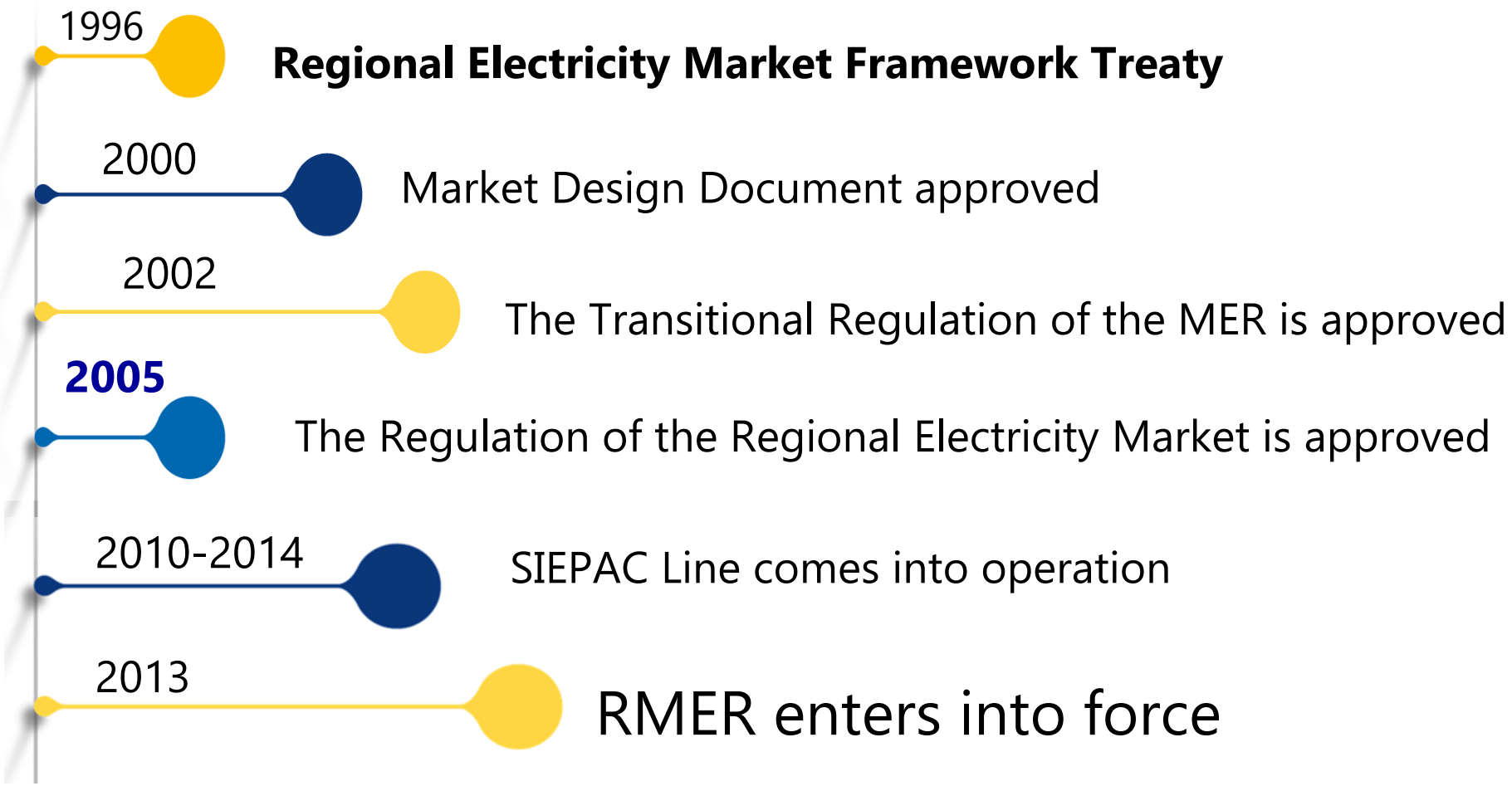
Connection to 16 substations in different countries.
2 circuits with a capacity of 300 MW each.
Construction in stages:
First Circuit
Second circuit according to system requirement

Binational Interconnections —> SIEPAC



- **70s:** Early Interconnections Show Benefits
- **Late 80s:** studies conclude that work should be done on the construction of an interconnection line with greater capacity and create a regional electricity market

How SIEPAC came about



Central American Electricity Market Framework Treaty

The formation and gradual growth of a competitive regional electricity market, based on reciprocal and non-discriminatory treatment, which contributes to the sustainable development of the region within a framework of respect and protection of the environment.

Based on the principles of: Competition, Gradualness, Reciprocity

Institutional Structure of the MER

Governments

CDMER

Regional Electricity Market Board of Directors

6 Energy Ministries or Councils

CRIE
Comisión Regional de Interconexión Eléctrica

6 National Regulators

EOR

Ente Operador Regional

6 System and Market Operators

290 MER Agents enabled

Regional Transmission Agent

EPR
EMPRESA PROPIETARIA DE LA RED

Traders

TransCos

GenCos

DisCos

Large Users

Political Organ of the MER

Facilitates compliance with Parties' commitments and coordinate interrelationship with Regional Organizations

CDMER

Made up of one representative from each country (usually energy ministers).

1. promotes the evolution and development of the MER;
2. formulates the conditions conducive to the development of regional power generation plant;
3. ensures that changes to national regulations are gradually carried out in order to harmonize them with regional regulations;
4. facilitates the fulfilment of the responsibilities of governments as set out in the Framework Treaty and its protocols

Regulatory body (CRIE)

Led by a board of commissioners. One commissioner for each country. They are usually the national regulators

a) Takes measures to guarantee conditions of competition and non-discrimination in the Market.
b) Promotes the development of the Market, ensuring its initial operation and its gradual evolution towards more competitive states.
c) Approves the regulations of physical and economic dispatch, at the proposal of the EOR.
d) Regulates aspects concerning regional transmission and generation.
e) Approves the tariffs for the use of the regional transmission system according to the corresponding regulations.
f) Imposes the sanctions established by the protocols in relation to non-compliance with the provisions of the Treaty and its regulations.
g) Resolve conflicts between market players

System & Market Operator(EOR)

Led by a Board of Directors made up of **two** Directors from each country. MER agents participate

a) Proposes to the CRIE the procedures for the operation of the Market and the use of the regional transmission networks.

b) Ensures that the operation and regional dispatch of energy is carried out with economic criteria, and adequate levels of safety, quality and reliability.

c) Carries out the commercial management of transactions between market agents.

d) Formulates the indicative expansion plan for regional generation and transmission.

Regional Transmission Company (EPR)

- Each government designates a public entity in its country to participate in a publicly owned or privately owned enterprise
- This company, called Empresa Propietaria de la Red (EPR), will be governed by private law and legally domiciled in Panama.
- No shareholder may have direct or indirect control, or more than 15% of the shares.

Finance Scheme

Infrastructure Financing	Million US$	%
IDB	253,5	50,2
BCIE (BEI)	109,0	21,6
CAF	15,0	3,0
BANCOMEXT	44,5	8,8
DAVIVIENDA	11,0	2,2
OTHERS	13,5	2,7
EQUITY (Shareholders)	58,5	11,6
TOTAL	505,0	100,0

- ✓IDB loans for US$253.50 million with sovereign guarantee of the countries of the region.
- ✓Other credits for US$193 million without state guarantee, being the most importante portion from CABEI for US$109 million.
- ✓The shareholder companies contributed share capital for a total of US58,5 million.

Interest Rates

Loan Bank	Amount Miles US$	Interest Rate
IDB		
BID 003/SQ-CR	10 000	2,00%
BID 004/SQ-ES	10 000	2,00%
BID 005/SQ-GU	10 000	2,00%
BID 006/SQ-PN	10 000	2,00%
BID 007/SQ-HO	15 000	2,00%
BID 008/SQ-NI	15 000	2,00%
BID 1095/SF-HO	25 000	2,00%
BID 1096/SF-NI	25 000	2,00%
BID 1368/OC-CR	30 000	4,72%
BID 1369/OC-ES	30 000	7,27%
BID 1370/OC-GU	30 000	4,72%
BID 1371/OC-PN	30 000	4,72%
BID ICE- 1908/OC-CR (ICE)	4 500	6,52%
BID 2421/ BL- NI	4 500	5,24%
BID 2016/ BL-HO (ENEE)	4 500	4,72%
TOTAL IBID	**253 500**	
CABEI		
BCIE 1690	44 500	7,64%
BCIE 1810A	44 500	6,40%
BCIE 1810 B	20 000	6,40%
TOTAL BCIE	**109 000**	
ANOTHER		
CAF	15 000	7,85%
BANCOMEXT	44 500	9,04%
DAVIVIENDA	11 043	7,82%
ENATREL - BEI	6 554	3,52%
TOTAL ANOTHER	**77 097**	
SHAREHOLDERS		
INDE	4 500	6,72%
ETESA	4 500	7,88%
SUB TOTAL ACCIONISTAS	**9 000**	

EPR is a Private Company

EPR is not a SPV.

EPR is a private company, whose capital comes from seven shareholders of public companies and two shareholders of private companies interested in participating in the project.

EPR is a permanent company with permanent branches in each country in the region, with administrative offices, spare parts and emergency inventories, and technical personnel in each of them.

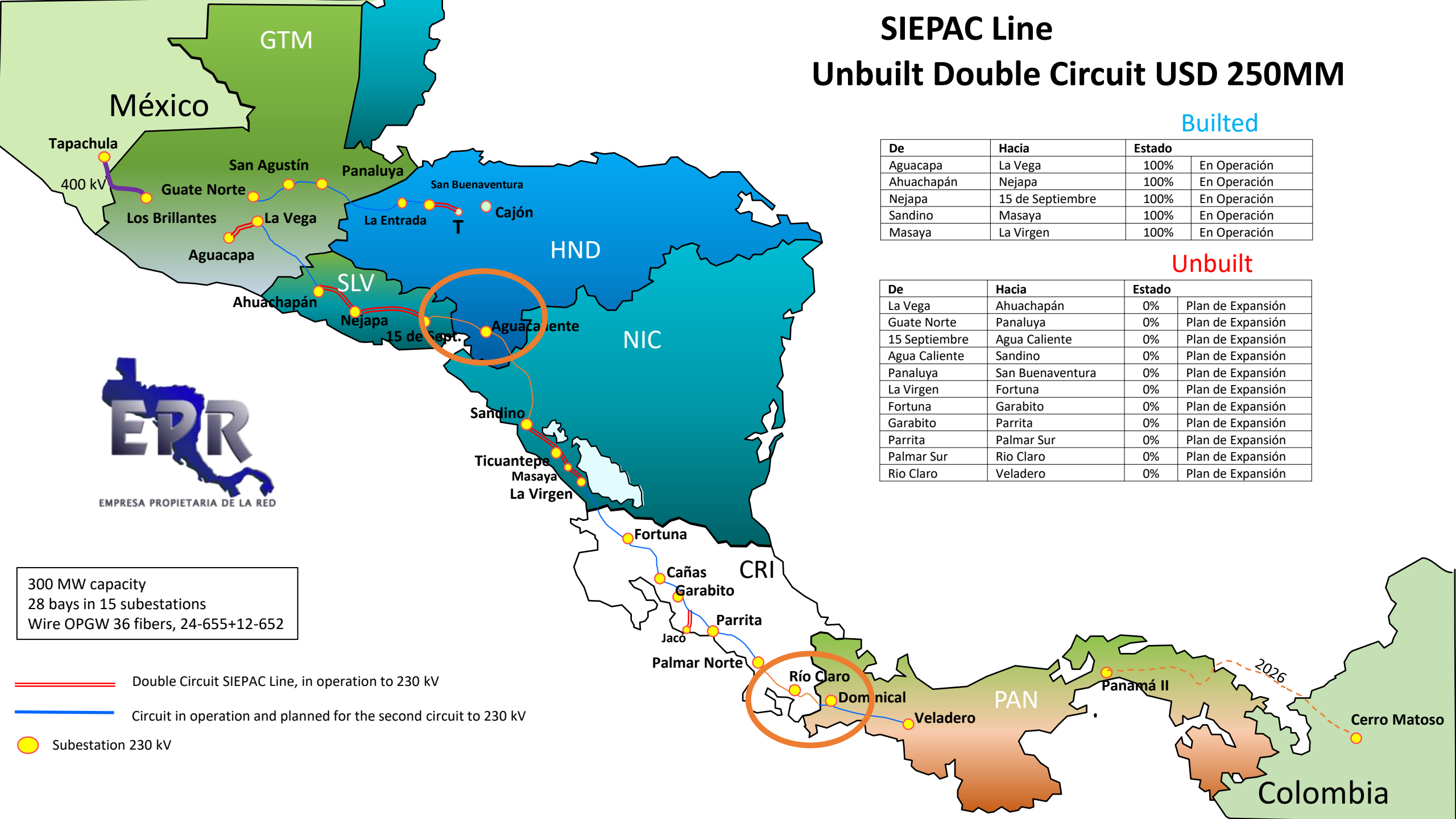
Development of business models and financing.

EPR will develop national expansions for Nicaragua and Honduras for USD 46MM between 2024-2026.

There are pending works to be assigned from the Second Stage of SIEPAC for approximately USD 200MM.

These works will be developed with financing from Development Banking (IDB/CABEI) and Capital Contributions from Shareholders for approximately 15%.

SIEPAC Line
Unbuilt Double Circuit USD 250MM



EMPRESA PROPIETARIA DE LA RED

300 MW capacity
28 bays in 15 subestations
Wire OPGW 36 fibers, 24-655+12-652

Double Circuit SIEPAC Line, in operation to 230 kV

Circuit in operation and planned for the second circuit to 230 kV

Subestation 230 kV

Builted

De	Hacia	Estado	
Aguacapa	La Vega	100%	En Operación
Ahuachapán	Nejapa	100%	En Operación
Nejapa	15 de Septiembre	100%	En Operación
Sandino	Masaya	100%	En Operación
Masaya	La Virgen	100%	En Operación

Unbuilt

De	Hacia	Estado	
La Vega	Ahuachapán	0%	Plan de Expansión
Guate Norte	Panaluya	0%	Plan de Expansión
15 Septiembre	Agua Caliente	0%	Plan de Expansión
Agua Caliente	Sandino	0%	Plan de Expansión
Panaluya	San Buenaventura	0%	Plan de Expansión
La Virgen	Fortuna	0%	Plan de Expansión
Fortuna	Garabito	0%	Plan de Expansión
Garabito	Parrita	0%	Plan de Expansión
Parrita	Palmar Sur	0%	Plan de Expansión
Palmar Sur	Rio Claro	0%	Plan de Expansión
Rio Claro	Veladero	0%	Plan de Expansión

Main risks facing EPR and lessons learned

RISKS DUE TO POLITICAL CHANGES IN THE REGION.

MITIGATION: EPR PRIVATE COMPANY.

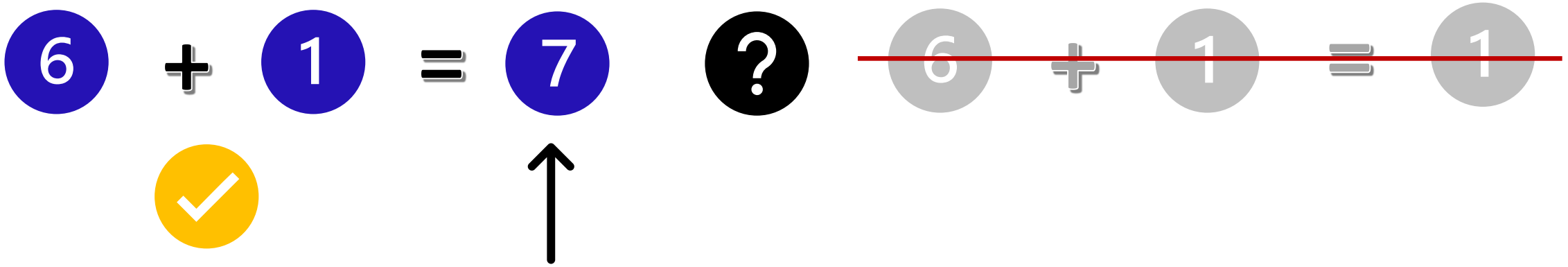
DESINTEGRATION RISKS.

MITIGATION: COMMUNICATION AND INDEPENDENCE.

RISKS OF NON – PAYMENT (TO DATE LATE PAYMENT 0%).

MITIGATION: GUARANTEES.

Regional Electricity Market -MER



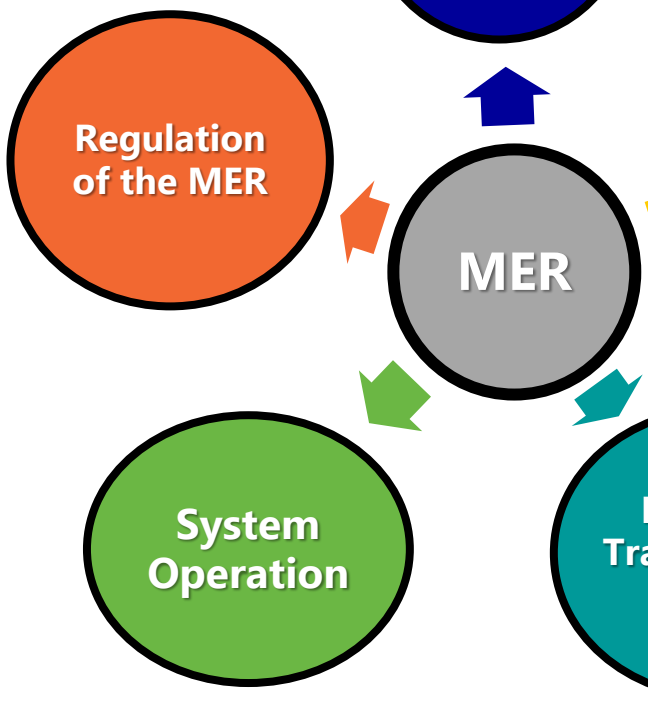
Why "seventh market" and not one?

- Different levels of openness of national markets.
- Different models (cost market, price market, single buyer).
- These models respond to national economic decisions, the reality of systems, national policies, etc.
- Level of network development differs in each country.
- Problems that go beyond the electricity sector, such as fiscal problems.
- To be consistent with the **gradualness** principle.

Features of the MER

- Independent of national markets
- Purchase and sale of energy are carried out in a coordinated manner.
- Transactions are made through the Regional Transmission Network (RTR).
- It's a multi-nodal market
- MER agents, except for transmission companies, can buy and sell energy freely, without discrimination, with free transit through the countries' electricity grids.
- Free access to regional and national transmission networks

MER Products & Services



It is done in the **Regional Contract Market** or the Regional Opportunity (Spot) Market.

Service provided by CRIE

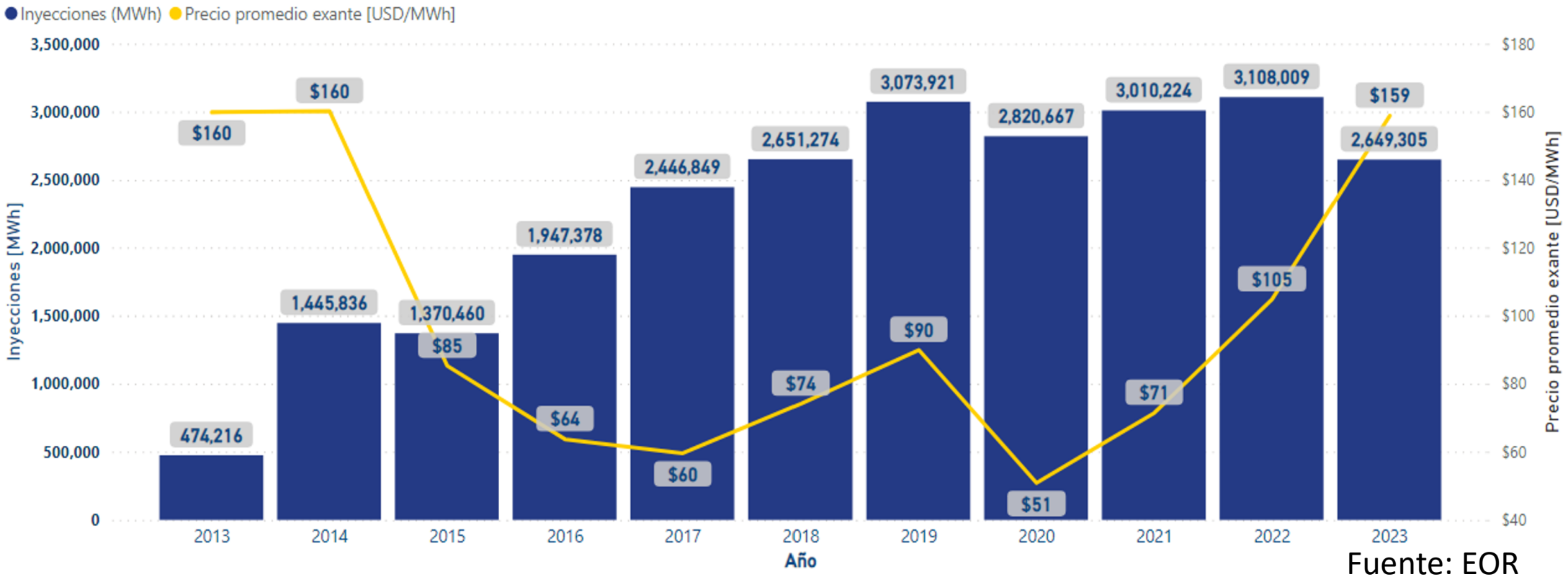
Minimum and mandatory requirements, they are not subject to transactions or remuneration in the MER.

Service provided by the EOR

It is the transmission of electrical energy by means of the RTR. SIEPAC + NATIONAL NETWORKS

Transactions in the MER

Histórico de Inyecciones y precios promedio anuales en el MER (1 junio 2013 – 31 diciembre 2023)



Fuente: EOR

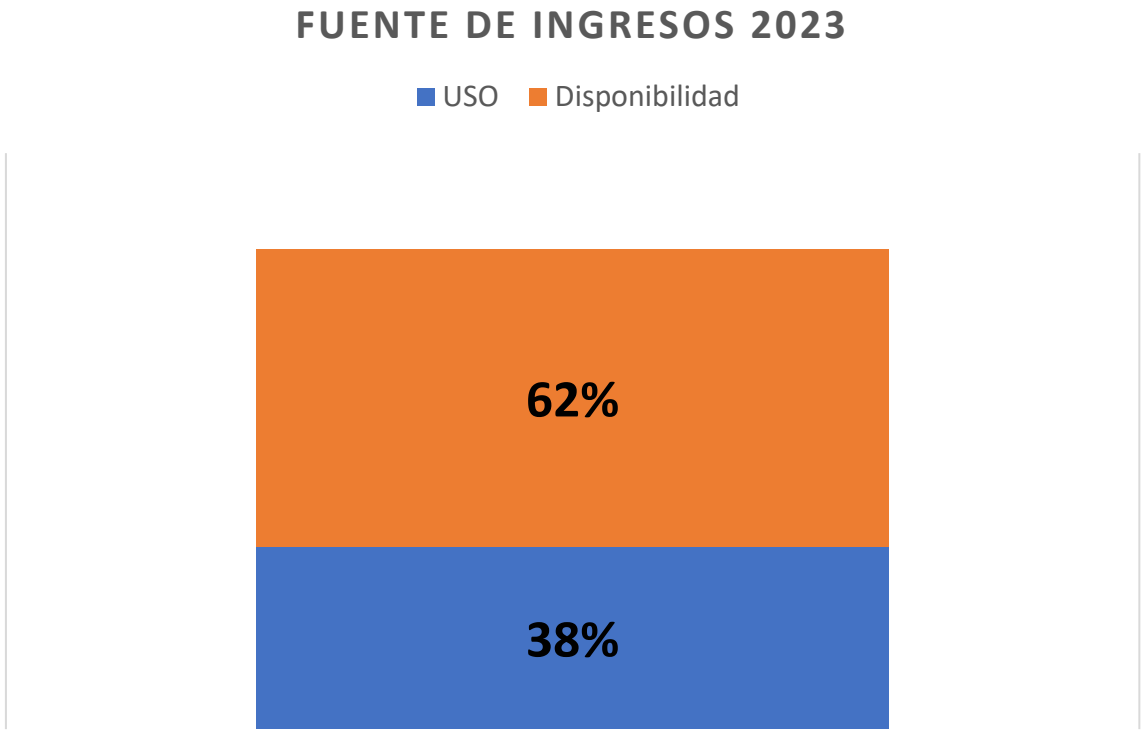
Remuneration of the SIEPAC line

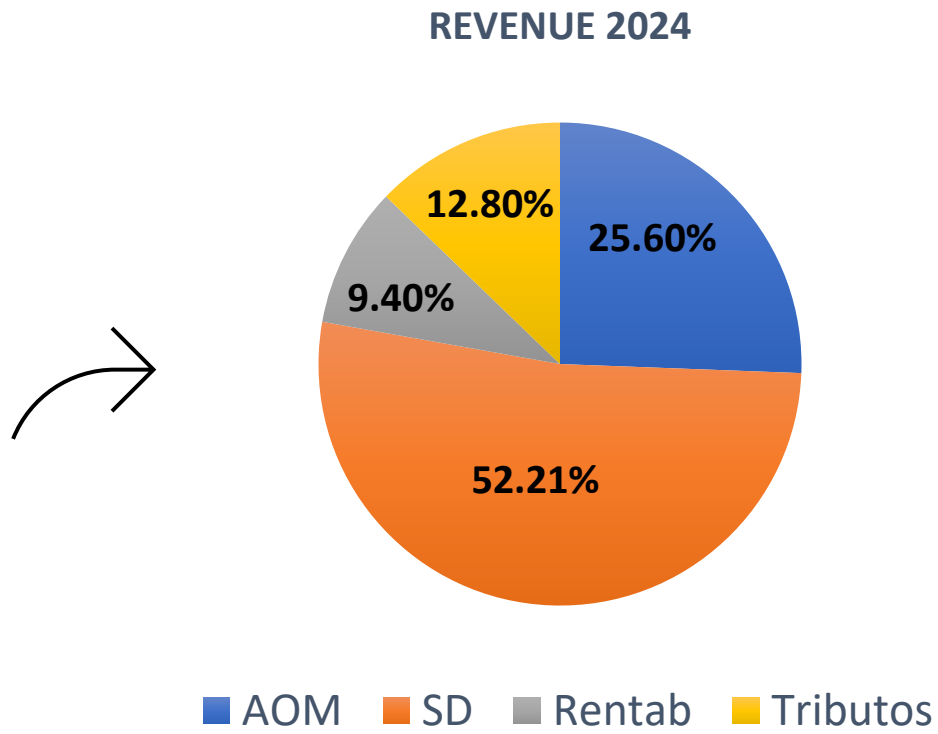
- EPR's Annual Income is guaranteed by the regional regulation.
- Annual Income must cover:
  - ✓ Administration, Operation and Maintenance costs of an efficiently operated company.
  - ✓ Debt Service: The benefits of concessional rates are passed directly onto the tariff.
  - ✓ Guaranteed Regulated Profitability on Capital Contributions.
  - ✓ Tax Burdens. They are not socialized. Each country absorbs the cost overruns or tax benefits.

Remuneration of the SIEPAC line

Where does that revenue come from?

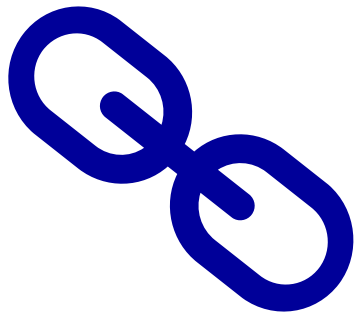
- The USE made by the Agents when making transactions.
- Of the AVAILABILITY that is paid for by all energy consumers.

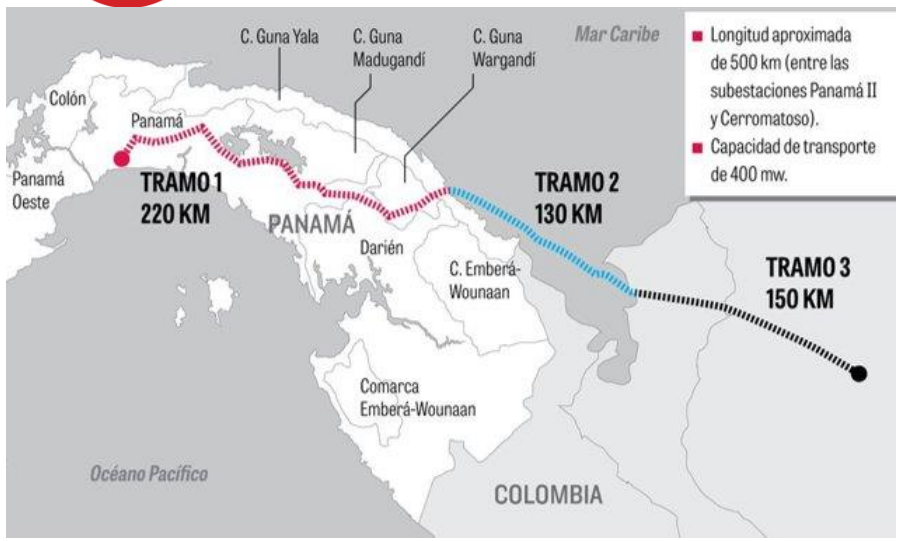




Usage: Variable Transmission Charges + Toll + Sale of Transmission Rights.

Extra-regional interconection lines





Extra-regional interconection lines

IDB Project

Support to the energy integration of Mesoamerica

The objective is to support the development of a 2050 vision for regional electricity integration in Central America. Specifically, it is proposed: (i) to define a long-term plan for the electrical integration of the region and adjacent countries, through the expansion of electrical interconnection in the Central American Electrical Interconnection System (SIEPAC) and evaluate the suitability of integration with the systems of Mexico, Belize and Colombia …

Key points

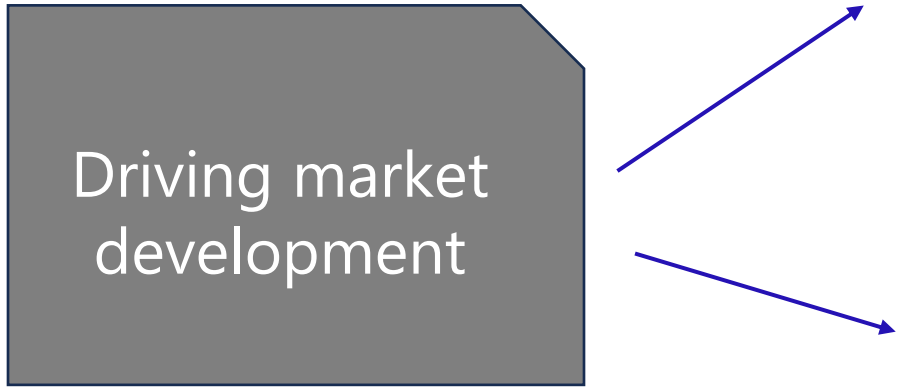
Implementation of the electricity market

- ✓ Signing of the Treaty and approval of the rules
- ✓ Level of political commitment of countries
- ✓ Promotion of the IDB to regional organizations and countries (credits).
- ✓ Gradualness

Infrastructure development

- ✓ IDB Financing (50%) with Sovereign Guarantee = TRUST
- ✓ All shareholders are equal, independent of the infrastructure in each country.
- ✓ Guarantee of entry to EPR. It is not affected by market development.

Main challenges



- ✓ Maintain political momentum and follow-up.
- ✓ Strengthening institutions.
- ✓ Developing national and regional networks.
- ✓ Keep national and regional regulatory interfaces up-to-date.

Benefits of Central American Electrical Integration.

- Increase in regional trade in electric energy.
- Total or partial reduction of blackouts
- Lower cost energy.
- Coordinated G&T planning across countries.
- Improved quality and security of energy supply.

Challenges for the Central American electrical integration.

- Promote new investments in regional transmission, including to neighboring countries
- Development of long-term contracts
- Increasing the level of integration: national markets with the MER

2024

Of interest:

www.crie.org.gt www.eprsiepac.com www.enteoperador.org